environmental economics

Energy and Sustainability Report

Old Town, Newbury

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About Environmental Economics

Our team of experienced consultants specialise in construction and building energy. We have qualifications in sustainability, energy, engineering, building physics and construction as well as environmental, quality management and auditing.

We develop flexible, practical, cost-effective specifications for our clients through identifying solutions and delivering design advice. This includes the following disciplines:

- *Energy Reports*
- *Sustainability Statements*
- *Compliance assessments and advice covering*
    - *Part L (SAP) & Future Homes Standard*
    - *Part F (ventilation)*
    - *Part G (water)*
    - *Part O (overheating)*
- *Overheating - TM59 dynamic modelling*
- *Overheating – simple method*
- *Life cycle carbon assessments*
- *Net zero carbon assessments*
- *BREEAM*
- *SBEM (existing and new build)*
- *Minimum Energy Efficiency Standards (MEES)*
- *Thermal Bridging (Psi value calculations)*

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1. Executive Summary

1.1.1. This Energy and Sustainability report was prepared by Environmental Economics Ltd on behalf of Lochailort Newbury Ltd for the site Old Town, Newbury. The report assesses measures to reduce the carbon emissions across the site through the use of fabric efficiency and low/zero carbon technology including ground source heat pumps in a district heating network and photovoltaic (PV) panels.

1.1.2. The proposed development is designed to incorporate insulation measures and low carbon district heating in order to comply with Policy DM4 of the West Berkshire Local Plan (adopted June 2025).

1.1.3. The development will incorporate a ground source heat pump district heating network, providing low carbon heat in accordance with local and national policies.

1.1.4. A representative sample of the residential element have been assessed using SAP 10.2 compliant software, which are shown to deliver circa 71% reduction in Part L (2021) regulated emissions. This is in accordance with Policy DM4 which sets a target of a 63% reduction over Part L (2021). This also exceeds the predicted 49% betterment from the upcoming Future Homes Standard over current regulations (see section 2.3).

1.1.5. Policy DM4 sets FEE targets for various dwelling types used on site. This report demonstrates compliance with these targets (see section 4.1) through good fabric design intent.

1.1.6. A representative sample of the proposed retail units has been assessed using SBEM calculation engine v6.1.e.0 and can be seen to deliver circa 21% reduction in carbon emissions (regulated and unregulated) against Part L 2 (2021) regulations. This provides opportunity for BREEAM Excellent (shell only).

1.1.7. The concierge and shared residents' area (comprising a gym, kitchenette, parcel room, meeting room and toilets) was assessed using SBEM calculation engine v6.1.e.0 and delivered circa 10% reduction in carbon emissions (regulated and unregulated) against Part L 2 (2021) regulations. An operative energy calculation was also completed as required in the West Berkshire Local Plan, to consider the unregulated emissions of this area.

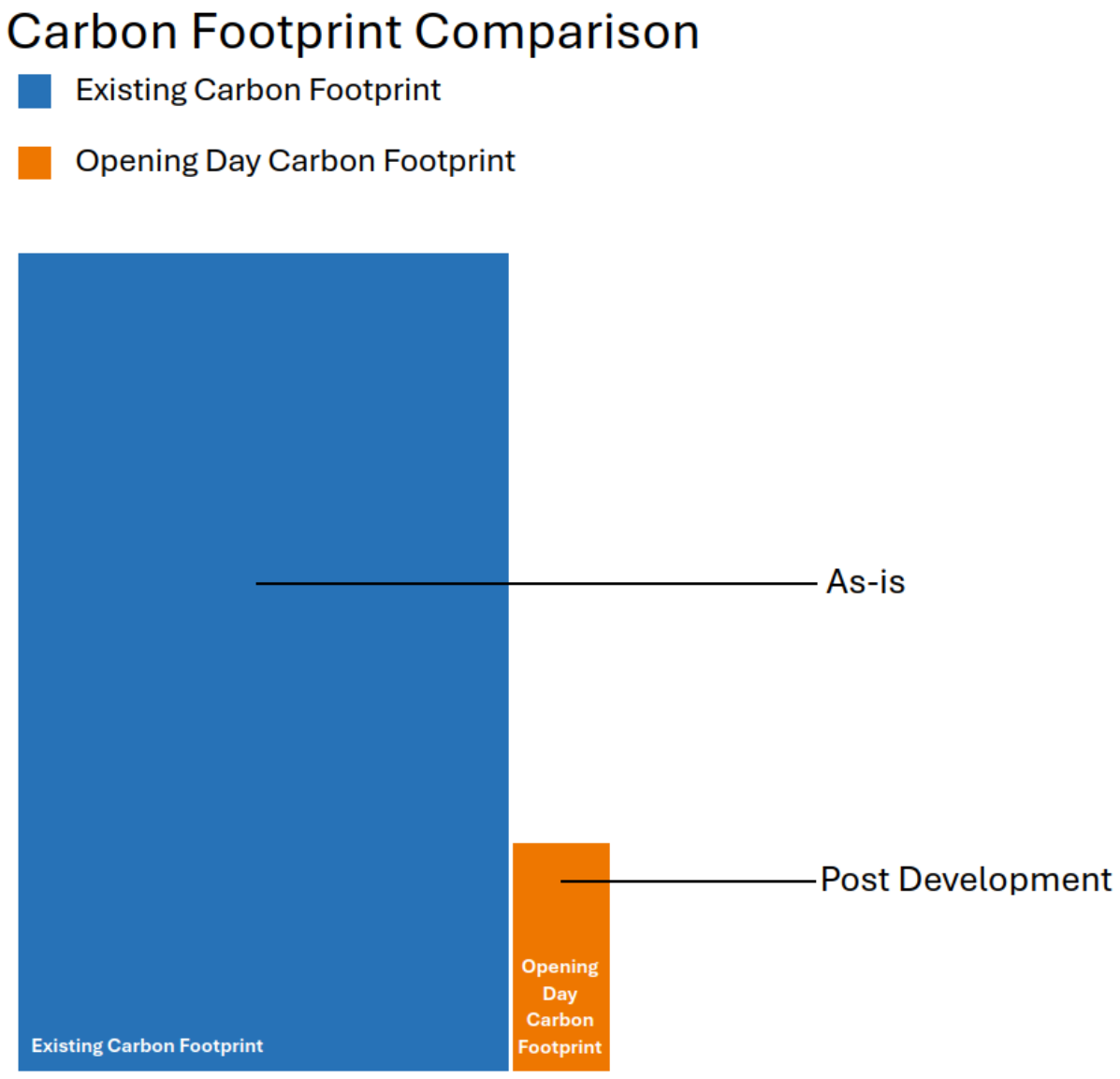
1.1.8. Policy DM4 sets a net zero carbon target which considers operational energy (regulated and unregulated) and allows for a cash in lieu payment to offset any residual carbon emissions from the site (domestic and non-domestic units). The proposed development aims to meet West Berkshires net zero carbon target ambition through use of renewable energy across the site in the form of ground source heat pumps connected to a district heating network and PV panels.

1.1.9. The reduction in carbon emissions from regulated and unregulated energy is demonstrated in sections 4.5 and 5.3 for residential and non-residential development respectively.

1.1.10. Proposed site wide total carbon emissions per year are 98 tonnes, a 68% improvement over the Part L 2021 baseline. The 98-tonne figure includes both regulated and unregulated carbon emissions for both the residential and non-residential units.

1.1.11. The proportional area chart (Figure 1 below) shows the predicted site wide total carbon emissions (orange rectangle) having a 97% improvement on the existing site which produces 3,040 tonnes/yr (blue rectangle).

Figure 1: Comparison of the carbon footprint between the proposed development and the existing site.



1.1.12. The use of smart meters will provide occupiers with real time data which will allow occupiers to manage their energy consumption, save money and reduce carbon. This is particularly important as the UK migrates towards half-hourly pricing levels and the proposed smart grid system.

1.1.13. The development strategy sets a high standard of overall sustainability, complying with Policy SP5, with measures that include:

- *Material suppliers with responsible sourcing certification guided by a high-quality sustainable procurement policy;*
- *Effective waste management procedures to minimise construction waste and to divert any residual waste from landfill;*
- *The implementation of drainage, ecology and travel plans;*
- *Provision of electric vehicle charging points within residential parking areas and separately to the public car park facility;*
- *Provision of secure cycle storage;*
- *Improved pedestrian access routes;*
- *Efficient internal and external water use in line with building regulations;*
- *Opportunity to achieve BREEAM Excellent.*

1.1.14. Potential overheating risk will be assessed in accordance with Approved Document O.

2. Project Overview

2.1. Description of Site

2.1.1. The site consists of 317 residential dwellings, 5 shell retail units and a concierge and shared residents area for the residential units (including a concierge, gym, meeting room, kitchen and postal room). The residential units comprise a range of terraced housing, duplex maisonettes, duplex flats and traditional flats.

2.1.2. The proposed site location/boundary for the whole site is shown in Appendix A.

2.1.3. This report addresses a development being undertaken by Lochailort Newbury Ltd, and does not include any further proposals for subsequent developments.

2.1.4. The retail units have been modelled with an assumed fit out specification.

2.2. Planning Policy

2.2.1. The planning authority for this site is West Berkshire Council.

2.2.2. Within the West Berkshire Local Plan (adopted June 2025), the relevant policies are the following:

2.2.3. Policy DM4:

Building Sustainable Homes and Businesses

New development of one or more new dwellings (C3 or C4 use class) and/or 100sqm or more of new non-residential floorspace, including hotels (C1 use class), residential institutions (C2 use class) or Secure Residential Institutions (C2A use class) should achieve net zero operational carbon emissions (regulated and unregulated energy) by implementing the energy hierarchy.

Proposals should demonstrate application of the energy hierarchy through submission of an Energy Statement or a detailed energy section within the Sustainability Statement in accordance with policy SP5 and which identifies how the following minimum standards of construction are achieved to the greatest extent feasible and viable.

1. Residential Development - minimum construction standard

A. New development of one or more new dwellings (C3 or C4 use class) will meet the following minimum standards of construction:

• Achieve the carbon Target Emission Rate set by the Future Homes Standard once this is confirmed by central government; in the meantime, achieve 63% reduction in carbon emissions is achieved by on-site measures, as compared to the baseline emission rate set by Building Regulations Part L 2021 (SAP 10.2). These regulated carbon emission targets are to be achieved before the addition of on-site renewable electricity generation (which should subsequently be considered in section 3 of this policy); and

• Equal to or less than the following targets, using the Building Regulations Part L SAP Fabric Energy Efficiency (FEE) metric:

o End terrace: 32.9 kWh/m2/year FEE

o Mid terrace: 25.1 kWh/m2/year FEE

o Room in roof (semi detached): 32.5 kWh/m2/year FEE

o Detached: 43.6 kWh/m2/year FEE

o Bungalow: 51.0 kWh/m2/year FEE

o Low-rise apartment: 21.0 kWh/m2/year FEE

o Mid to high-rise apartment: 13.5 kWh/m2/year FEE

o Where the proposed home type does not precisely reflect any of the above, the applicable target from the list above will be that of the most similar home type to that proposed, with a note to justify why this is thought to be the most similar. In apartment buildings, it will be acceptable to meet this target via a weighted average of all residential floor space in the building (recognising that there may be variation between floors in the building).

• For outline applications and where the home type is not known, it will be required to commit to delivering the relevant target(s) through reserved matters. This will be secured by a condition.

B. Residential refurbishment developments of 10+ units will meet BREEAM Domestic Refurbishment 2014 (or future equivalent) Excellent as a minimum.

2. New Non-Residential Development, including hotels, residential institutions, secure residential institutions - minimum construction standard

New development of 1 00sqm or more of new non-residential floorspace, including hotels (C 1 use class), residential institutions (C2 use class) or secure residential institutions (C2A use class) will meet the following minimum standards of construction:

• Appropriate to the building type, calculate a typical building baseline using a nationally recognised standard and demonstrate a percentage reduction in energy (regulated and unregulated) carbon emissions. These operational carbon emission targets are to be achieved before the addition of on-site renewable electricity generation (which should subsequently be considered in section 3 of this policy); and

• BREEAM Excellent (BREEAM New Construction V6 or future equivalent).

3. Renewable Energy

A. Subsequent to the achievement of the minimum construction standards under parts 1 and 2, new development of one or more new dwellings (C3 or C4 use class) and/or 100sqm or more of new non-residential floorspace, including hotels (C1 use class), residential institutions (C2 use class) or Secure Residential Institutions (C2A use class) should include onsite renewable, zero

and low carbon energy technologies to achieve net zero carbon operational energy (regulated and unregulated) on site.

B. The Council will support proposals for renewable energy provided that the technology is:

i. Suitable for the location;

ii. Not on the most versatile agricultural land (grades 1, 2 and 3a);

iii. Is accompanied by a landscape / visual impact assessment; and

iv. Would not cause harm to residential amenity by virtue of noise, vibration, overshadowing, flicker or other harmful emissions.

4. Carbon Offsetting

Where a development proposal of one or more new dwellings (C3 or C4 use class) and/or 100sqm or more of new non-residential floorspace, including hotels (C1 use class), residential institutions (C2 use class) and or secure residential institutions (C2A use class) cannot demonstrate that it is net zero carbon in relation to operational energy (regulated and unregulated), it will be required to address any residual carbon emissions by a cash in lieu contribution.

2.2.4. Policy SP5

Responding to Climate Change

The principles of climate change mitigation and adaptation will be required to be embedded into new development, improving the resilience of land, buildings and existing and future communities to the opportunities and impacts arising from climate change. All development should contribute to West Berkshire becoming and staying carbon neutral by 2030. Depending on the nature and scale of proposals, development will be expected to satisfy the following criteria:

a. To withstand predictable effects from climate change for its expected lifetime;

b. To take advantage of the latest low and zero carbon technologies and innovations, including digital;

c. To achieve net zero operational carbon development by applying the energy hierarchy, achieving the highest viable levels of energy efficiency, generating and supplying renewable, low and zero carbon energy, and as a last resort carbon offsetting in accordance with policy DM4;

d. To achieve the highest viable levels of energy efficiency;

e. To generate and supply renewable, low and zero carbon energy for its own use and/or local distribution networks in accordance with policy DM4;

f. To provide for sustainable forms of vehicular and personal transport to and from the site and reduce car use in accordance with policies SP19, DM44 and DM45;

g. To enable recycling and waste reduction both during construction and occupation;

h. To manage and conserve adequate water resources and avoid harming water quality and improve it where possible in accordance with policies DM7 and DM6;

i. To demonstrate that flood risk from all sources can be avoided or managed in accordance with policy SP6;

j. To use sustainable urban drainage systems in accordance with policy SP6;

k. To provide for green/blue infrastructure and open spaces within the layout for shading and cooling, to detain surface water run-off and absorb carbon dioxide emissions in accordance with policy SP10;

l. To improve wildlife habitat and species conservation and connectivity to allow for movement in response to climate change in accordance with policy SP11; and

m. To maintain the integrity of the historic environment and to respect the character and improve the environmental performance of heritage assets without compromising their significance in accordance with policy SP9. This necessitates taking a whole building approach informed by heritage expertise.

Proposals should be accompanied by a Sustainability Statement which demonstrates how these principles have been embedded into the development. The level of information provided should be proportionate to the scale and nature of the development proposed.

2.3. Building Regulations

2.3.1. The 317 dwellings, 5 shell retail units and concierge and shared residents' area comprising this development currently fall under Part L 2021 of the building regulations and will be required to follow SAP 10/SBEM methodology. Part L 2021 regulations have a higher standard in carbon requirements than Part L 2013. Specifically, any of the plots on site which are to be built to Part L 2021 (using SAP 10) will exceed current Part L1A 2013 building regulations by 31%.

2.3.2. In addition to the higher standards, some of the carbon content for different types of fuel has changed, meaning that the resultant carbon emissions will be calculated differently.

2.3.3. At present, the Future Homes Standard is in the consultation process headed by the UK Government. There are two transitional periods proposed, but it's likely that part, if not all the units on site will fall under FHS regulations.

2.3.4. The former government minister Christopher Pincher is quoted as saying, "A new home built to Future Homes Standard in 2025 is to have 75-80% lower carbon emissions than Part L 2013."

2.3.5. Based on the above statement and the 31% betterment from Part L1A 2013 to Part L1A 2021 regulations (2.3.1), it can be reasoned that the likely betterment over current regulations (Part L 2021) will be 49%.

2.3.6. Currently, there is no modelling software available to test whether the sample housetypes will pass the future regulations. Therefore, we have used SAP 10 methodology, but set a target of a 49% betterment in CO2 emissions over the current regulations as follows:

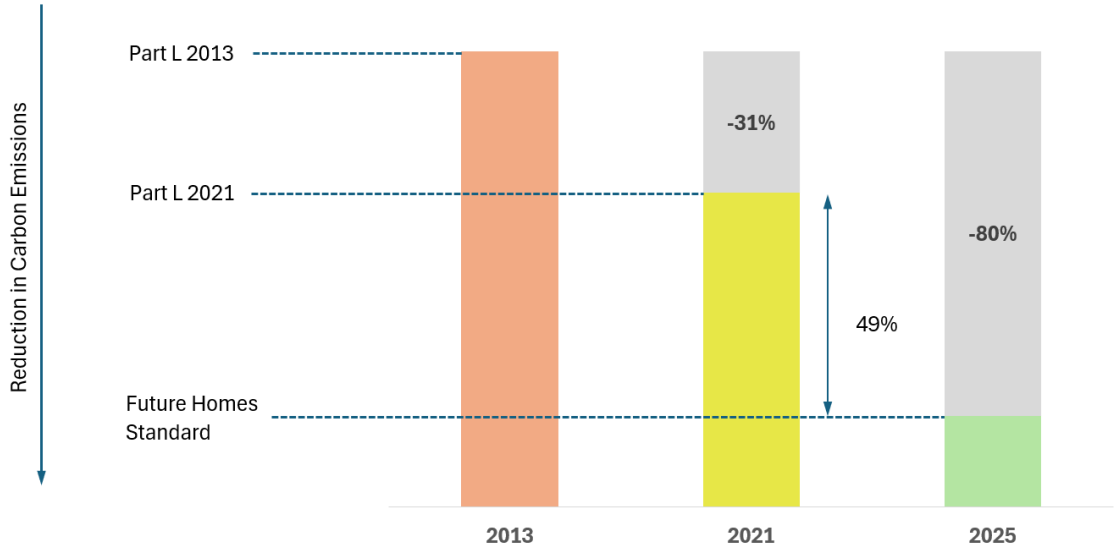


Figure 2: Regulatory targets for Carbon emissions. Percentage figures are reductions over Part L 2013 baseline.

3. Improvement Measures

3.1. Assessment Methodology

3.1.1. Environmental Economics has modelled the proposed development using Government approved software:

a. Dwellings are assessed using Design SAP 10 from Elmhurst Energy.

b. The retail units have been assessed using DesignBuilder v7.2.0, using the SBEM calculation engine v6.1.e.0.

3.1.2. These software tools provide a number of outputs which can be used to assess and compare the improvements from any number of build specifications in terms of:

- *Building regulations compliance*
- *Energy usage per year (kWh/annum)*
- *Carbon emissions as a measure of building regulations compliance (kg CO_2/m2/year)*
- *Energy costs per year (£/annum)*
- *More detailed breakdowns by end use (space heating, water heating, cooking, lighting, appliances)*
- *Ene 01 compliance (Designbuilder v7.2.0)*
- *Effective air change rate*

3.1.3. Each of these outputs can be used in different ways to analyse the performance of the dwelling. The total regulated carbon emissions for each property are based upon:

- *Space heating*
- *Water heating*
- *Electricity for pumps and fans*
- *Electricity for lighting*

3.1.4. Two SAP models were created in order to calculate the domestic energy demand. The required data for the site is calculated for each of the models, and then the difference used to establish the level of improvement.

3.1.5. Sample SAP 10 reports for residential units are shown in Appendix L.

3.1.6. A sample retail unit was modelled using Designbuilder.

3.1.7. The sample retail and concierge and residents' area SBEM outputs (BRUKLs) are found in Appendix J.

3.1.8. For non-domestic buildings, the iSBEM User Guide v6.1.d confirms the following:

SBEM is a compliance and energy certification procedure and not a design tool. If the performance of a particular feature is critical to the design, even if it can be represented in SBEM, it is prudent to use the most appropriate modelling tool for design purposes. In any case, SBEM should not be used for system sizing.

3.1.9. While the SAP and SBEM assessments provided within this report represent potential opportunities for the proposed development to comply with AD-L 2021 and the West Berkshire Policy DM4, it is incumbent on the appointed design engineers to review the performance requirements for the final design and adopt suitable systems.

3.2. Design Philosophy

3.2.1. Upgrades have been made to a number of elements from a standard build specification in order to improve energy efficiency across the development.

3.2.2. The proposed development adopts nationally recognised design and construction principles as the industry moves towards zero carbon. The principles are illustrated in Figure 3 below.

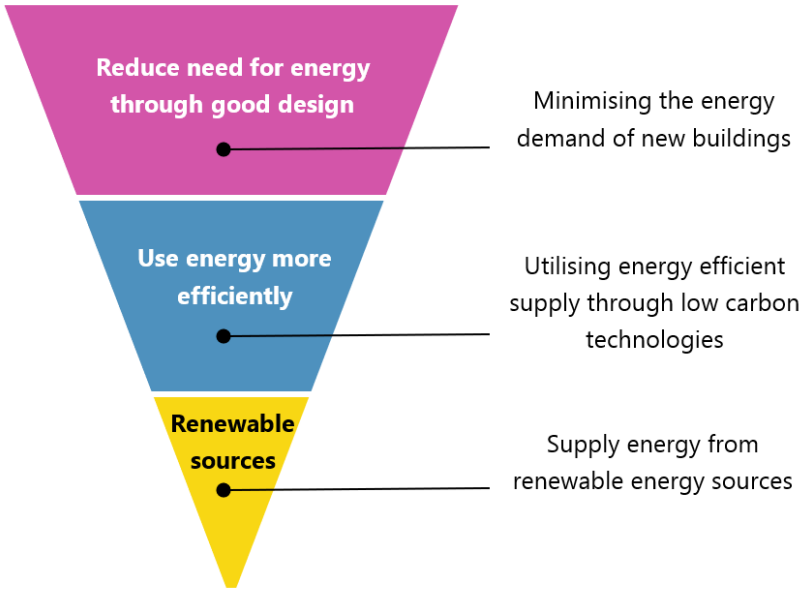


Figure 3 – The Energy Hierarchy

3.2.3. In order to reduce the residual carbon emissions a number of improvements were made to the standard material and product specification. These improvements include:

- *Upgraded heating and hot water controls.*
- *Delayed start thermostat.*
- *Design air permeability of 3.00m³/hr/m² for the residential and retail units.*
- *Bespoke thermal bridging details.*

3.3. Fabric Improvements Part L 2021

3.3.1. The building fabric for all dwellings within the proposed development will be improved in comparison to ADL 2013 specifications, and in relation to the ADL 2021 backstop notional specification. These fabric improvements reduce the space heating requirement upon a property. The improvements will be made through a combination of upgraded materials and increased insulation thicknesses. Enhanced glazing with a larger transmittance factor allowing for increased solar gains will also be used in dwellings.

3.3.2. Proposed fabric designs and U-Values used in the domestic energy calculations can be found in Table 1 below.

Table 1: Draft Build Specification

Element	***Minimum Standard***	***Improved Specification***	
-	***W/m²k***	***Description***	***W/m²k***
Walls	0.26	Full Fill Insulation in 100mm cavity	0.23-0.25
Roof	0.16	Plane Roof – 500mm Mineral Wool	0.08-0.09
		Sloping Ceiling to achieve	0.15
Floors	0.18	To be confirmed	0.10-0.11
Doors	1.60	Double glazed Low-E, Wood frame	1.1
Glazing	1.60	Double/Triple glazed Low-E, Wood frame,	0.8-1.1

3.3.3. Proposed fabric designs and U-Values used in the non-domestic energy calculations can be found in Table 2 below:

Table 2: Draft Build Specification for retail units

Element	***Minimum Standard***	***Improved Specification***	
-	***W/m²k***	***Description***	***W/m²k***
Walls	0.26	Full Fill Insulation in 100mm cavity	0.18
Ground Floor	0.18	To be confirmed	~0.11
Doors	1.60	External door	1.4
Glazing	1.60	T Solar – 0.72 L Solar – 0.76	1.0

Table 3: Draft Build Specification for concierge and shared residents' area

Element	*Minimum Standard*	*Improved Specification*	
-	***W/m²k***	***Description***	***W/m²k***
Walls	0.26	Full Fill Insulation in 100mm cavity	0.18
Ground Floor	0.18	To be confirmed	0.11
Doors	1.60	Doors where >50% of the area is glazed are modelled as windows as per National Calculation Methodology	-
Glazing	1.60	Frame factor = 0.1	1.0

3.3.4. Please note that this specification is not finalised and is subject to change up until detailed design stage.

3.3.5. As improvements are made to the thermal conductivity of main elements, thermal bridging and air permeability becomes increasingly significant in the overall fabric performance. Thermal bridges achieving a y-value of 0.03 has been used. This results in much lower heat loss levels in comparison with standard practice.

3.3.6. As a result of following these junction details and focusing on build quality air permeability will also decrease. A target air pressure rating of 3.00m^3/hr.m^2 has been set for all houses and retail units, which is an improvement on the maximum allowable rating in the 2021 Building Regulations.

3.4. Building Services & Renewable Energy (LZCT) in Domestic Units

3.4.1. The systems used in a property to supply hot water and heating, as well as to control it, are important to the overall energy demand of a property. AD-L 2021 includes requirements for efficiency and controls of such equipment, including space heating, water heating, ventilation, and lighting.

3.4.2. The design of building services which provide space heating and domestic hot water, ventilation, and lighting, must be considered in a holistic way in order to avoid unintended consequences and to maximise the benefits from such systems.

3.4.3. A district heating network utilising ground source heat pump bore holes from multiple plant rooms is proposed to provide heating and hot water across the site. The scheme is to be designed by ERDA/BMD who have provided an estimation of the main performance figures:

- ***Coefficient of performance (CoP) of 3.75***
- ***Distribution loss factor (DLF) over the network of 1.5.*** *This is in accordance with the CIBSE/ADE CP1 'Heat Networks: Code of Practice for the UK'.*

We have used the above figures for the sample SAP calculations. Please note, these figures are an estimation and may change at detailed design stage. More information on the district heating system can be found in Appendix B.

3.4.4. Subject to feasibility, the proposed development will incorporate photovoltaic (PV) systems. The sample SAPs are based on an average of 3.1 PV panels per dwelling. Upon detailed design stage, the exact number of panels per dwelling may change following a feasibility assessment undertaken by the PV installer.

3.4.5. Heat Interface Units (HIU) are proposed to be installed to all dwellings connected to the heat network. HIU's utilise one or two plate heat exchangers to provide instantaneous heating and hot water. See Appendix B for more information.

3.4.6. Decentralised Mechanical Extract Ventilation (dMEV) fans are proposed to be installed to all residential dwellings as the ventilation strategy. dMEVs manage humidity and are significantly more energy efficient and quieter in comparison to standard extractor fans.

3.4.7. Shower type is assumed to be a thermostatic mixer shower with a flow rate of 8L/min connected to an unvented hot water system.

3.4.8. Lighting provision will be from LED low energy fittings achieving a minimum efficacy of 100 lamp lumens per circuit Watt, an improvement of over 50% from AD-L 2013 performance levels.

3.4.9. Smart meters will be installed on all properties, providing:

- Real time information on energy use both in terms of consumption and cost
- Occupier can manage their energy, save money, and reduce carbon emissions.
- Smart meters will also allow for easier switching between suppliers.
- Facilitate a more reactive, price driven, demand-response.
- End estimated billing and eliminate the need for meter readers to visit premises.

3.5. Building Services & Renewable Energy (LZCT) in Non-Domestic Units

3.5.1. It was assumed that the shell retail units would not be connected to the heat network, and instead a typical fit out had been assumed in line with the recommendations of CIBSE Guide B0 (2016).

3.5.2. A split system has been modelled in a sample retail unit, utilising two Mitsubishi PLA-ZM50 internal cassettes and a PUZ-ZM100 outdoor unit, providing space heating and cooling with optimum start/stop control, local time control and temperature control.

3.5.3. This system used air source heat pumps, with an efficiency of 480%. Air source heat pumps are a low or zero carbon technology.

3.5.4. Electric instantaneous hot water was modelled as the commercial hot water system.

3.5.5. Lighting provision was assumed to be from LED low energy fittings achieving a minimum efficacy of 130 lamp lumens per circuit Watt.

3.5.6. A detailed summary of the fabric and services used in the SBEM model is provided in Appendix K.

3.5.7. The concierge and shared residents' area in Pellow House was modelled as fully fitted with underfloor heating supplied by the heat network. Central time control and optimum start/stop control optimise energy use for space heating. The system was assumed to include provision for metering to enable the building manager to monitor energy use. An alarm for 'out of range' values has been included to alert the building manager of any potential malfunctions.

3.5.8. LED lighting is to be supplied to all areas in the concierge and shared residents' area with an efficiency of 130 Lumens/Watt. The meeting room is controlled with a switch and photo electric sensor that switches off the lights when daylight provides sufficient lighting.

3.5.9. The other zones in the concierge and shared residents' area are controlled by occupancy sensors, with photoelectric sensors also provided to the concierge and gym area. Occupancy sensors ensure the lights are not left on when the room is unoccupied, saving energy, whilst also turning on as soon as a building user enters the room, removing the inconvenience of building users searching for a light switch in a dark room.

3.5.10. The concierge and shared residents' area includes a small gym. The heating system has been assumed in line with CIBSE Guide B0 (2016), which states that effective ventilation is usually the most critical factor when services fitness suites/weight training areas. Hence, an MVHR system is proposed throughout the concierge area, kitchenette, meeting room and gymnasium. Comfort cooling is to be provided to the gym via a split system.

3.6. TM54 Aims

3.6.1. Whilst Part L compliance calculations (SAP & SBEM) provide some insights regarding predicted energy consumption, there exists a performance gap between the Part L results and actual post-occupancy energy use.

3.6.2. The Chartered Institute of Building Services Engineers (CIBSE) have developed an alternative method of calculating building energy consumption, referred to as TM54.

3.6.3. TM54 assesses operational energy use, covering both regulated and unregulated energy uses. TM54 is a highly detailed HVAC (heating, ventilation and air-conditioning) modelling assessment, dependent on specific uses for each space assessed. Therefore, for shell only projects, TM54 calculations are not appropriate since the fit-out and specific use of each space is unknown. Operational energy credits (Ene 01 in BREEAM UK New Construction V.6.1) are not applicable to shell only BREEAM assessments.

3.6.4. The key principles of TM54 are to assist in designing in-use energy consumption targets, supply prospective building owners and occupiers with a clearer indication of predicted energy use and running costs, and to enable prospective occupiers to understand which energy performance measures have the greatest impact on energy use.

3.7. TM54 Methodology

3.7.1. Designbuilder v7.3.1.003 was used to create a dynamic simulation model (DSM) of the concierge and shared residents' area in Pellow House, comprising a concierge, gym, toilets, kitchenette, postal room and meeting room. The building envelopes (floor areas, wall areas, room volumes, U-values, Psi values, thermal mass) were taken from the planning drawings and SBEM model respectively.

3.7.2. Detailed HVAC modelling was conducted to best represent the proposed servicing strategy. Template modelling was considered but deemed inappropriate due to the complex nature of the proposed system. See Table 4 for more details regarding the benefits and caution points arising from detailed HVAC modelling.

3.7.3. Typically, at planning stage, template HVAC modelling would be used, however this was deemed inappropriate due to the complexity of the proposed system.

3.7.4. TM54 states that appropriate weather files should be considered for scenario modelling. The energyplus IWEC weather files can be used to represent a typical year, and the CIBSE_DSY1_2020_High50_ weather files can be used to represent a heat wave with a seven-year return in the high emissions climate change scenario.

3.7.5. At detailed design, the TM54 calculation should be rerun with more information added to the model regarding the specific product efficiencies and fine tuning of the proposed system. As per BREEAM Ene 01 methodology, energy consumption targets should be reported to BRE.

Table 4. Benefits and caution points on detailed HVAC modelling (from CIBSE TM54, 2022)

Benefits of including detailed HVAC modelling	***Caution points about detailed HVAC modelling***
Identifies opportunities to optimise the design of HVAC plant and controls, for a more efficient building with lower utility costs.	HVAC modelling as an 'isolated' or 'one-off' exercise will most likely not enable buildings on their own to achieve their operational energy targets. Instead, the approach needs to be iterative and fully embedded in the design, construction and handover process with sufficient expertise in the team and resource allocated in the programme.
Provides a 'dress rehearsal' of the proposed HVAC design that can flush out problems that otherwise may not have been picked up until installation or commissioning.	The detail of HVAC modelling should reflect the project's requirements, level of accuracy required, and type of systems present in the building.
Provides the client with increased assurance that operational targets are achievable.	Detailed HVAC modelling relies on a range of detailed inputs which, especially at the early design stages, may be subject to much uncertainty. It is therefore recommended to consider the probable ranges and confidence levels for key input data to have a better understanding of the uncertainty of the results and how this could be managed as a project evolves.
Provides increased accuracy of operational energy usage forecasting and scenario testing.	A review of the modelling report (and associated design) is recommended, as in all models, to reduce risk and address the above points.
Enables the simulation model to be a more useful tool to assist in the fine tuning of buildings in operation.	
Can hold designers and contractors more accountable for in-use performance.	

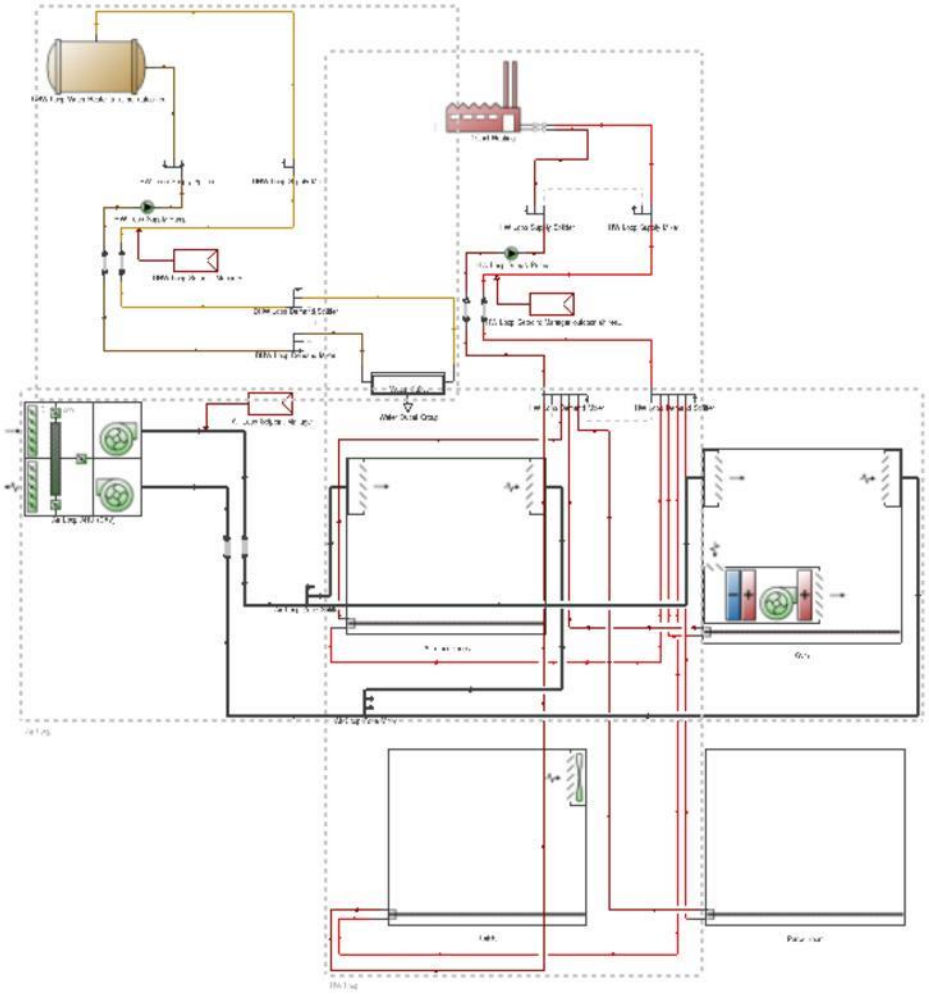


Figure 4. Detailed HVAC system modelled in DesignBuilder.

3.7.6. Figure 4 shows a visualisation of the detailed HVAC system modelled in DesignBuilder, comprising an underfloor heating system with MVHR serving all zones in the concierge and shared residents' area (except for the maintenance store). The gym is also serviced by an air-source heat pump system to provide cooling.

3.8. TM54 Scenarios

3.8.1. Two scenarios have been considered. One is a 'worst-case' operation where the MVHR system is left running continuously in all zones. This may increase energy consumption and supply air to zones during night hours with no predicted occupancy. In this scenario, the cooling system is left running continuously in the gym, such that active cooling will be provided during the night should the air temperature exceed the set point values.

3.8.2. The second scenario has scheduled operation of the MVHR in all zones and air conditioning system in the gym to optimise comfort whilst reducing energy use outside of occupied hours.

3.8.3. Each scenario was modelled in the GBR_LONDON_GATWICK_IWEC weather file to represent a typical weather scenario, and in the CIBSE_DSY1_LGW_2020_High50_ weather file to represent a heat wave with a seven-year return. This will add additional strain to the MVHR and air-conditioning services, which may represent the higher demands for this unit.

3.8.4. The system is automatically sized by DesignBuilder software based on predicted demand and room volumes.

4. Results - Residential

4.1. Fabric Energy Efficiency (FEE)

4.1.1. Policy DM4 sets out FEE targets for various types of residential dwellings.

4.1.2. Sample SAPs were produced following the specification outlined in this report.

4.1.3. To ensure accuracy, average DFEE outputs from the 8 orientations in SAP have been taken for each sample SAP and averaged.

4.1.4. For flats and maisonettes (duplex and single story) we applied a floor area weighted average to return a 'block' DFEE. Full calculation tables for this are shown in Appendix C.

4.1.5. Table 5 summarises the results along with a target FEE

4.1.6. The target FEE for flats and duplex flats is calculated based on the following:

- *Max of 6 stories per block*
- *Dwellings on 5th and 6th stories classed as mid-rise, falling into the 13.5 target FEE category.*
- *Dwellings on stories 1 to 4 will be classed as low rise, falling into the 21.0 target FEE category.*
- *2/3rds of dwellings in the block are low rise and 1/3rd is mid-rise.*
- *Therefore, a weighted target FEE is calculated by:*

$$\left(\frac{2}{3}\ X\ 21.0\right) + \left(\frac{1}{3}\ X\ 13.5\right) = 18.5$$

4.1.7. Results are shown below.

Table 5: Fabric Energy Efficiency (FEE) summary table

Typology	Category	Target FEE	DFEE
End Terrace	**End Terrace**	**32.9**	**32.5**
Mid Terrace	**Mid Terrace**	**25.1**	**23.6**
Maisonette/Duplex Maisonette	**Low-rise apartment**	**21.0**	**21.0**
Flats	**Low-rise apartment** **Mid to high rise apartment**	**18.5**	**17.6**
Duplex Flats	**Low-rise apartment** **Mid to high rise apartment**	**18.5**	**17.7**

4.2. Onsite Renewables Cross Check Table

4.2.1. Following guidance provides by West Berkshire Council, a renewables cross check table is provided below.

4.2.2. Where total PV generation is equal to or greater than the combined annual regulated and unregulated energy demand, this will be considered net zero operational energy and deemed policy compliant.

4.2.3. In this case, total annual PV generation does not exceed total annual energy use. This is based on an average of 3.1 PV panels per dwelling. Upon detailed design stage, this may change following a feasibility assessment undertaken by the PV installer.

Table 6: Onsite renewables cross check table

Total annual energy use (regulated and unregulated – KWh	**613,951**
Total annual PV energy generation - (KWh)	**303,756**

4.3. Regulated Carbon Reduction

4.3.1. Distribution loss factor (DLF) and Coefficient of Performance (entered as efficiency in SAP 10 software) are two critical data points that influence the level of emissions for the residential units.

4.3.2. We have modelled sample SAPs for end and mid terrace houses, duplex maisonettes, and ground floor, mid floor and top floor flats. The average reduction in regulated CO2 emissions across site over Part L 2021 for the residential units was 71%. See Table 7 below and in depth calculation in Tables 17 and 18 in Appendix D.

Table 7: Energy Summary Table – 'Be Lean' and 'Be Clean' (Regulated emissions only)

Stage	Energy Use (kWh per annum)	Total CO_2 emissions (Tonnes CO_2 per annum)	Percentage Reduction Of Total CO_2 emissions (Tonnes CO_2 per annum)
Baseline Part L 2021 of the Building Regulations Compliant Development	**1,073,886**	**246**	
Be Lean: Fabric First and Servicing Improvement - savings from demand reduction (FEE metric)	**1,148,709**	**235**	**4%**
Be Clean: Supply energy Efficient	**481,274**	**72.0**	**71%**

4.4. Unregulated Carbon Emissions

4.4.1. The Good Homes Alliance (GHA) provide a method for calculating unregulated energy demand for residential dwellings (see Appendix F).

4.4.2. Using figures calculated from the GHA, we can deduce total unregulated carbon emissions for all the residential units on site. This is calculated to be 59.4 tonnesCO_2/annum for the residential units.

4.5. Total Carbon Reduction

4.5.1. To comply with policy DM4, the total carbon emissions reduction was calculated. It is necessary to consider both regulated and unregulated carbon emissions for this calculation.

4.5.2. For the residential units, the baseline total carbon is 305 tonnesCO_2/annum. The proposed scheme total carbon is 93 tonnesCO_2/annum. This results in a 70% reduction in total carbon for the residential units. See Table 8 below and Tables 19, 20 and 21 in Appendix E.

Table 8: Energy Summary Table – 'Be Lean', 'Be Clean' and 'Be Green' (Regulated and Unregulated emissions)

Stage	Regulated Energy Use (kWh per annum)	Unregulated Energy Use (kWh per annum)	Total CO_2 emissions Regulated and Unregulated (Tonnes CO_2 per annum)	Percentage Reduction Of Total CO_2 emissions Regulated and Unregulated (Tonnes CO_2 per annum)
Baseline Part L 2021 of the Building Regulations Compliant Development	**1,073,886**	**436,432**	**305**	
Be Lean: Fabric First and Servicing Improvement - savings from demand reduction	**1,148,709**	**436,432**	**295**	**3%**
NEW BASELINE Be Clean: Supply energy Efficient	**481,274**	**436,432**	**131**	**57%**
Be Green: Use onsite renewable, zero and low carbon energy technologies	**177,519**	**436,432**	**93**	**70%**

4.6. Carbon Offsetting

4.6.1. To reach the net-zero carbon emissions target, it is necessary to calculate the residual carbon produced by the proposed development, which can then be addressed via a cash in lieu contribution.

4.6.2. As the site is all electric and will be powered by GSHPs for the domestic and non-domestic units, CO_2 emissions year-on-year will reduce as the carbon intensity of generating grid electricity reduces through decarbonisation.

4.6.3. Section 10.30 and 10.31 of the West Berkshire Local Plan (adopted June 2025) provides guidance for calculating carbon offsets, factoring in grid decarbonisation and citing Treasury Greenbook as a data source.

4.6.4. West Berkshire Council have produced a carbon offset calculator. Using this, the total carbon offset to achieve net-zero was calculated to be **£124,539.27 for the residential units.** Please refer to separate offset calculator spreadsheet for these calculations.

5. Results – Non-Residential

5.1. TM54 calculation

5.1.1. The results show that in a heat wave year, there is less load on the system overall, likely due to reduced heating demand. The gym is the only zone with active cooling, so whilst energy demand for cooling increased in the heat wave year, this was offset by reduced heat demand (Table 9).

Table 9. Summary of the total energy consumption arising from each scenario modelled across two weather files.

		Weather file	
		Typical weather year (IWEC weather file)	*Heat wave year (CIBSE DSY1 2020 High 50 weather file)*
Operation schedule	*Local mechanical extract and air-conditioning on 24/7*	15,287 kWh	15,090 kWh
	Local mechanical extract and air-conditioning on during occupied hours only	14,232 kWh	13,962 kWh

5.1.2. The operational energy of the building was primarily driven by room electricity, i.e. white goods used in the office areas. Lighting was the second highest energy demand, followed by system fans. Heating, cooling and domestic hot water were much lower than the unregulated energy demand. Figure 5 shows the demand for each load.

5.1.3. To improve operational energy efficiency, care should be taken when specifying white goods such as computers, monitors, televisions and utensils in the kitchenette.

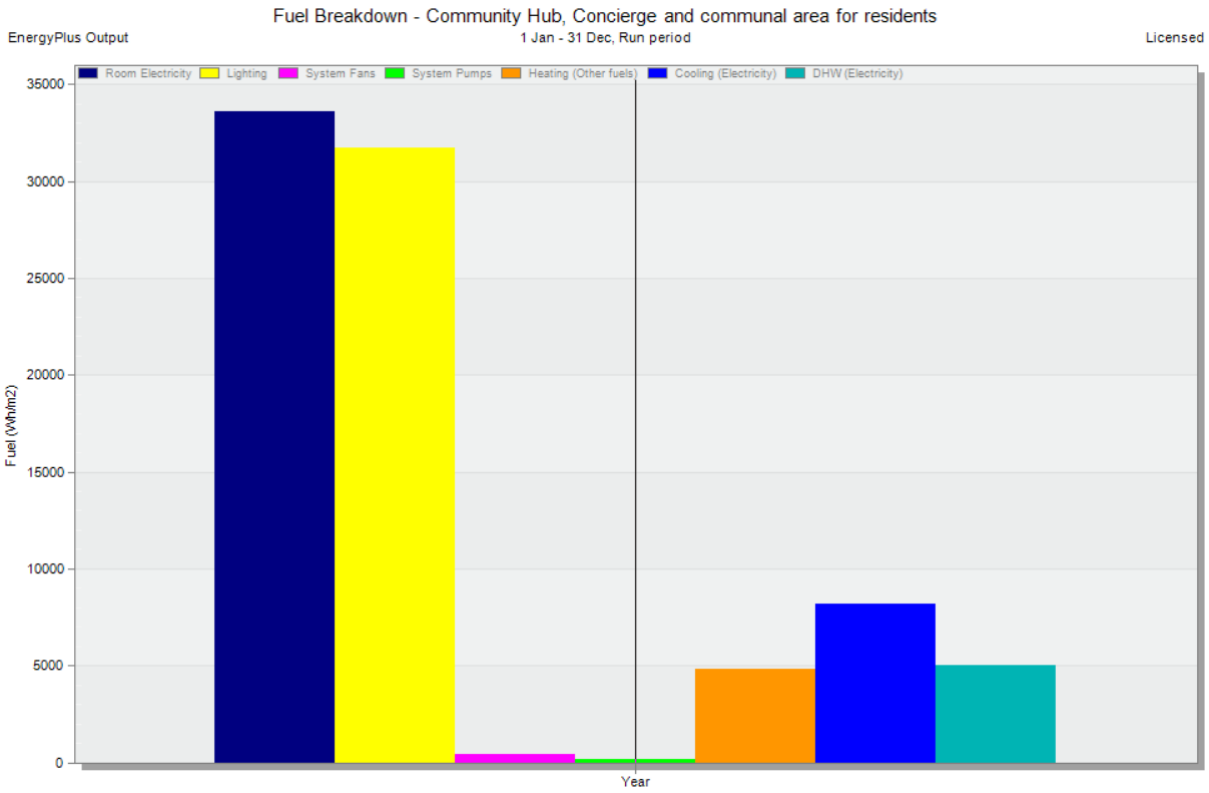


Figure 5. Bar chart showing the annual energy consumption in Wh/m^2 for a typical weather year.

5.2. Carbon Reduction (Regulated and Unregulated)

5.2.1. By assessing a sample retail unit and extrapolating across the retail units on site, these units achieve a 21% betterment over the current regulations.

5.2.2. Carbon emissions are estimated to be 3 tonnesCO_2/annum for the retail units. This is derived from the equipment loads in the BRUKL SBEM output. TM54 was not applied to the retail units because this is not an appropriate methodology for assessing shell only units. Hence, the BREEAM Ene 01 operational energy criteria are not applicable to shell only assessments.

5.2.3. The concierge and shared residents' area achieved a 10% betterment over Part L 2021. These results have been combined with those of the retail units to produce Table 10.

5.2.4. The unregulated energy use for the concierge and shared residents' area has been calculated using the TM54 results.

Table 10: Energy Summary Table – 'Be Lean' and 'Be Clean' (Regulated and Unregulated emissions) for the non-domestic units

Stage	Regulated Energy Use (kWh per annum)	Unregulated Energy Use (kWh per annum)	Total CO_2 emissions Regulated and Unregulated (Tonnes CO_2 per annum)	Percentage Reduction Of Total CO_2 emissions Regulated and Unregulated (Tonnes CO_2 per annum)
Baseline Part L 2021 of the Building Regulations Compliant Development	**22,007**	**22,864**	**6**	
Be Lean: Fabric First and Servicing Improvement - savings from demand reduction	**21,349**	**21,809**	**6**	**4%**
Be Clean: Supply energy Efficient	**15,954**	**21,809**	**5**	**16%**

5.3. Total Carbon Reduction

5.3.1. As per the guidance provided in the West Berkshire Council Sustainability Position Statement and Guidance, the highly efficient air-source heat pumps specified in the retail unit SBEMs and the ground source heat pump district heating network have been classified as 'Be Clean' strategies.

5.3.2. For simplicity, the photovoltaic arrays on the roofs of the proposed development have been assigned to the residential units.

Table 11: Energy Summary Table – 'Be Lean', 'Be Clean' and 'Be Green' (Regulated and Unregulated emissions)

Stage	Regulated Energy Use (kWh per annum)	Unregulated Energy Use (kWh per annum)	Total CO_2 emissions Regulated and Unregulated (Tonnes CO_2 per annum)	Percentage Reduction Of Total CO_2 emissions Regulated and Unregulated (Tonnes CO_2 per annum)
Baseline Part L 2021 of the Building Regulations Compliant Development	22,007	22,864	6	
Be Lean: Fabric First and Servicing Improvement - savings from demand reduction	21,349	21,809	6	4%
NEW BASELINE Be Clean: Supply energy Efficient	15,954	21,809	5	16%
Be Green: Use onsite renewable, zero and low carbon energy technologies	15,954	21,809	5	16%

5.4. Carbon Offsetting

5.4.1. To reach the net-zero carbon emissions target, it is necessary to calculate the residual carbon produced by the proposed development, which can then be addressed via a cash in lieu contribution.

5.4.2. As the site is all electric and will be powered by GSHPs for the domestic and non-domestic units CO_2 emissions year-on-year will reduce as the carbon intensity of generating grid electricity reduces through decarbonisation.

5.4.3. Section 10.30 and 10.31 of the West Berkshire Local Plan (adopted June 2025) provides guidance for calculating carbon offsets, factoring in grid decarbonisation and citing Treasury Greenbook as a data source.

5.4.4. West Berkshire Council have produced a carbon offset calculator. Using this, the total carbon offset to achieve net-zero was calculated to be **£12,687.90 for the non-residential units.** Please refer to the separate offset calculator spreadsheet for these calculations.

6. Results – Residential and Non-Residential Combined

6.1.1. Using data from the residential and non-residential results sections above, a table containing the combined results across the whole development is presented below.

Table 12: Energy Summary Table – 'Be Lean', 'Be Clean' and 'Be Green' (Regulated and Unregulated emissions) across whole development.

Stage	Regulated Energy Use (kWh per annum)	Unregulated Energy Use (kWh per annum)	Total CO_2 emissions Regulated and Unregulated (Tonnes CO_2 per annum)	Percentage Reduction Of Total CO_2 emissions Regulated and Unregulated (Tonnes CO_2 per annum)
Baseline Part L 2021 of the Building Regulations Compliant Development	**1,095,893**	**459,297**	**311**	
Be Lean: Fabric First and Servicing Improvement - savings from demand reduction	**1,170,058**	**458,242**	**301**	**3%**
NEW BASELINE Be Clean: Supply energy Efficient	**497,229**	**458,242**	**137**	**56%**
Be Green: Use onsite renewable, zero and low carbon energy technologies	**193,473**	**458,242**	**98**	**68%**

6.1.2. The baseline total carbon is 311 tonnesCO_2/annum. The proposed scheme total carbon is 98 tonnesCO_2/annum. This results in a 68% reduction in total carbon across the site.

7. Sustainability Appraisal

7.1. Waste Management

7.1.1. The proposed development aims to use waste reduction procedures to enable waste reduction and diversion of waste from landfill. The goal is to minimise waste and maximise re-use of resources in response to climate change.

7.1.2. It is recommended that a waste management plan and a system of recording waste transfer (for example BRE Smartwaste) should be utilised in order to maximise diversion of waste from landfill.

7.1.3. Appropriate facilities to separate residual waste and recycling will be provided on site.

7.1.4. The management and storage of recycling and waste during both construction and occupational phases of the development will be in line with Policy SP5 of the West Berkshire Local Plan.

7.2. Flood Risk

7.2.1. The simple check provided by the environment agency illustrates the site has areas which are categorised as being in flood zone 2, with medium risk of flooding from rivers and sea.

7.2.2. In response, a professional flood risk assessment has been prepared and submitted within the application.

7.2.3. It is understood that the designs contained therein provide measures to alleviate the risk to acceptable levels.

7.2.4. Full details of the Flood Risk Assessment and any recommendations to be implemented within the development can be found in the associated report.

7.2.5. Appendix G shows the Flood Risk map for this development.

7.2.6. The development will comply with flood risk mitigation requirements laid out in Policy SP5 of the West Berkshire Local Plan.

7.3. Sustainable Urban Drainage

7.3.1. A full SuDS Report has been completed for the proposed development along with the aforementioned Flood Risk Assessment.

7.3.2. Full details of the strategy including permeable paving, rainwater harvesting, attenuation tanks and blue roofs can be found in the associated report.

7.3.3. The development will comply with SuDS requirements laid out in Policy SP5 of the West Berkshire Local Plan.

7.4. Ecology and Biodiversity

7.4.1. A full Ecological Impact Assessment has been produced for the proposed development including both an Ecological Appraisal and Preliminary Roost Assessment for bats.

7.4.2. These reports outline the approaches which will be implemented within the development to support protected species and deliver a net gain for biodiversity.

7.4.3. Approaches will include bat bricks and bat boxes to protect and enhance bat species habitats.

7.4.4. Full details can be found in the associated reports.

7.5. Planting and Greening

7.5.1. A comprehensive landscaping scheme is proposed with new planting and this will introduce rich and diverse new species on site.

7.6. Electric Vehicle Charging

7.6.1. Providing EV charging points or the ability to retrofit EV charging points is an exemplary measure for sustainability and promotes sustainable lifestyles for residents.

7.6.2. It is proposed to provide policy compliant Electric Vehicle charging points across the site. In addition, it is proposed to provide 14 charging points within the multi-storey car park. This ensures open access to EV charging for visitors to the shopping centre and other local amenities.

7.6.3. This aligns with current government policy to stop the sale of new petrol and diesel cars by 2030 (GOV.UK, November 2020).

7.7. Public Transport

7.7.1. The site of the proposed development is in an ideal area for walking, cycling and public transport connectivity, making sustainable transport highly appealing to potential residents.

7.7.2. The development is roughly a 1-minute walk from Market Street bus stop and a 2-minute walk from Cheap Street bus stop, whilst the development is only a 4-minute walk from Newbury train station.

7.7.3. Market Street and Cheap Street bus stops provide access to number 2, 2A, 2c, 3, 3a, 4, 4a, 4b, 4c, 5, 6, 7, 7A, 103a, 103b, Link and V1 buses.

7.7.4. This amount of bus routes available in such close proximity to the development site allows for sustainable transport to a range of locations including:

- *Access to the rest of Newbury;*
- *Hungerford;*
- *Eastbury;*
- *Lambourn;*
- *East and West Ilsley;*
- *Andover;*
- *Greenham;*
- *Basingstoke;*
- *Vodafone Campus;*
- *Newbury train station.*

7.7.5. Newbury train station provides easy access to London and provides a direct link to the major national rail infrastructure. Access to Newbury train station is available through walking, cycling or the V1 bus.

7.7.6. Appendix H shows the walking routes to public transport from this development.

7.7.7. A full Transport Assessment has also been carried out for this development which goes into greater detail on how the proposal meets local policy requirements for sustainable transport.

7.7.8. Full details can be found in the associated report.

7.8. Car Club

7.8.1. Car clubs are a highly effective method in reducing car ownership and directly work towards air pollution reduction targets. Residents will have access to a car club with hybrid and electric vehicles.

7.8.2. A total of 3 new car club cars are proposed that will provide flexible transport options to complement the scheme's close proximity to Newbury's railway station and bus station.

7.8.3. The implementation of these car club schemes will reduce the need for 22 private cars across the development.

7.9. Cycle Parking

7.9.1. A total of 495 cycle parking spaces will be proposed across the site in secure storage areas.

7.9.2. 4 cycle repair stations will be provided around the site (including 3 for public use) to encourage the use of bicycles.

7.10. Permeability

7.10.1. The proposals repair the connectivity and pedestrian links that were lost when the Kennet Centre was constructed which will in turn promote walking.

7.11. Local Amenities

7.11.1. The proposed development is located in the town of Newbury.

7.11.2. The location of the development within Newbury provides the proposed development with a large range of amenities in extremely close proximity, as the development is within Newbury Town Centre.

7.11.3. Whilst the Kennet Centre is being demolished as part of the development works, several of the amenities are remaining with additional amenities being constructed in the area including:

- *The existing Vue Cinema;*
- *Restaurants;*
- *Cafes;*
- *Several newly constructed shops.*

7.11.4. Outside of the Kennet Centre but within walking distance of the development in Newbury are further amenities, including but not limited to:

- *Sainsbury's supermarket, which itself also contains a Sainsbury's Pharmacy and an Argos;*
- *West Berkshire Museum;*
- *Eateries and restaurants;*
- *Pubs and bars;*
- *Newbury Canoe Club;*
- *Several churches.*
- *Northbrook Street, which is the main shopping street in Newbury providing access to:*
    - *Several clothing shops;*
    - *Boots and Superdrug;*
    - *Cafes.*

7.11.5. There are also several other supermarkets including a Tesco Superstore, Waitrose and Aldi between half a mile and a mile from the proposed development.

7.11.6. There is also a large range of schools within a short distance from the proposed development site, including up to 8 different primary/junior schools within a 5-minute drive and 2 secondary schools in the same range.

7.11.7. This number of shops, schools and attractions within a close range means that the development site is ideally located to provide for all needs in a sustainable manner, without the need for travelling large distances to access them.

7.12. Water Use

7.12.1. The criteria for measuring potable water usage are set out in Approved Document G of the Building Regulations.

7.12.2. All dwellings on site can be designed to achieve the maximum of 105 litres per person per day internal potable water, with an additional allowance for external water use of 5 litres per person per day. The total internal water consumption estimate is 101.6 litres per person per day for dwellings with a bath and shower; and 90.6 litres per person per day for any dwellings with only a shower. An additional 5L is specified for external use. The specification of water fittings will be identified at the detailed design stage.

7.12.3. Representative data has been input into the BRE's Water Efficiency Calculator for New Dwellings for relevant domestic water consuming components; dual flush WC, taps and kitchen sink taps, bath and shower. Washing machine and dishwater specification have been set to default rates as standard practice.

7.12.4. The following representative rates have been utilised:

- *Duel Flush WC – 4L & 2.6L flush volumes;*
- *Taps – 4L per minute flow rate;*
- *Bath – 195L overflow capacity;*
- *Shower – 8L per minute flow rate;*
- *Kitchen sink taps – 4L per minute flow rate.*

7.12.5. Alternative component consumption rates are available which can achieve the required water consumption. The rates provided are representative only.

7.12.6. The calculator can be found in Appendix I.

7.12.7. The calculated results show that utilisation of the representative component's water consumption can achieve a maximum of 105 litres per person per day internally, and additional external water use of 5 litres per person per day.

7.12.8. The development therefore complies with water resource management requirements laid out in Policy SP5 of the West Berkshire Local Plan.

7.13. Air Quality

7.13.1. The scheme will comprise of suitable mitigation measures for air quality.

7.13.2. An Air Quality Assessment has been prepared by Stuart Michael Associates Limited and is submitted with the planning application. Impacts from development generated traffic and the constraints on the development and during the construction process have been assessed.

7.13.3. The Assessment concludes that taking into account the proposed development's negligible increase in air pollution during the operational stage, and the "not significant" impact arising from dust during the construction stage, it can be concluded that air quality should not be a determining factor in refusing planning consent.

7.14. Noise

7.14.1. The scheme will comprise of suitable mitigation measures for noise. A noise impact assessment has been prepared and submitted with the application.

7.14.2. The report concludes that the proposed development is in accordance with WHO Guidelines, British Standards, and WBC local policy.

7.14.3. 100% of heating and hot water will come from ground source heat pumps, extracting heat from boreholes.

7.15. BREEAM

7.15.1. BREEAM New Construction Version 6.1 pre-assessments have been completed for the retail units and concierge and shared residents' area, targeting a rating of Excellent. It has been assumed that the retail units will be completed as shell only.

7.15.2. The BREEAM pre-assessment for this development illustrates a potential credit mix which can achieve 73.98% for the retail and 70.71% for the concierge and shared residents' area.

7.15.3. For more details, please refer to the BREEAM pre-assessment reports.

8. Conclusion

8.1.1. This Energy and Sustainability report has been produced to accompany the planning application for the proposed site, consisting of 317 residential dwellings, 5 shell retail units and a concierge and residents' area at Old Town, Newbury.

8.1.2. The development will incorporate a ground source heat pump district heating network, providing low carbon heat in accordance with local and national policies.

8.1.3. The average regulated carbon reductions achieved across the sample units can be seen in the results section 4.

8.1.4. A representative sample of the residential element have been assessed using SAP 10.2 compliant software, which are shown to deliver circa 71% reduction in Part L (2021) regulated emissions. This is in accordance with Policy DM4 which sets a target of a 63% reduction over the Part L 2021 baseline.

8.1.5. It can be concluded that the provision of fabric and service improvements across the site can reduce carbon emissions by over 49% against Part L1A 2021 regulations. Therefore, the proposed development is predicted to comply with the requirements of the Future Homes Standard.

8.1.6. Policy DM4 sets FEE targets for various dwelling types used on site. This report demonstrates compliance with these targets (see section 4.1) through good fabric design intent.

8.1.7. The concierge and shared residents' area and a representative sample of the proposed retail units were assessed using SBEM calculation engine v6.1.e.0, and can be seen to deliver circa 16% reduction in regulated and unregulated carbon emissions against Part L 2 (2021) regulations.

8.1.8. Policy DM4 sets a net zero carbon target which considers operational energy (regulated and unregulated), and allows for a cash in lieu payment to offset any residual carbon emissions. The proposed development aims to meet West Berkshires net zero carbon target ambition through use of renewable energy across the site in the form of ground source heat pumps connected in a district heating network and photovoltaic panels. The total carbon offset to achieve net-zero is calculated to be **£124,539.27** and **£12,687.90** for residential and non-residential development respectively.

8.1.9. The reduction in carbon emissions from regulated and unregulated energy is demonstrated in sections 4.5 and 5.3 for residential and non-residential development respectively.

8.1.10. Proposed site wide total carbon emissions per year are 98 tonnes, a 68% improvement over the Part L 2021 baseline and a 97% improvement on the existing site which produces 3,040 tonnes/yr.

8.1.11. The development strategy sets a high standard of overall sustainability, complying with Policy SP5, with measures that include:

- *Enhanced building fabric specification with a Fabric-First approach including high efficiency insulation and provision of efficient appliances;*
- *Effective waste management procedures to minimise construction waste and to divert any residual waste from landfill;*
- *The implementation of drainage, ecology and travel plans;*
- *Provision of electric vehicle charging points within residential parking areas and separately to the public car park facility;*
- *Implementation of 3 car club cars to reduce the need for 22 personal vehicles;*
- *Provision of 495 secure cycle stores and cycle repair stations;*
- *Improved pedestrian access routes;*
- *Efficient internal and external water use in line with building regulations;*
- *Opportunity to achieve BREEAM Excellent with a potential credit yield of 73.98% for the retail and 70.71% for the concierge and shared residents' area.*

8.1.12. It can therefore be seen that the proposed development:

- *Achieves Part L 2021 compliance* ☑
- *Has Low / zero carbon energy source* ☑
- *Delivers significant reduction in total carbon reductions* ☑
- *Meets likely Future Homes Standard* ☑
- *Complies with Policy DM4 & SP5* ☑

Appendix A – Site Layout

THE ARCADE
The Globe Inn
MARKET PLACE
William Hill
BARTHOLOMEW STREET
The Newbury
The Catherine Wheel
CHEAP STREET
MARKET STREET
WEAVERS YARD
Old Town Newbury
Old Town, Newbury.
Ground Floor Plans, Site Layout.
LOCHAILORT
Woods Hardwick

THE ARCADE
The Globe Inn
MARKET PLACE
William Hill
BARTHOLOMEW STREET
The Newbury
The Catherine Wheel
CHEAP STREET
MARKET STREET
WEAVERS YARD
Old Town Newbury
Old Town, Newbury.
First Floor Plans, Site Layout.
LOCHAILORT
Woods Hardwick

THE ARCADE
The Globe Inn
MARKET PLACE
William Hill
BARTHOLOMEW STREET
The Newbury
The Catherine Wheel
CHEAP STREET
Vue Cinema
Vue Cinema & 4 Commercial Units
MARKET STREET
WEAVERS YARD
Old Town Newbury
LOCHAILORT
Woods Hardwick

THE ARCADE
The Globe Inn
MARKET PLACE
William Hill
BARTHOLOMEW STREET
The Newbury
The Catherine Wheel
CHEAP STREET
Vue Cinema
Vue Cinema & 4 Commercial Units
MARKET STREET
WEAVERS YARD
Old Town Newbury
LOCHAILORT
Woods Hardwick

THE ARCADE
The Globe Inn
MARKET PLACE
William Hill
BARTHOLOMEW STREET
The Newbury
The Catherine Wheel
CHEAP STREET
Vue Cinema
Vue Cinema & 4 Commercial Units
MARKET STREET
WEAVERS YARD
Old Town Newbury
LOCHAILORT
Woods Hardwick

THE ARCADE
The Globe Inn
MARKET PLACE
William Hill
BARTHOLOMEW STREET
The Newbury
The Catherine Wheel
CHEAP STREET
Car Park
Total Spaces: 477
Vue Cinema
Vue Cinema & 4 Commercial Units
MARKET STREET
WEAVERS YARD
Old Town Newbury
Old Town, Newbury
Plan Floor Plans, Site Layout
LOCHAILORT
Woods Hardwick

THE ARCADE
The Globe Inn
MARKET PLACE
William Hill
BARTHOLOMEW STREET
The Newbury
The Catherine Wheel
CHEAP STREET
Car Park
Total Spaces: 477
Vue Cinema
Vue Cinema & 4 Commercial Units
MARKET STREET
WEAVERS YARD
Old Town Newbury
Old Town, Newbury.
Sixth Floor Plans, Site Layout
LOCHAILORT
Woods Hardwick

THE ARCADE
The Globe Inn
MARKET PLACE
William Hill
BARTHOLOMEW STREET
The Newbury
The Catherine Wheel
CHEAP STREET
Car Park
Total Spaces: 477
Vue Cinema
Vue Cinema & 4 Commercial Units
MARKET STREET
WEAVERS YARD
Old Town Newbury
Old Town, Newbury.
Roof Plan, Site Layout.
LOCHAILORT
Woods Hardwick

Appendix B – District Heating Information

Heat network key information

- ***Distribution loss factors and estimated efficiency (COP) sourced from proposed district heating installer ERDA:***

  Email from ERDA 26/03/2024:

specification of the HIU and distribution network. I note you have followed guidance on the DLF for now and would confirm that – should BMD/EEL be responsible for that aspect – then we would follow CP1 as a minimum. I am not sure at this stage is there is a client spec on this, but there is ***the potential*** to target 1.2 as a figure on the next calculation iteration if flow temps can be reduced?

From concept design documentation 08/24:

2. What efficiency targets are set?

CoP "as close to 4.0 possible" for efficiency targets

Direct DHW from HUI required therefore limited opportunity to reduce flow temperature. Feasibility stage target CoP 3.75 with an aim to improve in detailed design.

- ***COP of 3.75***
- ***DLF of 1.5 following CP1 as a minimum***

Heat Interface Units (HIU's)

- ***Specification of HIU currently unconfirmed. Default SAP data gives losses of 1.44kwh/day.***
- ***Figure (right) shows an example HIU. Photograph courtesy of SAV systems.***

Appendix C – Fabric Energy Efficiency

Table 13 – End & Mid Terrace House

	DFEE (kwh/m2/yr)	
	End Terrace	Mid Terrace
East	32.3	24.2
North	33.5	26.3
Northeast	33.1	26.1
Northwest	33.8	26.1
South	30.8	19.5
Southeast	31.2	21.2
Southwest	31.9	21.2
West	33.2	24.2
Average Orientation DFEE kwh/m2/yr	**32.5**	**23.6**

Table 14 – Duplex Flats

	DFEE (kwh/m2/yr)		
	Duplex Flats		
	GF	MF	TF
East	19.6	15.8	19.0
North	15.9	12.6	15.6
Northeast	17.2	13.8	16.8
Northwest	17.2	13.8	16.8
South	21.4	17.2	20.6
Southeast	21.2	17.1	20.4
Southwest	21.2	17.1	20.4
West	19.6	15.8	19.0
Average Orientation DFEE kwh/m2/yr	19.2	15.4	18.6

Area Weighted Average Orientation DFEE kwh/m2/yr:

17.7

Table 15 – Maisonette/Duplex Maisonettes

	DFEE (kwh/m2/yr)				
	Maisonette/Duplex Maisonette				
	GF	TF			
East	24.2	20.2			
North	26.3	18.7			
Northeast	26.0	20.0			
Northwest	26.0	16.8			
South	20.1	18.7			
Southeast	21.6	20.0			
Southwest	21.6	16.8	Area Weighted Average		
West	24.2	15.7	Orientation DFEE kwh/m2/yr:		
Average Orientation DFEE kwh/m2/yr	23.7	18.4	**21.0**		

Table 16 – Flats

	DFEE (kwh/m2/yr)			
	Flats			
	GF	MF	TF	
East	22.9	16.05	21.9	
North	18.3	12.51	17.9	
Northeast	20.0	13.81	19.3	
Northwest	20.0	13.81	19.3	
South	25.0	17.36	23.7	
Southeast	24.7	17.34	23.5	
Southwest	24.7	17.34	23.5	
West	22.9	16.05	21.9	
Average Orientation DFEE kwh/m2/yr	22.3	15.5	21.4	
No Units in Block	10	40	10	
Floor Area (m2)	43.4	43.4	43.4	**TOTAL**
Total Floor Area (m2)	434	1734.4	433.6	**2602.0**
% of total	16.7%	66.7%	16.7%	
		Area Weighted Av. DFEE (kwh/m2/yr):		**17.6**

Appendix D – Regulated Carbon Emissions Reduction – Residential Units

Table 17 – Carbon reduction across sample domestic units – Be Lean

Unit type	Floor Area (m^2)	Number of units	Dwelling Emissions Worksheet - Be Lean						Target Emissions Worksheet					
			Regulated Energy		Regulated Carbon Emissions				Regulated Energy		Regulated Carbon Emissions			
			A	B	C	D	E	F	G	H	I	J	K	L
			Total Energy (kWh/yr/unit)	Total Energy (kWh/yr)	DER (kgCO2/m2/yr)	Total Carbon (Kg/year/unit)	Regulated Carbon emissions (kg/yr)	Regulated Carbon emissions (t/yr)	Baseline (kWh/yr/unit)	Baseline (kWh/yr)	TER (kgCO2/m2/yr)	Total Carbon (Kg/year/unit)	Regulated Carbon emissions (kg/yr)	Regulated Carbon emissions (t/yr)
Flat Duplex GF	86.7	10	4215.3	42152.7	10.0	862.7	**8626.7**	**8.6**	**3789.7**	**37896.5**	9.9	860.9	**8609.3**	**8.6**
Flat Duplex MF	86.7	9	3862.2	34759.4	9.1	788.1	**7092.9**	**7.1**	**3599.1**	**32391.6**	9.3	803.7	**7233.4**	**7.2**
Flat Duplex TF	86.7	10	4163.0	41630.1	9.8	851.4	**8513.9**	**8.5**	**3987.9**	**39878.8**	10.2	885.2	**8852.1**	**8.9**
Flat GF	43.4	43	2867.2	123290.9	13.5	586.7	**25226.4**	**25.2**	**3417.1**	**146934.9**	16.9	732.4	**31491.1**	**31.5**
Flat MF	43.4	43	2561.9	110159.6	12.1	522.5	**22467.0**	**22.5**	**2974.7**	**127912.5**	14.8	639.6	**27501.1**	**27.5**
Flat TF	43.4	43	2827.9	121600.1	13.3	578.4	**24872.2**	**24.9**	**3250.5**	**139772.4**	16.1	697.7	**29999.5**	**30.0**
House End Terrace	72.7	37	4784.3	177018.7	13.5	984.1	**36411.2**	**36.4**	**3417.8**	**126457.5**	11.6	843.1	**31194.3**	**31.2**
House Mid Terrace	71.5	74	4009.6	296711.9	11.5	823.2	**60916.4**	**60.9**	**3111.3**	**230237.7**	10.9	778.1	**57582.2**	**57.6**
Maisonette Duplex GF	80.0	24	4408.8	105810.7	11.3	905.4	**21729.0**	**21.7**	**4209.2**	**101020.3**	11.8	943.8	**22650.3**	**22.7**
Maisonette Duplex TF	80.0	24	3982.3	95575.0	10.2	815.0	**19559.9**	**19.6**	**3807.7**	**91383.6**	10.7	859.0	**20615.6**	**20.6**
Totals		**317**		**1148709.0**				**235.4**	**35564.8**	**1073885.8**				**245.7**

Table 18 – Carbon reduction across sample domestic units – Be Clean

Unit type	Floor Area (m^2)	Number of units	Dwelling Emissions Worksheet - Be Clean										Target Emissions Worksheet					
			Regulated Energy						Regulated Carbon Emissions				Regulated Energy		Regulated Carbon Emissions			
			A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
			Space Heating	Water Heating	Pumps and Fans	Lighting	Total energy (kWh/yr/unit)	Total energy (kWh/yr)	DER (kgCO2/m2/yr)	Total Carbon (Kg/year/unit)	Regulated Carbon emissions (kg/yr)	Regulated Carbon emissions (t/yr)	Baseline (kWh/yr/unit)	Baseline (kWh/yr)	TER (kgCO2/m2/yr)	Total Carbon (Kg/year/unit)	Regulated Carbon emissions (kg/yr)	Regulated Carbon emissions (t/yr)
Flat Duplex GF	86.7	10	415.2	1100.7	33.5	216.3	1765.7	17656.5	3.1	264.4	**2644.4**	**2.6**	**3789.7**	**37896.5**	9.9	860.9	**8609.3**	**8.6**
Flat Duplex MF	86.7	9	294.4	1100.7	33.5	216.3	1644.9	14804.2	2.8	245.4	**2208.2**	**2.2**	**3599.1**	**32391.6**	9.3	803.7	**7233.4**	**7.2**
Flat Duplex TF	86.7	10	400.1	1100.7	33.5	216.3	1750.6	17506.4	3.0	261.8	**2618.3**	**2.6**	**3987.9**	**39878.8**	10.2	885.2	**8852.1**	**8.9**
Flat GF	43.4	43	201.0	875.1	11.9	130.7	1218.7	52404.5	4.2	181.2	**7793.5**	**7.8**	**3417.1**	**146934.9**	16.9	732.4	**31491.1**	**31.5**
Flat MF	43.4	43	104.3	875.1	11.9	130.7	1121.9	48243.8	3.8	165.6	**7122.3**	**7.1**	**2974.7**	**127912.5**	14.8	639.6	**27501.1**	**27.5**
Flat TF	43.4	43	194.5	875.1	15.3	124.7	1209.5	52007.8	4.1	179.5	**7718.9**	**7.7**	**3250.5**	**139772.4**	16.1	697.7	**29999.5**	**30.0**
House End Terrace	72.7	37	690.4	1044.6	20.0	193.4	1948.4	72092.0	4.1	295.1	**10918.0**	**10.9**	**3417.8**	**126457.5**	11.6	843.1	**31194.3**	**31.2**
House Mid Terrace	71.5	74	428.9	1038.9	19.7	174.7	1662.3	123008.4	3.5	249.6	**18470.8**	**18.5**	**3111.3**	**230237.7**	10.9	778.1	**57582.2**	**57.6**
Maisonette Duplex GF	80.0	24	517.4	1076.6	22.0	196.1	1812.1	43490.0	3.4	272.7	**6545.6**	**6.5**	**4209.2**	**101020.3**	11.8	943.8	**22650.3**	**22.7**
Maisonette Duplex TF	80.0	24	363.7	1076.6	22.0	206.9	1669.2	40060.9	3.1	249.5	**5988.9**	**6.0**	**3807.7**	**91383.6**	10.7	859.0	**20615.6**	**20.6**
Totals		**317**						**481274.5**				**72.0**		**1073885.8**				**245.7**

Appendix E – Total Carbon Emissions Reduction (Regulated & Unregulated) – Residential Units

SAP 10.2 Electricity Carbon Emission Factor = 0.136 kgCO2/kwh

Table 19 – Carbon reduction across sample domestic units – Be Lean

			Dwelling Emissions Worksheet - Be Lean											
			Unregulated Carbon Emissions (From GHA Building standard figures)						Regulated Energy		Regulated Carbon Emissions			
Unit type	Floor Area (m^2)	Number of units	A	B	C	D	E	F	G	H	I	J	K	L
			Total Unregulated Energy (kwh/m2/yr)	Energy (kwh/yr/unit)	Energy (kwh/yr)	Total Carbon (Kg/year/unit)	Non-Regulated Carbon Emissions (Kg/year)	Non-Regulated Carbon Emissions (t/year)	Total Energy (kWh/yr/unit)	Total Energy (kWh/yr)	DER (kgCO2/m2/yr)	Total Carbon (Kg/year/unit)	Regulated Carbon emissions (kg/yr)	Regulated Carbon emissions (t/yr)
Flat Duplex GF	86.7	10	21.9	1898.7	18987.3	258.2	**2582.3**	**2.6**	4215.3	42152.7	10.0	862.7	**8626.7**	**8.6**
Flat Duplex MF	86.7	9	21.9	1898.7	17088.6	258.2	**2324.0**	**2.3**	3862.2	34759.4	9.1	788.1	**7092.9**	**7.1**
Flat Duplex TF	86.7	10	21.9	1898.7	18987.3	258.2	**2582.3**	**2.6**	4163.0	41630.1	9.8	851.4	**8513.9**	**8.5**
Flat GF	43.4	43	21.9	949.6	40832.1	129.1	**5553.2**	**5.6**	2867.2	123290.9	13.5	586.7	**25226.4**	**25.2**
Flat MF	43.4	43	21.9	949.6	40832.1	129.1	**5553.2**	**5.6**	2561.9	110159.6	12.1	522.5	**22467.0**	**22.5**
Flat TF	43.4	43	21.9	949.6	40832.1	129.1	**5553.2**	**5.6**	2827.9	121600.1	13.3	578.4	**24872.2**	**24.9**
House End Terrace	72.7	37	21.9	1591.7	58892.6	216.5	**8009.4**	**8.0**	4784.3	177018.7	13.5	984.1	**36411.2**	**36.4**
House Mid Terrace	71.5	74	21.9	1566.3	115905.3	213.0	**15763.1**	**15.8**	4009.6	296711.9	11.5	823.2	**60916.4**	**60.9**
Maisonette Duplex GF	80.0	24	21.9	1751.6	42037.5	238.2	**5717.1**	**5.7**	4408.8	105810.7	11.3	905.4	**21729.0**	**21.7**
Maisonette Duplex TF	80.0	24	21.9	1751.6	42037.5	238.2	**5717.1**	**5.7**	3982.3	95575.0	10.2	815.0	**19559.9**	**19.6**
Totals	69	**317**			**436,432**		**59,355**	**59.4**		**1,148,709**				**235**

Table 20 – Carbon reduction across sample domestic units – Be Clean

			Dwelling Emissions Worksheet – Be Clean															
			Unregulated Carbon Emissions (From GHA Building standard figures)						Regulated Energy						Regulated Carbon Emissions			
Unit type	Floor Area (m^2)	Number of units	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
			Total Unregulated Energy	Energy (kwh/yr/unit)	Energy (kwh/yr)	Total Carbon (Kg/year/unit)	Non-Regulated Carbon Emissions	Non-Regulated Carbon Emissions	Space Heating	Water Heating	Pumps and Fans	Lighting	Total energy (kWh/yr/unit)	Total energy (kWh/yr)	DER (kgCO2/m2/yr)	Total Carbon (Kg/year/uni	Regulated Carbon emissions	Regulated Carbon emissions
Flat Duplex GF	86.7	10	21.9	1898.7	18987.3	258.2	**2582.3**	**2.6**	415.2	1100.7	33.5	216.3	1765.7	17656.5	3.1	264.4	**2644.4**	**2.6**
Flat Duplex MF	86.7	9	21.9	1898.7	17088.6	258.2	**2324.0**	**2.3**	294.4	1100.7	33.5	216.3	1644.9	14804.2	2.8	245.4	**2208.2**	**2.2**
Flat Duplex TF	86.7	10	21.9	1898.7	18987.3	258.2	**2582.3**	**2.6**	400.1	1100.7	33.5	216.3	1750.6	17506.4	3.0	261.8	**2618.3**	**2.6**
Flat GF	43.4	43	21.9	949.6	40832.1	129.1	**5553.2**	**5.6**	201.0	875.1	11.9	130.7	1218.7	52404.5	4.2	181.2	**7793.5**	**7.8**
Flat MF	43.4	43	21.9	949.6	40832.1	129.1	**5553.2**	**5.6**	104.3	875.1	11.9	130.7	1121.9	48243.8	3.8	165.6	**7122.3**	**7.1**
Flat TF	43.4	43	21.9	949.6	40832.1	129.1	**5553.2**	**5.6**	194.5	875.1	15.3	124.7	1209.5	52007.8	4.1	179.5	**7718.9**	**7.7**
House End Terrace	72.7	37	21.9	1591.7	58892.6	216.5	**8009.4**	**8.0**	690.4	1044.6	20.0	193.4	1948.4	72092.0	4.1	295.1	**10918.0**	**10.9**
House Mid Terrace	71.5	74	21.9	1566.3	115905.3	213.0	**15763.1**	**15.8**	428.9	1038.9	19.7	174.7	1662.3	123008.4	3.5	249.6	**18470.8**	**18.5**
Maisonette Duplex GF	80.0	24	21.9	1751.6	42037.5	238.2	**5717.1**	**5.7**	517.4	1076.6	22.0	196.1	1812.1	43490.0	3.4	272.7	**6545.6**	**6.5**
Maisonette Duplex TF	80.0	24	21.9	1751.6	42037.5	238.2	**5717.1**	**5.7**	363.7	1076.6	22.0	206.9	1663.2	40060.9	3.1	249.5	**5988.9**	**6.0**
Totals	69.4	**317**			**436432.4**		**59354.8**	**59.4**						**481274.5**				**72.0**

Table 21 – Carbon reduction across sample domestic units – Be Green

			Dwelling Emissions Worksheet – Be Green																	
			Unregulated Carbon Emissions (From GHA Building standard figures)						Regulated Energy								Regulated Carbon Emissions			
Unit type	Floor Area (m^2)	Number of units	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
			Total Unregulated Energy (kwh/m2/yr)	Energy (kwh/yr/unit)	Energy (kwh/yr)	Total Carbon (Kg/year/unit)	Non-Regulated Carbon Emissions (Kg/year)	Non-Regulated Carbon Emissions (t/year)	Space Heating	Water Heating	Pumps and Fans	Lighting	PV (kWh/yr/unit)	PV (kWh/yr)	Total energy (kWh/yr/unit)	Total energy (kWh/yr)	DER (kgCO2/m2/yr)	Total Carbon (Kg/year/unit)	Regulated Carbon emissions (kg/yr)	Regulated Carbon emissions (t/yr)
Flat Duplex GF	86.7	10	21.9	**1898.7**	18987.3	258.2	**2582.3**	**2.6**	415.2	1100.7	33.5	216.3	-958.2	-9582.2	807.4	8074.3	1.7	143.1	**1430.6**	**1.4**
Flat Duplex MF	86.7	9	21.9	**1898.7**	17088.6	258.2	**2324.0**	**2.3**	294.4	1100.7	33.5	216.3	-958.2	-8624.0	686.7	6180.2	1.4	124.0	**1115.8**	**1.1**
Flat Duplex TF	86.7	10	21.9	**1898.7**	18987.3	258.2	**2582.3**	**2.6**	400.1	1100.7	33.5	216.3	-958.2	-9582.2	792.4	7924.2	1.6	140.5	**1404.5**	**1.4**
Flat GF	43.4	43	21.9	**949.6**	40832.1	129.1	**5553.2**	**5.6**	201.0	875.1	11.9	130.7	-958.2	-41203.5	260.5	11201.0	1.4	60.3	**2591.6**	**2.6**
Flat MF	43.4	43	21.9	**949.6**	40832.1	129.1	**5553.2**	**5.6**	104.3	875.1	11.9	130.7	-958.2	-41203.5	163.7	7040.4	1.0	44.2	**1901.8**	**1.9**
Flat TF	43.4	43	21.9	**949.6**	40832.1	129.1	**5553.2**	**5.6**	194.5	875.1	15.3	124.7	-958.2	-41203.5	251.3	10804.4	1.4	58.5	**2517.0**	**2.5**
House End Terrace	72.7	37	21.9	**1591.7**	58892.6	216.5	**8009.4**	**8.0**	690.4	1044.6	20.0	193.4	-958.2	-35454.1	990.2	36637.9	2.4	173.7	**6427.1**	**6.4**
House Mid Terrace	71.5	74	21.9	**1566.3**	115905.3	213.0	**15763.1**	**15.8**	428.9	1038.9	19.7	174.7	-958.2	-70908.3	704.1	52100.1	1.8	128.7	**9526.5**	**9.5**
Maisonette Duplex GF	80.0	24	21.9	**1751.6**	42037.5	238.2	**5717.1**	**5.7**	517.4	1076.6	22.0	196.1	-958.2	-22997.3	853.9	20492.7	1.9	152.0	**3647.1**	**3.6**
Maisonette Duplex TF	80.0	24	21.9	**1751.6**	42037.5	238.2	**5717.1**	**5.7**	363.7	1076.6	22.0	206.9	-958.2	-22997.3	711.0	17063.6	1.6	128.0	**3071.2**	**3.1**
Totals	69.4	**317**			**436432.4**		**59354.8**	**59.4**						**303755.7**		**177518.7**				**33.6**

Appendix F – Unregulated Energy Demand (Good Homes Alliance)

- ***Unregulated energy is the energy consumed by a building resulting from appliances and cooking.***
- ***SAP 10 does not calculate or set targets for unregulated energy demand.***
- ***In the 'Building Standards Compared' document (linked below) Passivhaus PHPP model has been used by the GLA to calculate unregulated energy demand for each archetype (1 bed 50m² flat, 2 bed 61m² flat, 3 bed 84m² semi house, 3 bed 84m² terraced house, and 5 bed 110m² detached house)***
- ***The GHA adopted an unregulated energy factor of 21.9kWh/m²/yr as being representative for use when reviewing varying architypes.***
- ***21.9kWh/m²/yr is at the higher end of the calculated figures and can be seen to be a reasonable estimation for the proposed development, where the average floor area is 69m². See Table 22 below.***

Table 22 – Unregulated energy demand used in calculations seen in red.

Archetype	Gross Internal Floor Area (m²)	Calculated Occupancy (SAP)	Given Occupancy	Unregulated Energy (Calculated Occupancy) kWh/m².year	Unregulated Energy (Given Occupancy) kWh/m².year
1	50	1.69	2	24.4	30.1
2	61	2.01	3	21.9	34
3	84	2.53	4	19.3	31.5
4	84	2.53	4	19.3	31.5
5	110	2.81	6	16.3	34.4

https://goodhomes.org.uk/resource/building-standards-compared

Appendix G – Flood Risk Map (Zone 2)

Environment Agency

Flood map for planning

Your reference	Location (easting/northing)	Created
Newbury	**447123/167008**	**11 Jul 2024 11:16**

Your selected location is in flood zone 2, an area with a medium probability of flooding.

This means:

- you must complete a flood risk assessment for development in this area
- you should follow the Environment Agency's standing advice for carrying out a flood risk assessment (see www.gov.uk/guidance/flood-risk-assessment-standing-advice)

Notes

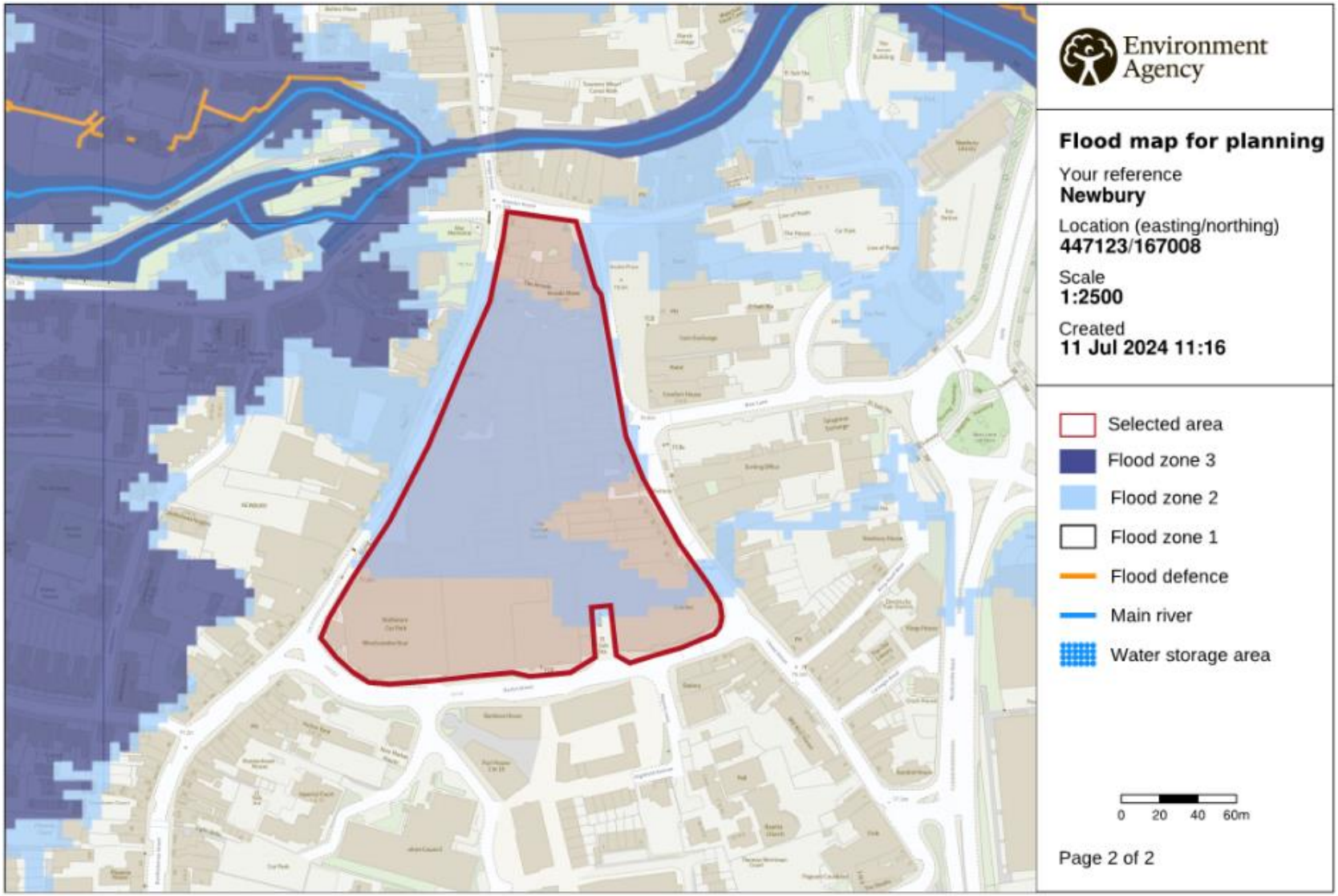
The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence which sets out the terms and conditions for using government data. https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2022 OS 100024198. https://flood-map-for-planning.service.gov.uk/os-terms

Page 1 of 2



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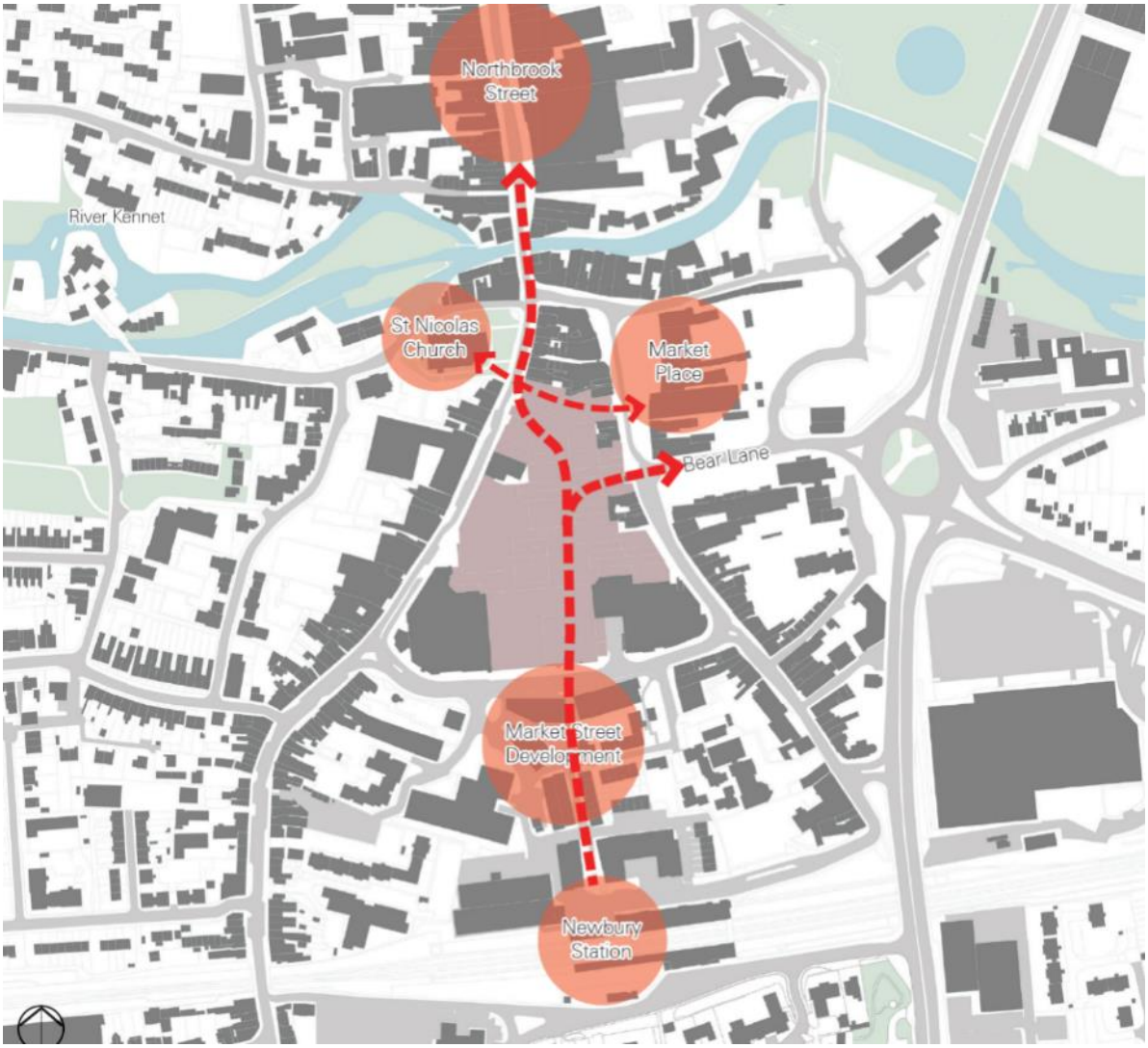
Appendix H – Walking Routes to Public Transport



Appendix I – Water Efficiency Calculator

WATER EFFICIENCY CALCULATOR FOR NEW DWELLINGS - (BASIC CALCULATOR)									
	House Type:	Type 1		Type 2		Type 3		Type 4	
	Description:	Bath and Shower		Shower only					
Installation Type	Unit of measure	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day
Is a dual or single flush WC specified?		Dual		Dual		Select option:		Select option:	
WC	Full flush volume	4	5.84	4	5.84		0.00		0.00
	Part flush volume	2.6	7.70	2.5	7.40		0.00		0.00
Taps (excluding kitchen and external taps)	Flow rate (litres / minute)	4	7.90	4	7.90		0.00		0.00
Are both a Bath & Shower Present?		Bath & Shower		Shower only					
Bath	Capacity to overflow	195	21.45		0.00		0.00		0.00
Shower	Flow rate (litres / minute)	8	34.96	8	44.80		0.00		0.00
Kitchen sink taps	Flow rate (litres / minute)	4	12.12	4	12.12		0.00		0.00
Has a washing machine been specified?		No		Yes					
Washing Machine	Litres / kg		17.16	8.1	17.01		0.00		0.00
Has a dishwasher been specified?		No		No					
Dishwasher	Litres / place setting		4.50		4.50		0.00		0.00
Has a waste disposal unit been specified?		No	0.00	No	0.00		0.00		0.00
Water Softener	Litres / person / day		0.00		0.00		0.00		0.00
	Calculated Use		111.6		99.6		0.0		0.0
	Normalisation factor		0.91		0.91		0.91		0.91
Code for Sustainable Homes	Total Consumption		101.6		90.6		0.0		0.0
	Mandatory level		Level 3/4		Level 3/4		-		-
Building Regulations 17.K	External use		5.0		5.0		5.0		5.0
	Total Consumption		106.6		95.6		0.0		0.0
	17.K Compliance?		Yes		Yes		-		-

Appendix J –SBEM BRUKLs

The sample SBEM outputs (BRUKL) for the retail unit can be found on the following pages.

Be Lean (Retail)

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

Old Town Sample Retail Unit As designed

Date: Fri Aug 22 20:24:30 2025

Administrative information

Building Details

Address: Old Town, Newbury,

Certifier details

Name: Matthew Cooke

Telephone number: 01582 544250

Address: 8 Cardiff Road, Luton, LU1 1PP

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.2

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v7.3.1

BRUKL compliance module version: v6.1.e.1

Foundation area [m²]: 74.76

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	6.15	
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	5.96	
Target primary energy rate (TPER), kWh_{PE}/m^2.annum	66.2	
Building primary energy rate (BPER), kWh_{PE}/m^2.annum	63.81	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.2	0.2	Retail Unit Sample - Sales area_P_5
Floors	0.18	0.09	0.09	Retail Unit Sample - Sales area_S_3
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	-	-	No heat loss flat roofs
Windows** and roof windows	1.6	1.2	1.2	Retail Unit Sample - Sales area_G_10
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.2	1.2	Retail Unit Sample - Sales area_D_9
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m²K)] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m²K)]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m³/(h.m²) at 50 Pa	8	3

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Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- Ref HP 2.64% split

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.64	5	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

1- Instantaneous HW only

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	-
Standard value	1	N/A

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

Shell and core configuration

Zone	Assumed shell?
Retail Unit Sample - Sales area	NO

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
Retail Unit Sample - Sales area	130	130	1.154

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Retail Unit Sample - Sales area	NO (-55.6%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m²]	74.8	74.8
External area [m²]	222.6	222.6
Weather	SWI	SWI
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	51.57	109.97
Average U-value [W/m²K]	0.23	0.49
Alpha value* [%]	37.08	21.12

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
100	**Retail/Financial and Professional Services**
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	16.85	18.32
Cooling	7.72	10.17
Auxiliary	0	0
Lighting	15.51	14.4
Hot water	1.7	1.7
Equipment*	20.26	20.26
TOTAL**	**41.78**	**44.59**

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	247.94	335.23
Primary energy [kWh_{PE}/m²]	63.81	66.2
Total emissions [kg/m²]	5.96	6.15

HVAC Systems Performance										
System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	149.3	98.7	16.9	7.7	0	2.46	3.55	2.64	5
	Notional	174.1	161.1	18.3	10.2	0	2.64	4.4	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Be Green (Retail)

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

Old Town Sample Retail Unit — As designed

Date: Fri Aug 22 20:12:21 2025

Administrative information

Building Details

Address: Old Town, Newbury,

Certifier details

Name: Matthew Cooke

Telephone number: 01582 544250

Address: 8 Cardiff Road, Luton, LU1 1PP

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.2

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v7.3.1

BRUKL compliance module version: v6.1.e.1

Foundation area [m²]: 74.76

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	6.15	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	4.34	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	66.2	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	46.82	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.2	0.2	Retail Unit Sample - Sales area_P_5
Floors	0.18	0.09	0.09	Retail Unit Sample - Sales area_S_3
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	-	-	No heat loss flat roofs
Windows** and roof windows	1.6	1.2	1.2	Retail Unit Sample - Sales area_G_10
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.2	1.2	Retail Unit Sample - Sales area_D_9
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m^2K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
$m^3/(h.m^2)$ at 50 Pa	8	3

Page 1 of 4

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- Example fitout Mitsubishi 2x PLA-ZM50 1xPUZ-ZM100

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.8	7.7	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- Instantaneous HW only

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	-
Standard value	1	N/A

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

Shell and core configuration

Zone	Assumed shell?
Retail Unit Sample - Sales area	NO

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
Retail Unit Sample - Sales area	130	130	1.154

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Retail Unit Sample - Sales area	NO (-55.6%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m²]	74.8	74.8
External area [m²]	222.6	222.6
Weather	SWI	SWI
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	51.57	109.97
Average U-value [W/m²K]	0.23	0.49
Alpha value* [%]	37.08	21.12

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
100	**Retail/Financial and Professional Services**
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	8.81	18.32
Cooling	4.76	10.17
Auxiliary	0	0
Lighting	15.51	14.4
Hot water	1.7	1.7
Equipment*	20.26	20.26
TOTAL**	**30.78**	**44.59**

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	247.94	335.23
Primary energy [kWh_{PE}/m^2]	46.82	66.2
Total emissions [kg/m²]	4.34	6.15

HVAC Systems Performance										
System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	149.3	98.7	8.8	4.8	0	4.71	5.76	4.8	7.7
	Notional	174.1	161.1	18.3	10.2	0	2.64	4.4	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

The sample SBEM output (BRUKL) for the concierge and shared residents' area can be found on the following pages.

Be Lean (Concierge & shared residents' area)

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Concierge and communal area for residents — As designed

Date: Fri Aug 22 20:47:33 2025

Administrative information

Building Details

Address: Pellow House, Old Town, Newbury,

Certifier details

Name: Matthew Cooke

Telephone number: 01582 544250

Address: 8 Cardiff Road, Luton, LU1 1PP

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.2

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v7.3.1

BRUKL compliance module version: v6.1.e.1

Foundation area [m²]: 155.92

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2$annum	4.71	
Building CO_2 emission rate (BER), $kgCO_2/m^2$annum	4.66	
Target primary energy rate (TPER), kWh_{PE}/m^2annum	49.28	
Building primary energy rate (BPER), kWh_{PE}/m^2annum	49.04	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	$U_{a\text{-Limit}}$	$U_{a\text{-Calc}}$	$U_{i\text{-Calc}}$	First surface with maximum value
Walls*	0.26	0.19	0.2	Ground floor - Kitchenette_P_7
Floors	0.18	0.09	0.1	Ground floor - Meeting room_S_3
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	-	-	No heat loss flat roofs
Windows** and roof windows	1.6	1	1	Ground floor - Toilets circ_G_8
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	-	-	No external personnel doors
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors

$U_{a\text{-Limit}}$ = Limiting area-weighted average U-values [W/(m²K)] $U_{i\text{-Calc}}$ = Calculated maximum individual element U-values [W/(m²K)]

$U_{a\text{-Calc}}$ = Calculated area-weighted average U-values [W/(m²K)]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
$m^3/(h.m^2)$ at 50 Pa	8	3

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Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- ASHP Be Lean

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.5	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

1- Instanteous electric

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	-
Standard value	1	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter

NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
Ground floor - Toilets	-	-	0.5	-	-	-	-	-	-	-	N/A

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
Ground floor - Toilets circ	130	-	-
Ground floor - Kitchenette	130	-	-
Ground floor - Gym	130	-	-
Ground floor - Toilets	130	-	-
Ground floor - Parcel room	130	-	-
Ground floor - Meeting room	130	-	-
Ground floor - Concierge	130	140	0.964

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Ground floor - Kitchenette	N/A	N/A
Ground floor - Gym	NO (-23.1%)	NO
Ground floor - Parcel room	N/A	N/A
Ground floor - Meeting room	NO (-3%)	NO
Ground floor - Concierge	NO (-2.4%)	YES

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m²]	155.9	155.9
External area [m²]	382.7	382.7
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	86.74	155.83
Average U-value [W/m²K]	0.23	0.41
Alpha value* [%]	17.38	19.17

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
73	**Offices and Workshop Businesses**
	General Industrial and Special Industrial Groups
	Storage or Distribution
27	**Hotels**
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	13.53	16.95
Cooling	0	0
Auxiliary	3.79	2.16
Lighting	13.08	12.16
Hot water	1.41	1.41
Equipment*	43.55	43.55
TOTAL**	**31.81**	**32.68**

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	237.27	296.66
Primary energy [kWh_{PE}/m^2]	49.04	49.28
Total emissions [kg/m²]	4.66	4.71

HVAC Systems Performance										
System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: radiators, [HS] ASHP, [HFT] Electricity, [CFT] Natural Gas										
	Actual	108.6	128.6	13.5	0	3.8	2.23	0	2.5	0
	Notional	161.1	135.5	17	0	2.2	2.64	0	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Be Green (Concierge & shared residents' area)

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Concierge and communal area for residents As designed

Date: Fri Aug 22 17:36:02 2025

Administrative information

Building Details

Address: Pellow House, Old Town, Newbury,

Certifier details

Name: Matthew Cooke

Telephone number: 01582 544250

Address: 8 Cardiff Road, Luton, LU1 1PP

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.2

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v7.3.1

BRUKL compliance module version: v6.1.e.1

Foundation area [m²]: 155.92

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	7.37	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	3.6	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	39.75	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	38.86	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.19	0.2	Ground floor - Kitchenette_P_7
Floors	0.18	0.09	0.1	Ground floor - Meeting room_S_3
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	-	-	No heat loss flat roofs
Windows** and roof windows	1.6	1	1	Ground floor - Gym_G_6
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	-	-	No external personnel doors
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m²K)] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m²K)]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m³/(h.m²) at 50 Pa	8	3

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Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- Gym bivalent split MSZ-LN18VG2 R/B/V/W

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	5.2	10.5	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

2- District Heating GSHP underfloor

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.75	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

1- Instanteous electric

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	-
Standard value	1	N/A

1- District heating network

	Emission factor [$kgCO_2/kWh$]	Primary energy factor [kWh_{PE}/kWh]
This building	0.136	1.45
Standard value	0.35	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter

NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	**Zone**	**Standard**
Ground floor - Toilets	-	-	0.5	-	-	-	-	-	-	-	N/A

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m^2]**
Standard value	95	80	0.3
Ground floor - Gym	130	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
Ground floor - Toilets circ	130	-	-
Ground floor - Kitchenette	130	-	-
Ground floor - Toilets	130	-	-
Ground floor - Parcel room	130	-	-
Ground floor - Meeting room	130	-	-
Ground floor - Concierge	130	140	0.964

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Ground floor - Gym	NO (-23.1%)	NO
Ground floor - Kitchenette	N/A	N/A
Ground floor - Parcel room	N/A	N/A
Ground floor - Meeting room	NO (-3%)	NO
Ground floor - Concierge	NO (-2.4%)	YES

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m²]	155.9	155.9
External area [m²]	382.7	382.7
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	86.74	155.83
Average U-value [W/m²K]	0.23	0.41
Alpha value* [%]	17.38	19.17

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
73	**Offices and Workshop Businesses**
	General Industrial and Special Industrial Groups
	Storage or Distribution
27	**Hotels**
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	6.65	33.09
Cooling	2	4.2
Auxiliary	2.64	1.77
Lighting	13.08	12.16
Hot water	1.41	1.41
Equipment*	43.55	43.55
TOTAL**	**25.78**	**52.63**

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	18.33
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*18.33*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	226.66	293.57
Primary energy [kWh_{PE}/m²]	38.86	39.75
Total emissions [kg/m²]	3.6	7.37

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HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	163.6	209.2	8.9	7.4	0.8	5.1	7.85	5.2	10.5
	Notional	231.8	246.2	24.4	15.5	0	2.64	4.4	----	----
[ST] Central heating using water: floor heating, [HS] District heating, [HFT] District Heating, [CFT] Natural Gas										
	Actual	73.8	98.8	5.8	0	3.3	3.52	0	3.75	0
	Notional	130.7	94.6	36.3	0	2.4	1	0	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Appendix K – SBEM Specification Sheet

SBEM Assessment Specifications Sheet

Site :	Old Town Newbury Retail Unit Sample
Client:	Lochailort Newbury Ltd
Date :	16.05.2024
Revision:	1

Fabric Specifications			
Walls	Description	U-Value	Thermal Mass
External Wall Type 1	Insulated cavity wall, includes partition to residential zones	0.18W/m^{2}K	134.8kJ/m^{2}K
Floors	Description	U-Value	Thermal Mass
Ground Floor 1	Assumed	0.11W/m^{2}K	94.0kJ/m^{2}K
Doors	Description	U-Value	Thermal Mass
Door 1	External door	1.2W/m^{2}K	29.3kJ/m^{2}K
Windows	Description	U-value	Solar Factors
Glazing	Display windows	1.3W/m^{2}K	T-Solar: 0.72 L-Solar: 0.76
Window above door	Double glazing	1.0W/m^{2}K	T-Solar: 0.72 L-Solar: 0.76

Building Services

PLEASE NOTE: Shell only projects will have assumed services

HVAC Specification			
System	**Serving**	**Description/Product**	**Performance**
Split/multi-split system	All	Example product: Mitsubishi 2x PLA-ZM50 1xPUZ-ZM100	Seasonal heating energy efficiency ratio = 4.80 Seasonal cooling energy efficiency ratio = 7.70
Central heating using water: radiators Variable speed pumps with different sensor across pump Does the system have provision for metering?: Yes Is there an alarm for 'out of range' values: Yes Central time control: No Optimum start/stop control: Yes Local time control (i.e. room by room): Yes Local temperature control (i.e. room by room): Yes Weather compensation control: No			

Water Heating Specification			
System	**Serving Zones**	**Description/Product**	**Performance**
Instantaneous electric hot water	All zones	Instantaneous electric hot water	Seasonal Efficiency= 100%

Ventilation Specification			
System	**Serving Zones**	**Performance**	**Value**
Natural	All	N/A	N/A

Lighting Specification			
Product	**Performance**	**Assigned zones**	**Lamp type**
LED lighting	Lumens/Watt: 130 Light Output Ratio=1	All zones	LED
Local Manual switching	No		
PIR Sensor	No		
PIR with photocell	No		
All lighting sub-metered: No M&T alarm for "out of range" values: No			
Display Lighting*			
Time control of display lighting: Yes Does display lighting use efficient lamps: Yes Lumens per circuit wattage: 130 **For areas where display items are exhibited, e.g. display windows, reception*			

Electric Power Factor: >0.95

Renewable Option 1	
Solar Thermal Provision	N/A
PV Array	Peak Power: N/A Orientation (or location): N/A

Other	
Air Pressure Target	3.00 Pa m^3/hm^{-2}

SBEM Assessment Specifications Sheet

Site :	Old Town Newbury Concierge and shared residents' area
Client:	Lochailort
Date :	19.08.2025
Revision:	1.0

Fabric Specifications			
Walls	Description	U-Value	Thermal Mass
External Wall Type 1	Insulated cavity wall, includes partition to residential zones	0.18W/m^{2}K	134.8kJ/m^{2}K
Semi-exposed walls	Insulated cavity walls between meeting room and maintenance store, between kitchenette and maintenance store and between parcel room and residential stairway	0.18W/m^{2}K	134.8kJ/m^{2}K
Floors	Description	U-Value	Thermal Mass
Ground Floor 1	Assumed	0.11W/m^{2}K	94.0kJ/m^{2}K
Doors	Description	U-Value	Thermal Mass
None	Doors where >50% of the area is glazed are modelled as windows as per National Calculation Methodology		
Windows	Description	U-value	Solar Factors
Glazing type 1	Frame factor = 0.1, glazing to toilets and meeting room	1.0W/m^{2}K	T-Solar: 0.72 L-Solar: 0.76
Glazing type 2	Frame factor = 0.1, glazing to concierge and gym	1.0W/m^{2}K	T-Solar: 0.50 L-Solar: 0.60

Building Services

PLEASE NOTE: Shell only projects will have assumed services

HVAC Specification			
System	**Serving**	**Description/Product**	**Performance**
Underfloor heating	All	Ground-source heat pump (from heat network)	Heating efficiency = 3.75
Air-source heat pump bivalent system with underfloor heating	Gym	A split system with Mitsubishi MSZ-LN18VG2	Heating SEER = 5.2 Cooling SEER = 10.5 Cooling EER = 5.15
Central heating using water: underfloor Variable speed pumps with different sensor across pump Does the system have provision for metering?: Yes Is there an alarm for 'out of range' values: Yes Central time control: Yes Optimum start/stop control: Yes Local time control (i.e. room by room): No Local temperature control (i.e. room by room): No Weather compensation control: No			

Water Heating Specification			
System	**Serving Zones**	**Description/Product**	**Performance**
Instantaneous electric hot water	All zones	Instantaneous electric hot water with no storage	Seasonal Efficiency= 100%

Ventilation Specification			
System	**Serving Zones**	**Performance**	**Value**
Natural	All	N/A	N/A

Lighting Specification			
Product	**Performance**	**Assigned zones**	**Lamp type**
LED lighting	Lumens/Watt: 130 Light Output Ratio=1	All zones	LED
Local Manual switching with photocell	Only in meeting room, PH-switching, standalone sensors, parasitic power = 0.20 W/m^2		
PIR Sensor	In all zones except meeting room and maintenance store, auto-on-off, parasitic power = 0.20 W/m^2		
PIR with photocell	Only in concierge and gym, PH-switching, standalone sensors, parasitic power = 0.20 W/m^2		
All lighting sub-metered: No M&T alarm for "out of range" values: No			
Display Lighting*			
Time control of display lighting: Yes Does display lighting use efficient lamps: Yes Lumens per circuit wattage: 130 **For areas where display items are exhibited, e.g. display windows, reception*			

Electric Power Factor: >0.95

Renewable Option 1		
Solar Thermal Provision	N/A	
PV Array	Peak Power: N/A	Orientation (or location): N/A

Other	
Air Pressure Target	3.00 Pa m^3/hm^{-2}

Appendix L – Sample SAP 10 Calculations

Sample SAP 10 Calculations can be found on the following pages.

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.77	**TER**	10.38
Environmental	99 A	**% DER < TER**			82.95
CO_2 Emissions (t/year)	0.13	**DFEE**	21.41	**TFEE**	25.68
Compliance Check	See BREL	**% DFEE < TFEE**			16.62
% DPER < TPER	58.66	**DPER**	22.68	**TPER**	54.85

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17650.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 203.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674 (64)
12Total per year (kWh/year)												2752 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.4800	10.6334	0.7600	0.7000	0.7700	29.3237	(74)
North	1.7600	10.6334	0.7600	0.7000	0.7700	6.8997	(74)

Solar gains	36.2234	69.2247	117.6297	188.9434	254.5240	272.4755	254.3907	201.8266	141.4290	82.4029	44.6862	30.1976 (83)
Total gains	621.3959	668.6372	691.7761	743.9773	782.2352	782.4743	745.4825	693.9486	648.1418	605.1561	598.4337	603.7387 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	
alpha	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	
util living area	0.9836	0.9722	0.9485	0.8681	0.7083	0.5066	0.3679	0.4127	0.6460	0.8901	0.9671	0.9862	(86)
MIT	20.3123	20.4341	20.6032	20.8257	20.9580	20.9953	20.9995	20.9989	20.9810	20.8239	20.5394	20.2772	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house	0.9799	0.9661	0.9373	0.8428	0.6656	0.4546	0.3115	0.3525	0.5891	0.8630	0.9590	0.9830	(89)
MIT 2	19.5228	19.6754	19.8848	20.1476	20.2877	20.3204	20.3232	20.3229	20.3100	20.1503	19.8088	19.4785	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.7698	19.9127	20.1095	20.3597	20.4974	20.5315	20.5347	20.5344	20.5199	20.3610	20.0374	19.7283	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7698	19.9127	20.1095	20.3597	20.4974	20.5315	20.5347	20.5344	20.5199	20.3610	20.0374	19.7283	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9762	0.9617	0.9333	0.8442	0.6769	0.4707	0.3292	0.3713	0.6060	0.8646	0.9549	0.9796	(94)
Useful gains	606.6033	643.0596	645.6346	628.0797	529.5022	368.3086	245.3782	257.6599	392.7725	523.2387	571.4213	591.4430	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	965.3637	936.8408	849.2789	715.1244	548.9850	370.1458	245.5397	257.9985	400.6239	609.1198	807.3343	969.0183	(97)
Space heating kWh	266.9177	197.4210	151.5114	62.6722	14.4952	0.0000	0.0000	0.0000	0.0000	63.8956	169.8574	280.9160	(98a)
Space heating requirement - total per year (kWh/year)												1207.6864	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	266.9177	197.4210	151.5114	62.6722	14.4952	0.0000	0.0000	0.0000	0.0000	63.8956	169.8574	280.9160	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1207.6864	
Space heating per m2											(98c) / (4) =	13.9295	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	266.9177	197.4210	151.5114	62.6722	14.4952	0.0000	0.0000	0.0000	0.0000	63.8956	169.8574	280.9160	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	400.3766	296.1315	227.2670	94.0083	21.7428	0.0000	0.0000	0.0000	0.0000	95.8434	254.7860	421.3740	
Space heating requirement	400.3766	296.1315	227.2670	94.0083	21.7428	0.0000	0.0000	0.0000	0.0000	95.8434	254.7860	421.3740	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1811.5296	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												18.1153	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5230.6304	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1583.7415	0.1567	75.7117	(367)
Electrical energy for heat distribution (space & water)	18.1153	0.0000	8.6549	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			239.4509	(373)
Space and water heating			239.4509	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			153.8760	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.7700	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1583.7415	1.5802	763.3730	(467)
Electrical energy for heat distribution (space & water)	18.1153	0.0000	91.4057	(472)
Overall CO2 factor for heat network			0.4258	(486)
Total CO2 associated with community systems			2528.8912	(473)
Space and water heating			2528.8912	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1965.9479	(483)
Dwelling Primary energy Rate (DPER)			22.6800	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
Heatloss Floor 1			43.3500	0.1300	5.6355			(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1247			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E5 Ground floor (normal)	6.7700	0.1600	1.0832
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P1 Party wall - Ground floor	19.4300	0.0800	1.5544
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0424 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.1671 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	71.4535	71.2501	71.0507	70.1143	69.9391	69.1235	69.1235	68.9725	69.4377	69.9391	70.2935	70.6641	(39)
Average = Sum(39)m / 12 =												70.1135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8241	0.8218	0.8195	0.8087	0.8067	0.7973	0.7973	0.7955	0.8009	0.8067	0.8108	0.8150	(40)
HLP (average)												0.8087	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
										Total per year (kWh/year) = Sum(64)m =		2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.2400	10.6334	0.6300	0.7000	0.7700	30.0273	(74)

Solar gains	30.0273	57.3836	97.5088	156.6241	210.9870	225.8679	210.8765	167.3036	117.2372	68.3077	37.0425	25.0322	(83)
Total gains	608.8644	650.4608	665.3198	705.3227	732.3628	726.5312	692.6329	650.0903	614.6146	584.7255	584.4547	592.2379	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3015	70.5022	70.7000	71.6442	71.8237	72.6712	72.6712	72.8303	72.3424	71.8237	71.4616	71.0868	
alpha	5.6868	5.7001	5.7133	5.7763	5.7882	5.8447	5.8447	5.8554	5.8228	5.7882	5.7641	5.7391	
util living area	0.9892	0.9825	0.9692	0.9187	0.7977	0.5953	0.4371	0.4843	0.7302	0.9283	0.9786	0.9907	(86)
MIT	20.0975	20.2238	20.4109	20.6929	20.8985	20.9849	20.9979	20.9962	20.9535	20.7170	20.3794	20.0812	(87)
Th 2	20.2325	20.2345	20.2365	20.2458	20.2475	20.2557	20.2557	20.2572	20.2526	20.2475	20.2440	20.2403	(88)
util rest of house	0.9866	0.9783	0.9614	0.8985	0.7544	0.5314	0.3642	0.4079	0.6673	0.9063	0.9725	0.9883	(89)
MIT 2	19.1787	19.3400	19.5767	19.9277	20.1583	20.2460	20.2548	20.2555	20.2189	19.9627	19.5452	19.1640	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.4661	19.6164	19.8376	20.1671	20.3899	20.4771	20.4872	20.4872	20.4487	20.1987	19.8062	19.4509	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4661	19.6164	19.8376	20.1671	20.3899	20.4771	20.4872	20.4872	20.4487	20.1987	19.8062	19.4509	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9831	0.9740	0.9565	0.8961	0.7631	0.5508	0.3870	0.4318	0.6846	0.9047	0.9682	0.9852	(94)
Useful gains	598.5938	633.5301	636.3537	632.0707	558.8311	400.1439	268.0498	280.7048	420.7552	528.9857	565.8713	583.4934	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1083.6734	1048.5486	947.6491	789.9838	607.7612	406.2491	268.7001	281.9067	440.8357	671.3212	893.1619	1077.6925	(97)
Space heating kWh	360.8992	278.8925	231.6038	113.6974	36.4040	0.0000	0.0000	0.0000	0.0000	105.8976	235.6492	367.6841	(98a)
Space heating requirement - total per year (kWh/year)												1730.7279	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	360.8992	278.8925	231.6038	113.6974	36.4040	0.0000	0.0000	0.0000	0.0000	105.8976	235.6492	367.6841	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1730.7279	
Space heating per m2										(98c) / (4) =		19.9623	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	360.8992	278.8925	231.6038	113.6974	36.4040	0.0000	0.0000	0.0000	0.0000	105.8976	235.6492	367.6841	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	391.0068	302.1587	250.9250	123.1825	39.4410	0.0000	0.0000	0.0000	0.0000	114.7320	255.3079	398.3577	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.0310	84.7336	84.1803	82.9107	81.1355	79.8000	79.8000	79.8000	79.8000	82.7429	84.3428	85.0948	(217)
Fuel for water heating, kWh/month	274.8189	243.7859	260.7573	233.3136	231.3986	212.3443	209.9929	218.2535	220.5242	236.7197	246.3450	271.7169	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.0522	-34.0491	-51.2340	-60.3739	-67.5059	-63.8722	-63.0931	-58.3837	-50.4758	-40.1585	-25.8892	-19.7533	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.6843	-18.6438	-37.7720	-57.7989	-77.4856	-78.2579	-77.3368	-64.9856	-46.9877	-27.0053	-11.7029	-6.8394	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1875.1115	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2859.9707	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1071.3411	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3974.1193	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1875.1115	0.2100	393.7734	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2859.9707	0.2100	600.5938	(264)
Space and water heating			994.3673	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	0.1336	-74.5440	
PV Unit electricity exported	-513.5003	0.1254	-64.3679	
Total			-138.9120	(269)
Total CO2, kg/year			899.7693	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.3800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1875.1115	1.1300	2118.8760	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2859.9707	1.1300	3231.7668	(278)
Space and water heating			5350.6429	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	1.4938	-833.3127	
PV Unit electricity exported	-513.5003	0.4601	-236.2611	
Total			-1069.5738	(283)
Total Primary energy kWh/year			4755.3287	(286)
Target Primary Energy Rate (TPER)			54.8500	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.77	**TER**	10.38
Environmental	99 A	**% DER < TER**			82.95
CO_2 Emissions (t/year)	0.13	**DFEE**	21.41	**TFEE**	25.68
Compliance Check	See BREL	**% DFEE < TFEE**			16.62
% DPER < TPER	58.66	**DPER**	22.68	**TPER**	54.85

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2257	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2878	0.2821	0.2765	0.2483	0.2426	0.2144	0.2144	0.2088	0.2257	0.2426	0.2539	0.2652	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5414	0.5398	0.5382	0.5308	0.5294	0.5230	0.5230	0.5218	0.5255	0.5294	0.5322	0.5352	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		18083.8300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							208.5794	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9510	37.8383	37.7278	37.2089	37.1118	36.6599	36.6599	36.5762	36.8339	37.1118	37.3082	37.5135	(38)
Heat transfer coeff	65.3058	65.1931	65.0826	64.5637	64.4666	64.0147	64.0147	63.9310	64.1888	64.4666	64.6630	64.8684	(39)
Average = Sum(39)m / 12 =												64.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7532	0.7519	0.7507	0.7447	0.7436	0.7383	0.7383	0.7374	0.7404	0.7436	0.7458	0.7482	(40)
HLP (average)												0.7447	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
									Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)											908	(64)

Electric shower(s)

54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 614.3496 (64a)

Heat gains from water heating, kWh/month

37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.4800	10.6334	0.7600	0.7000	0.7700	29.3237	(74)
North	1.7600	10.6334	0.7600	0.7000	0.7700	6.8997	(74)

Solar gains	36.2234	69.2247	117.6297	188.9434	254.5240	272.4755	254.3907	201.8266	141.4290	82.4029	44.6862	30.1976	(83)
Total gains	514.4518	562.9495	588.9893	648.1858	690.5587	695.1438	661.1229	607.6084	559.4090	511.5750	498.1758	497.7463	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.9194	77.0524	77.1832	77.8035	77.9207	78.4708	78.4708	78.5736	78.2580	77.9207	77.6840	77.4381	
alpha	6.1280	6.1368	6.1455	6.1869	6.1947	6.2314	6.2314	6.2382	6.2172	6.1947	6.1789	6.1625	
util living area	0.9947	0.9897	0.9785	0.9274	0.7935	0.5802	0.4248	0.4813	0.7443	0.9482	0.9882	0.9956	(86)

MIT	20.1017	20.2356	20.4296	20.7199	20.9198	20.9901	20.9988	20.9974	20.9587	20.7117	20.3681	20.0768 (87)
Th 2	20.2940	20.2952	20.2963	20.3015	20.3025	20.3071	20.3071	20.3079	20.3053	20.3025	20.3005	20.2985 (88)
util rest of house	0.9933	0.9872	0.9729	0.9093	0.7519	0.5210	0.3586	0.4102	0.6849	0.9314	0.9847	0.9945 (89)
MIT 2	19.4662	19.5999	19.7918	20.0733	20.2475	20.3021	20.3067	20.3070	20.2817	20.0708	19.7362	19.4451 (90)
Living area fraction									fLA = Living area / (4) =			0.3128 (91)
MIT	19.6650	19.7987	19.9913	20.2756	20.4578	20.5173	20.5232	20.5230	20.4935	20.2713	19.9339	19.6427 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6650	19.7987	19.9913	20.2756	20.4578	20.5173	20.5232	20.5230	20.4935	20.2713	19.9339	19.6427 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9918	0.9849	0.9700	0.9085	0.7616	0.5392	0.3793	0.4325	0.7017	0.9306	0.9825	0.9932	(94)
Useful gains	510.2357	554.4500	571.3023	588.8818	525.9338	374.8247	250.7659	262.7698	392.5487	476.0564	489.4471	494.3600	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1003.4218	971.2940	878.0516	734.4513	564.5853	378.7956	251.1403	263.5869	410.3886	623.4751	829.8782	1001.7447	(97)
Space heating kWh	366.9305	280.1192	228.2215	104.8100	28.7567	0.0000	0.0000	0.0000	0.0000	109.6796	245.1104	377.4942	(98a)
Space heating requirement - total per year (kWh/year)												1741.1221	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	366.9305	280.1192	228.2215	104.8100	28.7567	0.0000	0.0000	0.0000	0.0000	109.6796	245.1104	377.4942	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1741.1221	
Space heating per m2											(98c) / (4) =	20.0821	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	601.7381	473.7088	485.8756	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9366	0.9721	0.9538	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	563.5606	460.4723	463.4198	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	748.3914	711.6595	651.8733	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	133.0782	186.8832	140.2094	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	33.2696	46.7208	35.0524	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												115.0427	(107)
Energy for space heating												20.0821	(99)
Energy for space cooling												1.3269	(108)
Total												21.4091	(109)
Fabric Energy Efficiency (DFEE)												21.4	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
Heatloss Floor 1			43.3500	0.1300	5.6355			(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1247			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	6.2700	0.0500	0.3135
E2 Other lintels (including other steel lintels)	2.5200	0.0500	0.1260
E3 Sill	20.7200	0.0500	1.0360
E4 Jamb	13.5400	0.0000	0.0000
E6 Intermediate floor within a dwelling	6.7700	0.1600	1.0832
E5 Ground floor (normal)	22.0000	0.0600	1.3200
E18 Party wall between dwellings	12.6600	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	19.4300	0.0800	1.5544
P1 Party wall - Ground floor	6.7700	0.0200	0.1354
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0700	0.4739
E7 Party floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0424 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.1671 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	71.4535	71.2501	71.0507	70.1143	69.9391	69.1235	69.1235	68.9725	69.4377	69.9391	70.2935	70.6641	(39)
Average = Sum(39)m / 12 =												70.1135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8241	0.8218	0.8195	0.8087	0.8067	0.7973	0.7973	0.7955	0.8009	0.8067	0.8108	0.8150	(40)
HLP (average)												0.8087	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)

Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)

Water heating gains (Table 5)

49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)

Total internal gains

478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.2400	10.6334	0.6300	0.7000	0.7700	30.0273	(74)

Solar gains	30.0273	57.3836	97.5088	156.6241	210.9870	225.8679	210.8765	167.3036	117.2372	68.3077	37.0425	25.0322	(83)
Total gains	508.2557	551.1084	568.8684	615.8666	647.0217	648.5361	617.6087	573.0854	535.2172	497.4798	490.5321	492.5809	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3015	70.5022	70.7000	71.6442	71.8237	72.6712	72.6712	72.8303	72.3424	71.8237	71.4616	71.0868	
alpha	5.6868	5.7001	5.7133	5.7763	5.7882	5.8447	5.8447	5.8554	5.8228	5.7882	5.7641	5.7391	
util living area	0.9955	0.9920	0.9847	0.9514	0.8549	0.6571	0.4884	0.5457	0.8023	0.9621	0.9905	0.9962	(86)
MIT	19.9505	20.0826	20.2814	20.5978	20.8509	20.9751	20.9962	20.9931	20.9237	20.6186	20.2477	19.9343	(87)
Th 2	20.2325	20.2345	20.2365	20.2458	20.2475	20.2557	20.2557	20.2572	20.2526	20.2475	20.2440	20.2403	(88)
util rest of house	0.9943	0.9899	0.9804	0.9375	0.8169	0.5900	0.4078	0.4614	0.7430	0.9485	0.9876	0.9952	(89)
MIT 2	19.2657	19.3987	19.5971	19.9115	20.1414	20.2429	20.2545	20.2547	20.2072	19.9365	19.5709	19.2560	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.4799	19.6126	19.8111	20.1262	20.3633	20.4719	20.4865	20.4857	20.4313	20.1499	19.7826	19.4682	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4799	19.6126	19.8111	20.1262	20.3633	20.4719	20.4865	20.4857	20.4313	20.1499	19.7826	19.4682	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9928	0.9877	0.9774	0.9349	0.8233	0.6101	0.4331	0.4878	0.7583	0.9464	0.9854	0.9939	(94)
Useful gains	504.6072	544.3250	556.0256	575.7861	532.6883	395.6605	267.4729	279.5390	405.8295	470.7984	483.3569	489.5913	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1084.6586	1048.2742	945.7652	787.1166	605.9057	405.8891	268.6468	281.8001	439.6314	667.9094	891.5034	1078.9144	(97)
Space heating kWh	431.5582	338.6539	289.9663	152.1579	54.4738	0.0000	0.0000	0.0000	0.0000	146.6506	293.8654	438.4563	(98a)
Space heating requirement - total per year (kWh/year)												2145.7825	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	431.5582	338.6539	289.9663	152.1579	54.4738	0.0000	0.0000	0.0000	0.0000	146.6506	293.8654	438.4563	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2145.7825	
Space heating per m2											(98c) / (4) =	24.7495	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	649.7609	511.5139	524.1907	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8804	0.9388	0.9112	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	572.0692	480.2208	477.6372	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	693.9149	660.7987	611.5218	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	87.7289	134.3500	99.6101	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	21.9322	33.5875	24.9025	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												80.4223	(107)
Energy for space heating												24.7495	(99)
Energy for space cooling												0.9276	(108)
Total												25.6771	(109)
Fabric Energy Efficiency (TFEE)												25.7	(109)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.77	**TER**	10.38
Environmental	99 A	**% DER < TER**			82.95
CO_2 Emissions (t/year)	0.13	**DFEE**	21.41	**TFEE**	25.68
Compliance Check	See BREL	**% DFEE < TFEE**			16.62
% DPER < TPER	58.66	**DPER**	22.68	**TPER**	54.85

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17650.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 203.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674 (64)
12Total per year (kWh/year)												2752 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.4800	10.6334	0.7600	0.7000	0.7700	29.3237	(74)
North	1.7600	10.6334	0.7600	0.7000	0.7700	6.8997	(74)

Solar gains	36.2234	69.2247	117.6297	188.9434	254.5240	272.4755	254.3907	201.8266	141.4290	82.4029	44.6862	30.1976 (83)
Total gains	621.3959	668.6372	691.7761	743.9773	782.2352	782.4743	745.4825	693.9486	648.1418	605.1561	598.4337	603.7387 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	
alpha	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	
util living area	0.9836	0.9722	0.9485	0.8681	0.7083	0.5066	0.3679	0.4127	0.6460	0.8901	0.9671	0.9862	(86)
MIT	20.3123	20.4341	20.6032	20.8257	20.9580	20.9953	20.9995	20.9989	20.9810	20.8239	20.5394	20.2772	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house	0.9799	0.9661	0.9373	0.8428	0.6656	0.4546	0.3115	0.3525	0.5891	0.8630	0.9590	0.9830	(89)
MIT 2	19.5228	19.6754	19.8848	20.1476	20.2877	20.3204	20.3232	20.3229	20.3100	20.1503	19.8088	19.4785	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.7698	19.9127	20.1095	20.3597	20.4974	20.5315	20.5347	20.5344	20.5199	20.3610	20.0374	19.7283	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7698	19.9127	20.1095	20.3597	20.4974	20.5315	20.5347	20.5344	20.5199	20.3610	20.0374	19.7283	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9762	0.9617	0.9333	0.8442	0.6769	0.4707	0.3292	0.3713	0.6060	0.8646	0.9549	0.9796	(94)
Useful gains	606.6033	643.0596	645.6346	628.0797	529.5022	368.3086	245.3782	257.6599	392.7725	523.2387	571.4213	591.4430	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	965.3637	936.8408	849.2789	715.1244	548.9850	370.1458	245.5397	257.9985	400.6239	609.1198	807.3343	969.0183	(97)
Space heating kWh	266.9177	197.4210	151.5114	62.6722	14.4952	0.0000	0.0000	0.0000	0.0000	63.8956	169.8574	280.9160	(98a)
Space heating requirement - total per year (kWh/year)												1207.6864	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	266.9177	197.4210	151.5114	62.6722	14.4952	0.0000	0.0000	0.0000	0.0000	63.8956	169.8574	280.9160	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1207.6864	
Space heating per m2											(98c) / (4) =	13.9295	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	266.9177	197.4210	151.5114	62.6722	14.4952	0.0000	0.0000	0.0000	0.0000	63.8956	169.8574	280.9160	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	400.3766	296.1315	227.2670	94.0083	21.7428	0.0000	0.0000	0.0000	0.0000	95.8434	254.7860	421.3740	
Space heating requirement	400.3766	296.1315	227.2670	94.0083	21.7428	0.0000	0.0000	0.0000	0.0000	95.8434	254.7860	421.3740	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1811.5296	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												18.1153	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5230.6304	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1583.7415	0.1567	75.7117	(367)
Electrical energy for heat distribution (space & water)	18.1153	0.0000	8.6549	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			239.4509	(373)
Space and water heating			239.4509	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			153.8760	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.7700	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1583.7415	1.5802	763.3730	(467)
Electrical energy for heat distribution (space & water)	18.1153	0.0000	91.4057	(472)
Overall CO2 factor for heat network			0.4258	(486)
Total CO2 associated with community systems			2528.8912	(473)
Space and water heating			2528.8912	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1965.9479	(483)
Dwelling Primary energy Rate (DPER)			22.6800	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
Heatloss Floor 1			43.3500	0.1300	5.6355			(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1247			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E5 Ground floor (normal)	6.7700	0.1600	1.0832
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P1 Party wall - Ground floor	19.4300	0.0800	1.5544
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0424 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.1671 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	71.4535	71.2501	71.0507	70.1143	69.9391	69.1235	69.1235	68.9725	69.4377	69.9391	70.2935	70.6641	(39)
Average = Sum(39)m / 12 =												70.1135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8241	0.8218	0.8195	0.8087	0.8067	0.7973	0.7973	0.7955	0.8009	0.8067	0.8108	0.8150	(40)
HLP (average)												0.8087	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
										Total per year (kWh/year) = Sum(64)m =		2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.2400	10.6334	0.6300	0.7000	0.7700	30.0273	(74)

Solar gains	30.0273	57.3836	97.5088	156.6241	210.9870	225.8679	210.8765	167.3036	117.2372	68.3077	37.0425	25.0322	(83)
Total gains	608.8644	650.4608	665.3198	705.3227	732.3628	726.5312	692.6329	650.0903	614.6146	584.7255	584.4547	592.2379	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3015	70.5022	70.7000	71.6442	71.8237	72.6712	72.6712	72.8303	72.3424	71.8237	71.4616	71.0868	
alpha	5.6868	5.7001	5.7133	5.7763	5.7882	5.8447	5.8447	5.8554	5.8228	5.7882	5.7641	5.7391	
util living area	0.9892	0.9825	0.9692	0.9187	0.7977	0.5953	0.4371	0.4843	0.7302	0.9283	0.9786	0.9907	(86)
MIT	20.0975	20.2238	20.4109	20.6929	20.8985	20.9849	20.9979	20.9962	20.9535	20.7170	20.3794	20.0812	(87)
Th 2	20.2325	20.2345	20.2365	20.2458	20.2475	20.2557	20.2557	20.2572	20.2526	20.2475	20.2440	20.2403	(88)
util rest of house	0.9866	0.9783	0.9614	0.8985	0.7544	0.5314	0.3642	0.4079	0.6673	0.9063	0.9725	0.9883	(89)
MIT 2	19.1787	19.3400	19.5767	19.9277	20.1583	20.2460	20.2548	20.2555	20.2189	19.9627	19.5452	19.1640	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.4661	19.6164	19.8376	20.1671	20.3899	20.4771	20.4872	20.4872	20.4487	20.1987	19.8062	19.4509	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4661	19.6164	19.8376	20.1671	20.3899	20.4771	20.4872	20.4872	20.4487	20.1987	19.8062	19.4509	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9831	0.9740	0.9565	0.8961	0.7631	0.5508	0.3870	0.4318	0.6846	0.9047	0.9682	0.9852	(94)
Useful gains	598.5938	633.5301	636.3537	632.0707	558.8311	400.1439	268.0498	280.7048	420.7552	528.9857	565.8713	583.4934	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1083.6734	1048.5486	947.6491	789.9838	607.7612	406.2491	268.7001	281.9067	440.8357	671.3212	893.1619	1077.6925	(97)
Space heating kWh	360.8992	278.8925	231.6038	113.6974	36.4040	0.0000	0.0000	0.0000	0.0000	105.8976	235.6492	367.6841	(98a)
Space heating requirement - total per year (kWh/year)												1730.7279	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	360.8992	278.8925	231.6038	113.6974	36.4040	0.0000	0.0000	0.0000	0.0000	105.8976	235.6492	367.6841	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1730.7279	
Space heating per m2										(98c) / (4) =		19.9623	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	360.8992	278.8925	231.6038	113.6974	36.4040	0.0000	0.0000	0.0000	0.0000	105.8976	235.6492	367.6841	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	391.0068	302.1587	250.9250	123.1825	39.4410	0.0000	0.0000	0.0000	0.0000	114.7320	255.3079	398.3577	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.0310	84.7336	84.1803	82.9107	81.1355	79.8000	79.8000	79.8000	79.8000	82.7429	84.3428	85.0948	(217)
Fuel for water heating, kWh/month	274.8189	243.7859	260.7573	233.3136	231.3986	212.3443	209.9929	218.2535	220.5242	236.7197	246.3450	271.7169	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.0522	-34.0491	-51.2340	-60.3739	-67.5059	-63.8722	-63.0931	-58.3837	-50.4758	-40.1585	-25.8892	-19.7533	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.6843	-18.6438	-37.7720	-57.7989	-77.4856	-78.2579	-77.3368	-64.9856	-46.9877	-27.0053	-11.7029	-6.8394	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1875.1115	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2859.9707	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1071.3411	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3974.1193	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1875.1115	0.2100	393.7734	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2859.9707	0.2100	600.5938	(264)
Space and water heating			994.3673	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	0.1336	-74.5440	
PV Unit electricity exported	-513.5003	0.1254	-64.3679	
Total			-138.9120	(269)
Total CO2, kg/year			899.7693	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.3800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1875.1115	1.1300	2118.8760	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2859.9707	1.1300	3231.7668	(278)
Space and water heating			5350.6429	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	1.4938	-833.3127	
PV Unit electricity exported	-513.5003	0.4601	-236.2611	
Total			-1069.5738	(283)
Total Primary energy kWh/year			4755.3287	(286)
Target Primary Energy Rate (TPER)			54.8500	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.77	**TER**	10.38
Environmental	99 A	**% DER < TER**			82.95
CO_2 Emissions (t/year)	0.13	**DFEE**	21.41	**TFEE**	25.68
Compliance Check	See BREL	**% DFEE < TFEE**			16.62
% DPER < TPER	58.66	**DPER**	22.68	**TPER**	54.85

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.4800	10.6334	0.7600	0.7000	0.7700	29.3237	(74)
North	1.7600	10.6334	0.7600	0.7000	0.7700	6.8997	(74)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	36.2234	69.2247	117.6297	188.9434	254.5240	272.4755	254.3907	201.8266	141.4290	82.4029	44.6862	30.1976	(83)
Total gains	675.8472	706.5185	735.9149	771.8971	802.3267	788.5804	751.8392	702.5390	660.3507	633.5841	634.6900	653.9803	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area													
	0.9767	0.9659	0.9359	0.8545	0.6953	0.5031	0.3648	0.4078	0.6365	0.8744	0.9592	0.9808	(86)
MIT	20.4026	20.4961	20.6621	20.8507	20.9648	20.9959	20.9996	20.9991	20.9839	20.8515	20.5956	20.3636	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house													
	0.9716	0.9586	0.9225	0.8276	0.6524	0.4513	0.3089	0.3482	0.5797	0.8449	0.9492	0.9765	(89)
MIT 2	19.6347	19.7511	19.9548	20.1748	20.2939	20.3209	20.3232	20.3230	20.3123	20.1800	19.8765	19.5859	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8749	19.9841	20.1760	20.3862	20.5038	20.5320	20.5348	20.5345	20.5224	20.3900	20.1014	19.8291	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8749	19.9841	20.1760	20.3862	20.5038	20.5320	20.5348	20.5345	20.5224	20.3900	20.1014	19.8291	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9676	0.9543	0.9193	0.8302	0.6641	0.4674	0.3264	0.3669	0.5967	0.8480	0.9455	0.9727	(94)
Useful gains	653.9667	674.2570	676.5111	640.8452	532.8279	368.5792	245.4103	257.7290	394.0495	537.2890	600.0744	636.1245	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	971.9248	941.3000	853.4289	716.7777	549.3838	370.1781	245.5435	258.0066	400.7759	610.9296	811.3331	975.3096	(97)
Space heating kWh	236.5608	179.4529	131.6268	54.6714	12.3176	0.0000	0.0000	0.0000	0.0000	54.7886	152.1063	252.3537	(98a)
Space heating requirement - total per year (kWh/year)												1073.8781	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	236.5608	179.4529	131.6268	54.6714	12.3176	0.0000	0.0000	0.0000	0.0000	54.7886	152.1063	252.3537	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1073.8781	
Space heating per m2											(98c) / (4) =	12.3861	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	236.5608	179.4529	131.6268	54.6714	12.3176	0.0000	0.0000	0.0000	0.0000	54.7886	152.1063	252.3537	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	354.8412	269.1794	197.4403	82.0070	18.4764	0.0000	0.0000	0.0000	0.0000	82.1829	228.1594	378.5306	
Space heating requirement													
	354.8412	269.1794	197.4403	82.0070	18.4764	0.0000	0.0000	0.0000	0.0000	82.1829	228.1594	378.5306	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1610.8172	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												16.1082	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5029.9180	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1610.8172	4.4400	71.5203	(340a)
Space heating total			71.5203	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			280.1113	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7657 (357)
SAP value		87.5883
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1530.2182	0.1568	67.3631	(367)
Electrical energy for heat distribution (space & water)	16.1082	0.0000	8.3418	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			230.7891	(373)
Space and water heating			230.7891	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			145.2143	(383)
CO2 emissions per m2			1.6700	(384)
EI value			98.5225	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)

Average = Sum(39)m / 12 = 62.4033

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)

Total per year (kWh/year) = Sum(64)m = 2751.6674 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.4800	12.7500	0.7600	0.7000	0.7700	35.1606	(74)
North	1.7600	12.7500	0.7600	0.7000	0.7700	8.2731	(74)

Solar gains	43.4336	74.5092	126.2264	206.2135	267.3389	306.4834	281.0067	227.7396	160.7181	94.0355	52.9325	36.3187	(83)
Total gains	683.0575	711.8031	744.5117	789.1672	815.1415	822.5883	778.4551	728.4520	679.6398	645.2166	642.9363	660.1014	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area													
	0.9733	0.9616	0.9229	0.8284	0.6549	0.4387	0.3125	0.3509	0.5959	0.8448	0.9509	0.9780	(86)
MIT	20.4392	20.5285	20.7083	20.8806	20.9760	20.9983	20.9998	20.9997	20.9893	20.8863	20.6387	20.3994	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house													
	0.9675	0.9534	0.9070	0.7984	0.6101	0.3881	0.2584	0.2932	0.5387	0.8103	0.9390	0.9731	(89)
MIT 2	19.6806	19.7914	20.0101	20.2073	20.3041	20.3225	20.3234	20.3233	20.3163	20.2175	19.9292	19.6309	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9179	20.0219	20.2285	20.4179	20.5143	20.5339	20.5350	20.5349	20.5268	20.4267	20.1511	19.8713	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9179	20.0219	20.2285	20.4179	20.5143	20.5339	20.5350	20.5349	20.5268	20.4267	20.1511	19.8713	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9633	0.9491	0.9046	0.8028	0.6230	0.4039	0.2753	0.3113	0.5561	0.8159	0.9356	0.9692	(94)
Useful gains	658.0010	675.5916	673.4511	633.5337	507.8171	332.2252	214.3108	226.7345	377.9779	526.4303	601.5176	639.7400	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	955.8860	924.9381	825.5010	693.7948	518.8400	332.8504	214.3530	226.8273	382.3341	582.0168	789.4699	959.2204	(97)
Space heating kWh													
	221.6264	167.5608	113.1251	43.3881	8.2011	0.0000	0.0000	0.0000	0.0000	41.3563	135.3257	237.6935	(98a)
Space heating requirement - total per year (kWh/year)												968.2769	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	221.6264	167.5608	113.1251	43.3881	8.2011	0.0000	0.0000	0.0000	0.0000	41.3563	135.3257	237.6935	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												968.2769	
Space heating per m2											(98c) / (4) =	11.1681	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	221.6264	167.5608	113.1251	43.3881	8.2011	0.0000	0.0000	0.0000	0.0000	41.3563	135.3257	237.6935	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	332.4397	251.3413	169.6876	65.0821	12.3016	0.0000	0.0000	0.0000	0.0000	62.0345	202.9885	356.5402	
Space heating requirement													
	332.4397	251.3413	169.6876	65.0821	12.3016	0.0000	0.0000	0.0000	0.0000	62.0345	202.9885	356.5402	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)

Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year	
Space heating fuel - community heating	1452.4154 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	14.5242 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)	
mechanical ventilation fans (SFP = 0.1292)	33.4924 (330a)
Total electricity for the above, kWh/year	33.4924 (331)
Electricity for lighting (calculated in Appendix L)	216.3282 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4774.9901 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1452.4154	6.5500	95.1332	(340a)
Space heating total			95.1332	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			358.4383	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1487.9777	0.1573	60.9331	(367)
Electrical energy for heat distribution (space & water)	14.5242	0.0000	8.1007	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			224.1180	(373)
Space and water heating			224.1180	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			126.2851	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1487.9777	1.5824	612.8906	(467)
Electrical energy for heat distribution (space & water)	14.5242	0.0000	85.7626	(472)
Overall CO2 factor for heat network			0.4252	(486)
Total CO2 associated with community systems			2372.7657	(473)
Space and water heating			2372.7657	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1728.9306	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - South

Current energy efficiency rating: B 88
Current environmental impact rating: A 99

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£71	£71	£0
Community scheme	£469	£469	£0
Space heating	£209	£209	£0
Water heating	£270	£270	£0
Lighting	£62	£62	£0
Generated (PV)	-£182	-£182	£0
Total cost of fuels	£358	£358	£0
Total cost of uses	£359	£359	£0
Delivered energy	55 kWh/m²	55 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	20 kWh/m²	20 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5778 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day)	126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	

Distribution loss (46)m = 0.15 x (45)m

32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss / Combi loss

Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS / PV diverter / Solar input / FGHRS

Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
									Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.4800	10.6334	0.7600	0.7000	0.7700	29.3237	(74)
North	1.7600	10.6334	0.7600	0.7000	0.7700	6.8997	(74)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	36.2234	69.2247	117.6297	188.9434	254.5240	272.4755	254.3907	201.8266	141.4290	82.4029	44.6862	30.1976	(83)
Total gains	675.8472	706.5185	735.9149	771.8971	802.3267	788.5804	751.8392	702.5390	660.3507	633.5841	634.6900	653.9803	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area	0.9767	0.9659	0.9359	0.8545	0.6953	0.5031	0.3648	0.4078	0.6365	0.8744	0.9592	0.9808	(86)
MIT	20.4026	20.4961	20.6621	20.8507	20.9648	20.9959	20.9996	20.9991	20.9839	20.8515	20.5956	20.3636	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house	0.9716	0.9586	0.9225	0.8276	0.6524	0.4513	0.3089	0.3482	0.5797	0.8449	0.9492	0.9765	(89)
MIT 2	19.6347	19.7511	19.9548	20.1748	20.2939	20.3209	20.3232	20.3230	20.3123	20.1800	19.8765	19.5859	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.8749	19.9841	20.1760	20.3862	20.5038	20.5320	20.5348	20.5345	20.5224	20.3900	20.1014	19.8291	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8749	19.9841	20.1760	20.3862	20.5038	20.5320	20.5348	20.5345	20.5224	20.3900	20.1014	19.8291	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9676	0.9543	0.9193	0.8302	0.6641	0.4674	0.3264	0.3669	0.5967	0.8480	0.9455	0.9727	(94)
Useful gains	653.9667	674.2570	676.5111	640.8452	532.8279	368.5792	245.4103	257.7290	394.0495	537.2890	600.0744	636.1245	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	971.9248	941.3000	853.4289	716.7777	549.3838	370.1781	245.5435	258.0066	400.7759	610.9296	811.3331	975.3096	(97)
Space heating kWh	236.5608	179.4529	131.6268	54.6714	12.3176	0.0000	0.0000	0.0000	0.0000	54.7886	152.1063	252.3537	(98a)
Space heating requirement - total per year (kWh/year)												1073.8781	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	236.5608	179.4529	131.6268	54.6714	12.3176	0.0000	0.0000	0.0000	0.0000	54.7886	152.1063	252.3537	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1073.8781	
Space heating per m2										(98c) / (4) =		12.3861	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	236.5608	179.4529	131.6268	54.6714	12.3176	0.0000	0.0000	0.0000	0.0000	54.7886	152.1063	252.3537	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	354.8412	269.1794	197.4403	82.0070	18.4764	0.0000	0.0000	0.0000	0.0000	82.1829	228.1594	378.5306	
Space heating requirement	354.8412	269.1794	197.4403	82.0070	18.4764	0.0000	0.0000	0.0000	0.0000	82.1829	228.1594	378.5306	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1610.8172	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)

Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	16.1082	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5029.9180	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1610.8172	4.4400	71.5203	(340a)
Space heating total			71.5203	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			280.1113	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.7657	(357)
SAP value	87.5883	
SAP rating (Section 12)	88	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1530.2182	0.1568	67.3631	(367)
Electrical energy for heat distribution (space & water)	16.1082	0.0000	8.3418	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			230.7891	(373)
Space and water heating			230.7891	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			145.2143	(383)
CO2 emissions per m2			1.6700	(384)
EI value			98.5225	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5778	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.4800	12.7500	0.7600	0.7000	0.7700	35.1606	(74)
North	1.7600	12.7500	0.7600	0.7000	0.7700	8.2731	(74)

Solar gains	43.4336	74.5092	126.2264	206.2135	267.3389	306.4834	281.0067	227.7396	160.7181	94.0355	52.9325	36.3187	(83)
Total gains	683.0575	711.8031	744.5117	789.1672	815.1415	822.5883	778.4551	728.4520	679.6398	645.2166	642.9363	660.1014	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area													
	0.9733	0.9616	0.9229	0.8284	0.6549	0.4387	0.3125	0.3509	0.5959	0.8448	0.9509	0.9780	(86)
MIT	20.4392	20.5285	20.7083	20.8806	20.9760	20.9983	20.9998	20.9997	20.9893	20.8863	20.6387	20.3994	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house													
	0.9675	0.9534	0.9070	0.7984	0.6101	0.3881	0.2584	0.2932	0.5387	0.8103	0.9390	0.9731	(89)
MIT 2	19.6806	19.7914	20.0101	20.2073	20.3041	20.3225	20.3234	20.3233	20.3163	20.2175	19.9292	19.6309	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9179	20.0219	20.2285	20.4179	20.5143	20.5339	20.5350	20.5349	20.5268	20.4267	20.1511	19.8713	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9179	20.0219	20.2285	20.4179	20.5143	20.5339	20.5350	20.5349	20.5268	20.4267	20.1511	19.8713	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9633	0.9491	0.9046	0.8028	0.6230	0.4039	0.2753	0.3113	0.5561	0.8159	0.9356	0.9692	(94)
Useful gains	658.0010	675.5916	673.4511	633.5337	507.8171	332.2252	214.3108	226.7345	377.9779	526.4303	601.5176	639.7400	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	955.8860	924.9381	825.5010	693.7948	518.8400	332.8504	214.3530	226.8273	382.3341	582.0168	789.4699	959.2204	(97)
Space heating kWh													
	221.6264	167.5608	113.1251	43.3881	8.2011	0.0000	0.0000	0.0000	0.0000	41.3563	135.3257	237.6935	(98a)
Space heating requirement - total per year (kWh/year)												968.2769	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	221.6264	167.5608	113.1251	43.3881	8.2011	0.0000	0.0000	0.0000	0.0000	41.3563	135.3257	237.6935	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												968.2769	
Space heating per m2											(98c) / (4) =	11.1681	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement

	221.6264	167.5608	113.1251	43.3881	8.2011	0.0000	0.0000	0.0000	0.0000	41.3563	135.3257	237.6935 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	332.4397	251.3413	169.6876	65.0821	12.3016	0.0000	0.0000	0.0000	0.0000	62.0345	202.9885	356.5402
Space heating requirement												
	332.4397	251.3413	169.6876	65.0821	12.3016	0.0000	0.0000	0.0000	0.0000	62.0345	202.9885	356.5402 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388
Water heating fuel												
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446 (331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year

Space heating fuel - community heating	1452.4154 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	14.5242 (313)
Space cooling fuel	0.0000 (321)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)	
mechanical ventilation fans (SFP = 0.1292)	33.4924 (330a)
Total electricity for the above, kWh/year	33.4924 (331)
Electricity for lighting (calculated in Appendix L)	216.3282 (332)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4774.9901 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1452.4154	6.5500	95.1332	(340a)
Space heating total			95.1332	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			358.4383	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1487.9777	0.1573	60.9331	(367)
Electrical energy for heat distribution (space & water)	14.5242	0.0000	8.1007	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			224.1180	(373)
Space and water heating			224.1180	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			126.2851	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)

Space and Water heating from Heat pump	1487.9777	1.5824	612.8906 (467)
Electrical energy for heat distribution (space & water)	14.5242	0.0000	85.7626 (472)
Overall CO2 factor for heat network			0.4252 (486)
Total CO2 associated with community systems			2372.7657 (473)
Space and water heating			2372.7657 (476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673 (478)
Energy for lighting	216.3282	1.5338	331.8115 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405
PV Unit electricity exported	-520.7528	0.4449	-231.6735
Total			-1026.3140 (480)
Total Primary energy kWh/year			1728.9306 (483)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.75	**TER**	10.28
Environmental	99 A	**% DER < TER**			82.98
CO_2 Emissions (t/year)	0.12	**DFEE**	21.17	**TFEE**	25.35
Compliance Check	See BREL	**% DFEE < TFEE**			16.49
% DPER < TPER	58.73	**DPER**	22.41	**TPER**	54.30

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17650.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 203.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
12Total per year (kWh/year)												2752	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.4800	11.2829	0.7600	0.7000	0.7700	31.1149	(81)
Northwest	1.7600	11.2829	0.7600	0.7000	0.7700	7.3212	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	38.4361	78.2378	140.9596	231.4961	311.1762	331.7468	310.3423	247.4085	171.7614	95.6128	48.3625	31.3888	(83)
Total gains	623.6086	677.6503	715.1060	786.5301	838.8873	841.7455	801.4341	739.5305	678.4742	618.3659	602.1101	604.9300	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	
alpha	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	
util living area	0.9833	0.9704	0.9409	0.8436	0.6688	0.4721	0.3423	0.3875	0.6205	0.8818	0.9662	0.9860	(86)
MIT	20.3155	20.4461	20.6298	20.8539	20.9692	20.9968	20.9996	20.9992	20.9847	20.8345	20.5442	20.2789	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house	0.9795	0.9640	0.9285	0.8161	0.6265	0.4231	0.2898	0.3308	0.5647	0.8535	0.9578	0.9829	(89)
MIT 2	19.5268	19.6903	19.9167	20.1780	20.2976	20.3214	20.3233	20.3231	20.3127	20.1617	19.8147	19.4807	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.7735	19.9267	20.1398	20.3895	20.5077	20.5327	20.5348	20.5346	20.5229	20.3722	20.0429	19.7304	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7735	19.9267	20.1398	20.3895	20.5077	20.5327	20.5348	20.5346	20.5229	20.3722	20.0429	19.7304	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9758	0.9596	0.9247	0.8189	0.6382	0.4384	0.3063	0.3486	0.5815	0.8558	0.9537	0.9795	(94)
Useful gains	608.5285	650.2624	661.2796	644.1099	535.4045	368.9798	245.4403	257.7753	394.5215	529.1754	574.2577	592.5002	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	965.5972	937.7155	851.1668	716.9808	549.6284	370.2178	245.5466	258.0112	400.8127	609.8148	807.6784	969.1464	(97)
Space heating kWh	265.6591	193.1685	141.2761	52.4671	10.5826	0.0000	0.0000	0.0000	0.0000	59.9957	168.0629	280.2248	(98a)
Space heating requirement - total per year (kWh/year)												1171.4367	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	265.6591	193.1685	141.2761	52.4671	10.5826	0.0000	0.0000	0.0000	0.0000	59.9957	168.0629	280.2248	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1171.4367	
Space heating per m2											(98c) / (4) =	13.5114	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	265.6591	193.1685	141.2761	52.4671	10.5826	0.0000	0.0000	0.0000	0.0000	59.9957	168.0629	280.2248	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	398.4886	289.7527	211.9141	78.7006	15.8739	0.0000	0.0000	0.0000	0.0000	89.9936	252.0944	420.3371	
Space heating requirement	398.4886	289.7527	211.9141	78.7006	15.8739	0.0000	0.0000	0.0000	0.0000	89.9936	252.0944	420.3371	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1757.1550	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												17.5716	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5176.2558	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1569.2416	0.1570	73.5751	(367)
Electrical energy for heat distribution (space & water)	17.5716	0.0000	8.5747	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			237.2342	(373)
Space and water heating			237.2342	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			151.6593	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.7500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1569.2416	1.5813	740.9565	(467)
Electrical energy for heat distribution (space & water)	17.5716	0.0000	90.5651	(472)
Overall CO2 factor for heat network			0.4258	(486)
Total CO2 associated with community systems			2505.6341	(473)
Space and water heating			2505.6341	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1942.6908	(483)
Dwelling Primary energy Rate (DPER)			22.4100	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
Heatloss Floor 1			43.3500	0.1300	5.6355			(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1247			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E5 Ground floor (normal)	6.7700	0.1600	1.0832
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P1 Party wall - Ground floor	19.4300	0.0800	1.5544
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0424 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.1671 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	71.4535	71.2501	71.0507	70.1143	69.9391	69.1235	69.1235	68.9725	69.4377	69.9391	70.2935	70.6641	(39)
Average = Sum(39)m / 12 =												70.1135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8241	0.8218	0.8195	0.8087	0.8067	0.7973	0.7973	0.7955	0.8009	0.8067	0.8108	0.8150	(40)
HLP (average)												0.8087	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
										Total per year (kWh/year) = Sum(64)m =		2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	9.2400	11.2829	0.6300	0.7000	0.7700	31.8615	(81)

Solar gains	31.8615	64.8550	116.8481	191.8981	257.9487	275.0006	257.2574	205.0886	142.3812	79.2579	40.0900	26.0197	(83)
Total gains	610.6987	657.9322	684.6591	740.5967	779.3244	775.6640	739.0138	687.8753	639.7586	595.6757	587.5022	593.2254	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3015	70.5022	70.7000	71.6442	71.8237	72.6712	72.6712	72.8303	72.3424	71.8237	71.4616	71.0868	
alpha	5.6868	5.7001	5.7133	5.7763	5.7882	5.8447	5.8447	5.8554	5.8228	5.7882	5.7641	5.7391	
util living area													
	0.9891	0.9816	0.9653	0.9037	0.7660	0.5609	0.4102	0.4585	0.7083	0.9232	0.9781	0.9906	(86)
MIT	20.1002	20.2341	20.4354	20.7255	20.9181	20.9888	20.9985	20.9972	20.9602	20.7280	20.3835	20.0826	(87)
Th 2	20.2325	20.2345	20.2365	20.2458	20.2475	20.2557	20.2557	20.2572	20.2526	20.2475	20.2440	20.2403	(88)
util rest of house													
	0.9864	0.9772	0.9566	0.8811	0.7210	0.4994	0.3415	0.3858	0.6452	0.9002	0.9719	0.9883	(89)
MIT 2	19.1820	19.3529	19.6067	19.9647	20.1768	20.2487	20.2551	20.2560	20.2241	19.9751	19.5503	19.1658	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.4692	19.6285	19.8659	20.2027	20.4087	20.4802	20.4876	20.4878	20.4544	20.2106	19.8110	19.4526	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4692	19.6285	19.8659	20.2027	20.4087	20.4802	20.4876	20.4878	20.4544	20.2106	19.8110	19.4526	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9829	0.9727	0.9516	0.8797	0.7311	0.5182	0.3630	0.4086	0.6630	0.8989	0.9675	0.9851	(94)
Useful gains	600.2650	640.0008	651.5065	651.4839	569.7516	401.9764	268.2623	281.0472	424.1381	535.4769	568.4330	584.4028	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1083.8952	1049.4082	949.6600	792.4801	609.0781	406.4585	268.7253	281.9468	441.2316	672.1574	893.4986	1077.8119	(97)
Space heating kWh	359.8209	275.1218	221.8262	101.5173	29.2589	0.0000	0.0000	0.0000	0.0000	101.6902	234.0472	367.0963	(98a)
Space heating requirement - total per year (kWh/year)												1690.3787	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	359.8209	275.1218	221.8262	101.5173	29.2589	0.0000	0.0000	0.0000	0.0000	101.6902	234.0472	367.0963	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1690.3787	
Space heating per m2											(98c) / (4) =	19.4969	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	359.8209	275.1218	221.8262	101.5173	29.2589	0.0000	0.0000	0.0000	0.0000	101.6902	234.0472	367.0963	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	389.8384	298.0734	240.3317	109.9862	31.6998	0.0000	0.0000	0.0000	0.0000	110.1736	253.5723	397.7208	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.0244	84.7033	84.0834	82.6842	80.9056	79.8000	79.8000	79.8000	79.8000	82.6632	84.3275	85.0913	(217)
Fuel for water heating, kWh/month	274.8401	243.8732	261.0578	233.9526	232.0562	212.3443	209.9929	218.2535	220.5242	236.9480	246.3898	271.7280	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.0522	-34.0491	-51.2340	-60.3739	-67.5059	-63.8722	-63.0931	-58.3837	-50.4758	-40.1585	-25.8892	-19.7533	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.6843	-18.6438	-37.7720	-57.7989	-77.4856	-78.2579	-77.3368	-64.9856	-46.9877	-27.0053	-11.7029	-6.8394	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1831.3962	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2861.9606	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1071.3411	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3932.3940	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1831.3962	0.2100	384.5932	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2861.9606	0.2100	601.0117	(264)
Space and water heating			985.6049	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	0.1336	-74.5440	
PV Unit electricity exported	-513.5003	0.1254	-64.3679	
Total			-138.9120	(269)
Total CO2, kg/year			891.0069	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.2800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1831.3962	1.1300	2069.4777	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2861.9606	1.1300	3234.0155	(278)
Space and water heating			5303.4933	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	1.4938	-833.3127	
PV Unit electricity exported	-513.5003	0.4601	-236.2611	
Total			-1069.5738	(283)
Total Primary energy kWh/year			4708.1791	(286)
Target Primary Energy Rate (TPER)			54.3000	(287)

Full SAP Calculation Printout

elmhurst energy

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.75	**TER**	10.28
Environmental	99 A	**% DER < TER**			82.98
CO_2 Emissions (t/year)	0.12	**DFEE**	21.17	**TFEE**	25.35
Compliance Check	See BREL	**% DFEE < TFEE**			16.49
% DPER < TPER	58.73	**DPER**	22.41	**TPER**	54.30

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		3 * 10 =	30.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1412	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.2912	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2257	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2878	0.2821	0.2765	0.2483	0.2426	0.2144	0.2144	0.2088	0.2257	0.2426	0.2539	0.2652	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5414	0.5398	0.5382	0.5308	0.5294	0.5230	0.5230	0.5218	0.5255	0.5294	0.5322	0.5352	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		18083.8300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							208.5794	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9510	37.8383	37.7278	37.2089	37.1118	36.6599	36.6599	36.5762	36.8339	37.1118	37.3082	37.5135	(38)
Heat transfer coeff	65.3058	65.1931	65.0826	64.5637	64.4666	64.0147	64.0147	63.9310	64.1888	64.4666	64.6630	64.8684	(39)
Average = Sum(39)m / 12 =												64.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7532	0.7519	0.7507	0.7447	0.7436	0.7383	0.7383	0.7374	0.7404	0.7436	0.7458	0.7482	(40)
HLP (average)												0.7447	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =					614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.4800	11.2829	0.7600	0.7000	0.7700	31.1149	(81)
Northwest	1.7600	11.2829	0.7600	0.7000	0.7700	7.3212	(81)

Solar gains	38.4361	78.2378	140.9596	231.4961	311.1762	331.7468	310.3423	247.4085	171.7614	95.6128	48.3625	31.3888	(83)
Total gains	516.6645	571.9626	612.3192	690.7385	747.2108	754.4150	717.0745	653.1903	589.7415	524.7848	501.8521	498.9376	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.9194	77.0524	77.1832	77.8035	77.9207	78.4708	78.4708	78.5736	78.2580	77.9207	77.6840	77.4381	
alpha	6.1280	6.1368	6.1455	6.1869	6.1947	6.2314	6.2314	6.2382	6.2172	6.1947	6.1789	6.1625	
util living area	0.9946	0.9889	0.9742	0.9079	0.7514	0.5375	0.3921	0.4485	0.7149	0.9425	0.9878	0.9956	(86)

MIT	20.1050	20.2487	20.4610	20.7604	20.9407	20.9934	20.9992	20.9983	20.9669	20.7265	20.3734	20.0786	(87)
Th 2	20.2940	20.2952	20.2963	20.3015	20.3025	20.3071	20.3071	20.3079	20.3053	20.3025	20.3005	20.2985	(88)
util rest of house	0.9932	0.9861	0.9676	0.8867	0.7080	0.4815	0.3307	0.3819	0.6551	0.9243	0.9842	0.9945	(89)
MIT 2	19.4695	19.6127	19.8221	20.1093	20.2628	20.3039	20.3068	20.3073	20.2867	20.0841	19.7414	19.4469	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.6683	19.8117	20.0219	20.3129	20.4749	20.5196	20.5234	20.5235	20.4994	20.2851	19.9391	19.6445	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6683	19.8117	20.0219	20.3129	20.4749	20.5196	20.5234	20.5235	20.4994	20.2851	19.9391	19.6445	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9916	0.9838	0.9646	0.8871	0.7191	0.4988	0.3499	0.4027	0.6724	0.9238	0.9819	0.9931	(94)
Useful gains	512.3407	562.6691	590.6481	612.7361	537.3508	376.3383	250.9194	263.0685	396.5687	484.8014	492.7573	495.5027	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1003.6372	972.1378	880.0433	736.8622	565.6855	378.9390	251.1559	263.6166	410.7727	624.3641	830.2160	1001.8609	(97)
Space heating kWh	365.5246	275.1630	215.3100	89.3708	21.0810	0.0000	0.0000	0.0000	0.0000	103.8347	242.9703	376.7305	(98a)
Space heating requirement - total per year (kWh/year)												1689.9849	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	365.5246	275.1630	215.3100	89.3708	21.0810	0.0000	0.0000	0.0000	0.0000	103.8347	242.9703	376.7305	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1689.9849	
Space heating per m2											(98c) / (4) =	19.4923	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	601.7381	473.7088	485.8756	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9561	0.9816	0.9673	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	575.3518	465.0010	470.0086	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	817.6695	777.0574	705.1508	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	174.4687	232.1699	174.9458	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	43.6172	58.0425	43.7365	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												145.3961	(107)
Energy for space heating												19.4923	(99)
Energy for space cooling												1.6770	(108)
Total												21.1693	(109)
Fabric Energy Efficiency (DFEE)												21.2	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
Heatloss Floor 1			43.3500	0.1300	5.6355			(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1247			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	6.2700	0.0500	0.3135
E2 Other lintels (including other steel lintels)	2.5200	0.0500	0.1260
E3 Sill	20.7200	0.0500	1.0360
E4 Jamb	13.5400	0.0000	0.0000
E6 Intermediate floor within a dwelling	6.7700	0.1600	1.0832
E5 Ground floor (normal)	22.0000	0.0600	1.3200
E18 Party wall between dwellings	12.6600	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	19.4300	0.0800	1.5544
P1 Party wall - Ground floor	6.7700	0.0200	0.1354
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0700	0.4739
E7 Party floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0424 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.1671 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	71.4535	71.2501	71.0507	70.1143	69.9391	69.1235	69.1235	68.9725	69.4377	69.9391	70.2935	70.6641	(39)
Average = Sum(39)m / 12 =												70.1135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8241	0.8218	0.8195	0.8087	0.8067	0.7973	0.7973	0.7955	0.8009	0.8067	0.8108	0.8150	(40)
HLP (average)												0.8087	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains													
	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	9.2400	11.2829	0.6300	0.7000	0.7700	31.8615	(81)

Solar gains	31.8615	64.8550	116.8481	191.8981	257.9487	275.0006	257.2574	205.0886	142.3812	79.2579	40.0900	26.0197	(83)
Total gains	510.0899	558.5798	588.2077	651.1405	693.9833	697.6688	663.9896	610.8704	560.3613	508.4300	493.5796	493.5684	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3015	70.5022	70.7000	71.6442	71.8237	72.6712	72.6712	72.8303	72.3424	71.8237	71.4616	71.0868	
alpha	5.6868	5.7001	5.7133	5.7763	5.7882	5.8447	5.8447	5.8554	5.8228	5.7882	5.7641	5.7391	
util living area													
	0.9954	0.9914	0.9821	0.9395	0.8237	0.6172	0.4555	0.5139	0.7792	0.9585	0.9902	0.9962	(86)
MIT	19.9532	20.0935	20.3082	20.6374	20.8792	20.9818	20.9973	20.9949	20.9348	20.6320	20.2521	19.9358	(87)
Th 2	20.2325	20.2345	20.2365	20.2458	20.2475	20.2557	20.2557	20.2572	20.2526	20.2475	20.2440	20.2403	(88)
util rest of house													
	0.9942	0.9892	0.9772	0.9231	0.7824	0.5518	0.3797	0.4336	0.7181	0.9439	0.9873	0.9952	(89)
MIT 2	19.2684	19.4094	19.6232	19.9479	20.1634	20.2466	20.2548	20.2554	20.2145	19.9488	19.5752	19.2575	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.4826	19.6234	19.8375	20.1636	20.3873	20.4766	20.4871	20.4867	20.4398	20.1625	19.7869	19.4697	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4826	19.6234	19.8375	20.1636	20.3873	20.4766	20.4871	20.4867	20.4398	20.1625	19.7869	19.4697	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9927	0.9869	0.9741	0.9211	0.7906	0.5717	0.4034	0.4587	0.7344	0.9419	0.9850	0.9939	(94)
Useful gains	506.3670	551.2829	572.9584	599.7604	548.6434	398.8371	267.8803	280.2250	411.5341	478.8976	486.1605	490.5445	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1084.8524	1049.0418	947.6380	789.7370	607.5835	406.2094	268.6902	281.8719	440.2191	668.7944	891.8096	1079.0183	(97)
Space heating kWh													
	430.3931	334.4939	278.7616	136.7831	43.8514	0.0000	0.0000	0.0000	0.0000	141.2832	292.0673	437.8245	(98a)
Space heating requirement - total per year (kWh/year)												2095.4582	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	430.3931	334.4939	278.7616	136.7831	43.8514	0.0000	0.0000	0.0000	0.0000	141.2832	292.0673	437.8245	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2095.4582	
Space heating per m2											(98c) / (4) =	24.1691	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	649.7609	511.5139	524.1907	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9082	0.9553	0.9311	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	590.1016	488.6471	488.0516	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	751.3428	715.0101	655.6860	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	116.0937	168.4141	124.7200	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	29.0234	42.1035	31.1800	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												102.3069	(107)
Energy for space heating												24.1691	(99)
Energy for space cooling												1.1800	(108)
Total												25.3491	(109)
Fabric Energy Efficiency (TFEE)												25.3	(109)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.75	**TER**	10.28
Environmental	99 A	**% DER < TER**			82.98
CO_2 Emissions (t/year)	0.12	**DFEE**	21.17	**TFEE**	25.35
Compliance Check	See BREL	**% DFEE < TFEE**			16.49
% DPER < TPER	58.73	**DPER**	22.41	**TPER**	54.30

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17650.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 203.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
12Total per year (kWh/year)												2752	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.4800	11.2829	0.7600	0.7000	0.7700	31.1149	(81)
Northwest	1.7600	11.2829	0.7600	0.7000	0.7700	7.3212	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	38.4361	78.2378	140.9596	231.4961	311.1762	331.7468	310.3423	247.4085	171.7614	95.6128	48.3625	31.3888	(83)
Total gains	623.6086	677.6503	715.1060	786.5301	838.8873	841.7455	801.4341	739.5305	678.4742	618.3659	602.1101	604.9300	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	
alpha	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	
util living area	0.9833	0.9704	0.9409	0.8436	0.6688	0.4721	0.3423	0.3875	0.6205	0.8818	0.9662	0.9860	(86)
MIT	20.3155	20.4461	20.6298	20.8539	20.9692	20.9968	20.9996	20.9992	20.9847	20.8345	20.5442	20.2789	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house	0.9795	0.9640	0.9285	0.8161	0.6265	0.4231	0.2898	0.3308	0.5647	0.8535	0.9578	0.9829	(89)
MIT 2	19.5268	19.6903	19.9167	20.1780	20.2976	20.3214	20.3233	20.3231	20.3127	20.1617	19.8147	19.4807	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.7735	19.9267	20.1398	20.3895	20.5077	20.5327	20.5348	20.5346	20.5229	20.3722	20.0429	19.7304	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7735	19.9267	20.1398	20.3895	20.5077	20.5327	20.5348	20.5346	20.5229	20.3722	20.0429	19.7304	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9758	0.9596	0.9247	0.8189	0.6382	0.4384	0.3063	0.3486	0.5815	0.8558	0.9537	0.9795	(94)
Useful gains	608.5285	650.2624	661.2796	644.1099	535.4045	368.9798	245.4403	257.7753	394.5215	529.1754	574.2577	592.5002	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	965.5972	937.7155	851.1668	716.9808	549.6284	370.2178	245.5466	258.0112	400.8127	609.8148	807.6784	969.1464	(97)
Space heating kWh	265.6591	193.1685	141.2761	52.4671	10.5826	0.0000	0.0000	0.0000	0.0000	59.9957	168.0629	280.2248	(98a)
Space heating requirement - total per year (kWh/year)												1171.4367	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	265.6591	193.1685	141.2761	52.4671	10.5826	0.0000	0.0000	0.0000	0.0000	59.9957	168.0629	280.2248	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1171.4367	
Space heating per m2											(98c) / (4) =	13.5114	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	265.6591	193.1685	141.2761	52.4671	10.5826	0.0000	0.0000	0.0000	0.0000	59.9957	168.0629	280.2248	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	398.4886	289.7527	211.9141	78.7006	15.8739	0.0000	0.0000	0.0000	0.0000	89.9936	252.0944	420.3371	
Space heating requirement	398.4886	289.7527	211.9141	78.7006	15.8739	0.0000	0.0000	0.0000	0.0000	89.9936	252.0944	420.3371	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1757.1550	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												17.5716	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5176.2558	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1569.2416	0.1570	73.5751	(367)
Electrical energy for heat distribution (space & water)	17.5716	0.0000	8.5747	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			237.2342	(373)
Space and water heating			237.2342	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			151.6593	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.7500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1569.2416	1.5813	740.9565	(467)
Electrical energy for heat distribution (space & water)	17.5716	0.0000	90.5651	(472)
Overall CO2 factor for heat network			0.4258	(486)
Total CO2 associated with community systems			2505.6341	(473)
Space and water heating			2505.6341	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1942.6908	(483)
Dwelling Primary energy Rate (DPER)			22.4100	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
Heatloss Floor 1			43.3500	0.1300	5.6355			(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1247			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E5 Ground floor (normal)	6.7700	0.1600	1.0832
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P1 Party wall - Ground floor	19.4300	0.0800	1.5544
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0424 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.1671 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	71.4535	71.2501	71.0507	70.1143	69.9391	69.1235	69.1235	68.9725	69.4377	69.9391	70.2935	70.6641	(39)
Average = Sum(39)m / 12 =												70.1135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8241	0.8218	0.8195	0.8087	0.8067	0.7973	0.7973	0.7955	0.8009	0.8067	0.8108	0.8150	(40)
HLP (average)												0.8087	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
										Total per year (kWh/year) = Sum(64)m =		2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	9.2400	11.2829	0.6300	0.7000	0.7700	31.8615	(81)

Solar gains	31.8615	64.8550	116.8481	191.8981	257.9487	275.0006	257.2574	205.0886	142.3812	79.2579	40.0900	26.0197	(83)
Total gains	610.6987	657.9322	684.6591	740.5967	779.3244	775.6640	739.0138	687.8753	639.7586	595.6757	587.5022	593.2254	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3015	70.5022	70.7000	71.6442	71.8237	72.6712	72.6712	72.8303	72.3424	71.8237	71.4616	71.0868	
alpha	5.6868	5.7001	5.7133	5.7763	5.7882	5.8447	5.8447	5.8554	5.8228	5.7882	5.7641	5.7391	
util living area													
	0.9891	0.9816	0.9653	0.9037	0.7660	0.5609	0.4102	0.4585	0.7083	0.9232	0.9781	0.9906	(86)
MIT	20.1002	20.2341	20.4354	20.7255	20.9181	20.9888	20.9985	20.9972	20.9602	20.7280	20.3835	20.0826	(87)
Th 2	20.2325	20.2345	20.2365	20.2458	20.2475	20.2557	20.2557	20.2572	20.2526	20.2475	20.2440	20.2403	(88)
util rest of house													
	0.9864	0.9772	0.9566	0.8811	0.7210	0.4994	0.3415	0.3858	0.6452	0.9002	0.9719	0.9883	(89)
MIT 2	19.1820	19.3529	19.6067	19.9647	20.1768	20.2487	20.2551	20.2560	20.2241	19.9751	19.5503	19.1658	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.4692	19.6285	19.8659	20.2027	20.4087	20.4802	20.4876	20.4878	20.4544	20.2106	19.8110	19.4526	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4692	19.6285	19.8659	20.2027	20.4087	20.4802	20.4876	20.4878	20.4544	20.2106	19.8110	19.4526	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9829	0.9727	0.9516	0.8797	0.7311	0.5182	0.3630	0.4086	0.6630	0.8989	0.9675	0.9851	(94)
Useful gains	600.2650	640.0008	651.5065	651.4839	569.7516	401.9764	268.2623	281.0472	424.1381	535.4769	568.4330	584.4028	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1083.8952	1049.4082	949.6600	792.4801	609.0781	406.4585	268.7253	281.9468	441.2316	672.1574	893.4986	1077.8119	(97)
Space heating kWh	359.8209	275.1218	221.8262	101.5173	29.2589	0.0000	0.0000	0.0000	0.0000	101.6902	234.0472	367.0963	(98a)
Space heating requirement - total per year (kWh/year)												1690.3787	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	359.8209	275.1218	221.8262	101.5173	29.2589	0.0000	0.0000	0.0000	0.0000	101.6902	234.0472	367.0963	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1690.3787	
Space heating per m2											(98c) / (4) =	19.4969	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	359.8209	275.1218	221.8262	101.5173	29.2589	0.0000	0.0000	0.0000	0.0000	101.6902	234.0472	367.0963	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	389.8384	298.0734	240.3317	109.9862	31.6998	0.0000	0.0000	0.0000	0.0000	110.1736	253.5723	397.7208	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.0244	84.7033	84.0834	82.6842	80.9056	79.8000	79.8000	79.8000	79.8000	82.6632	84.3275	85.0913	(217)
Fuel for water heating, kWh/month	274.8401	243.8732	261.0578	233.9526	232.0562	212.3443	209.9929	218.2535	220.5242	236.9480	246.3898	271.7280	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.0522	-34.0491	-51.2340	-60.3739	-67.5059	-63.8722	-63.0931	-58.3837	-50.4758	-40.1585	-25.8892	-19.7533	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.6843	-18.6438	-37.7720	-57.7989	-77.4856	-78.2579	-77.3368	-64.9856	-46.9877	-27.0053	-11.7029	-6.8394	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1831.3962	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2861.9606	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1071.3411	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3932.3940	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1831.3962	0.2100	384.5932	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2861.9606	0.2100	601.0117	(264)
Space and water heating			985.6049	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	0.1336	-74.5440	
PV Unit electricity exported	-513.5003	0.1254	-64.3679	
Total			-138.9120	(269)
Total CO2, kg/year			891.0069	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.2800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1831.3962	1.1300	2069.4777	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2861.9606	1.1300	3234.0155	(278)
Space and water heating			5303.4933	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	1.4938	-833.3127	
PV Unit electricity exported	-513.5003	0.4601	-236.2611	
Total			-1069.5738	(283)
Total Primary energy kWh/year			4708.1791	(286)
Target Primary Energy Rate (TPER)			54.3000	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.75	**TER**	10.28
Environmental	99 A	**% DER < TER**			82.98
CO_2 Emissions (t/year)	0.12	**DFEE**	21.17	**TFEE**	25.35
Compliance Check	See BREL	**% DFEE < TFEE**			16.49
% DPER < TPER	58.73	**DPER**	22.41	**TPER**	54.30

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.4800	11.2829	0.7600	0.7000	0.7700	31.1149	(81)
Northwest	1.7600	11.2829	0.7600	0.7000	0.7700	7.3212	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	38.4361	78.2378	140.9596	231.4961	311.1762	331.7468	310.3423	247.4085	171.7614	95.6128	48.3625	31.3888	(83)
Total gains	678.0599	715.5316	759.2448	814.4498	858.9788	847.8517	807.7907	748.1209	690.6831	646.7939	638.3664	655.1716	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area													
	0.9764	0.9639	0.9274	0.8294	0.6565	0.4690	0.3397	0.3832	0.6115	0.8657	0.9581	0.9806	(86)
MIT	20.4056	20.5074	20.6861	20.8756	20.9743	20.9973	20.9997	20.9994	20.9871	20.8607	20.6000	20.3652	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house													
	0.9712	0.9562	0.9128	0.8005	0.6142	0.4203	0.2876	0.3271	0.5559	0.8351	0.9480	0.9763	(89)
MIT 2	19.6384	19.7650	19.9831	20.2012	20.3022	20.3217	20.3233	20.3231	20.3146	20.1897	19.8819	19.5879	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8784	19.9972	20.2030	20.4122	20.5124	20.5330	20.5349	20.5347	20.5249	20.3996	20.1065	19.8311	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8784	19.9972	20.2030	20.4122	20.5124	20.5330	20.5349	20.5347	20.5249	20.3996	20.1065	19.8311	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9672	0.9519	0.9099	0.8045	0.6262	0.4354	0.3039	0.3446	0.5727	0.8389	0.9442	0.9725	(94)
Useful gains	655.7966	681.1371	690.8226	655.2217	537.9059	369.1706	245.4621	257.8244	395.5660	542.5651	602.7527	637.1389	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	972.1424	942.1177	855.1113	718.3975	549.9250	370.2405	245.5492	258.0170	400.9364	611.5297	811.6507	975.4302	(97)
Space heating kWh													
	235.3613	175.3789	122.2307	45.4865	8.9422	0.0000	0.0000	0.0000	0.0000	51.3096	150.4066	251.6887	(98a)
Space heating requirement - total per year (kWh/year)												1040.8047	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	235.3613	175.3789	122.2307	45.4865	8.9422	0.0000	0.0000	0.0000	0.0000	51.3096	150.4066	251.6887	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1040.8047	
Space heating per m2											(98c) / (4) =	12.0047	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	235.3613	175.3789	122.2307	45.4865	8.9422	0.0000	0.0000	0.0000	0.0000	51.3096	150.4066	251.6887	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	353.0419	263.0684	183.3461	68.2298	13.4133	0.0000	0.0000	0.0000	0.0000	76.9644	225.6099	377.5331	
Space heating requirement													
	353.0419	263.0684	183.3461	68.2298	13.4133	0.0000	0.0000	0.0000	0.0000	76.9644	225.6099	377.5331	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1561.2070	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												15.6121	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4980.3078	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1561.2070	4.4400	69.3176	(340a)
Space heating total			69.3176	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			277.9086	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7597 (357)
SAP value		87.6859
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1516.9888	0.1571	65.4102	(367)
Electrical energy for heat distribution (space & water)	15.6121	0.0000	8.2685	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			228.7631	(373)
Space and water heating			228.7631	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			143.1882	(383)
CO2 emissions per m2			1.6500	(384)
EI value			98.5431	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			3.0000 (17)
Infiltration rate			0.1500 (18)
Number of sides sheltered			3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7750 (20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)

Average = Sum(39)m / 12 = 62.4033

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)

Total per year (kWh/year) = Sum(64)m = 2751.6674 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.4800	13.7758	0.7600	0.7000	0.7700	37.9894	(81)
Northwest	1.7600	13.7758	0.7600	0.7000	0.7700	8.9387	(81)

Solar gains	46.9281	85.4061	152.2932	252.8092	326.2339	372.2643	342.0586	278.9737	195.9553	110.3656	58.2773	38.4694	(83)
Total gains	686.5519	722.6999	770.5784	835.7629	874.0366	888.3692	839.5070	779.6862	714.8770	661.5468	648.2812	662.2521	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area													
	0.9726	0.9589	0.9121	0.7995	0.6158	0.4066	0.2898	0.3280	0.5687	0.8330	0.9491	0.9776	(86)
MIT	20.4438	20.5418	20.7329	20.9032	20.9829	20.9989	20.9999	20.9998	20.9917	20.8956	20.6448	20.4023	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house													
	0.9667	0.9502	0.8948	0.7677	0.5723	0.3595	0.2396	0.2739	0.5133	0.7974	0.9369	0.9727	(89)
MIT 2	19.6863	19.8076	20.0386	20.2306	20.3098	20.3228	20.3234	20.3233	20.3180	20.2270	19.9365	19.6346	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9232	20.0373	20.2558	20.4410	20.5204	20.5343	20.5350	20.5349	20.5287	20.4361	20.1581	19.8747	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9232	20.0373	20.2558	20.4410	20.5204	20.5343	20.5350	20.5349	20.5287	20.4361	20.1581	19.8747	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9625	0.9460	0.8929	0.7735	0.5851	0.3743	0.2553	0.2908	0.5303	0.8037	0.9335	0.9687	(94)
Useful gains	660.8190	683.6528	688.0334	646.4592	511.3965	332.4745	214.3281	226.7692	379.1040	531.6722	605.1917	641.5340	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	956.2212	925.8952	827.2043	695.2337	519.2188	332.8768	214.3550	226.8312	382.4530	582.6043	789.9045	959.4338	(97)
Space heating kWh													
	219.7792	162.7869	103.5432	35.1176	5.8198	0.0000	0.0000	0.0000	0.0000	37.8935	132.9932	236.5174	(98a)
Space heating requirement - total per year (kWh/year)												934.4507	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	219.7792	162.7869	103.5432	35.1176	5.8198	0.0000	0.0000	0.0000	0.0000	37.8935	132.9932	236.5174	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												934.4507	
Space heating per m2											(98c) / (4) =	10.7780	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	219.7792	162.7869	103.5432	35.1176	5.8198	0.0000	0.0000	0.0000	0.0000	37.8935	132.9932	236.5174	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	329.6688	244.1804	155.3147	52.6764	8.7296	0.0000	0.0000	0.0000	0.0000	56.8402	199.4898	354.7761	
Space heating requirement													
	329.6688	244.1804	155.3147	52.6764	8.7296	0.0000	0.0000	0.0000	0.0000	56.8402	199.4898	354.7761	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)

Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year	
Space heating fuel - community heating	1401.6761 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	14.0168 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)	
mechanical ventilation fans (SFP = 0.1292)	33.4924 (330a)
Total electricity for the above, kWh/year	33.4924 (331)
Electricity for lighting (calculated in Appendix L)	216.3282 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4724.2508 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1401.6761	6.5500	91.8098	(340a)
Space heating total			91.8098	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			355.1148	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1474.4472	0.1576	58.9159	(367)
Electrical energy for heat distribution (space & water)	14.0168	0.0000	8.0250	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			222.0253	(373)
Space and water heating			222.0253	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			124.1923	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1474.4472	1.5835	591.8858	(467)
Electrical energy for heat distribution (space & water)	14.0168	0.0000	84.9749	(472)
Overall CO2 factor for heat network			0.4252	(486)
Total CO2 associated with community systems			2350.9733	(473)
Space and water heating			2350.9733	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1707.1382	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Southeast

Current energy efficiency rating: B 88
Current environmental impact rating: A 99

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£71	£71	£0
Community scheme	£466	£466	£0
Space heating	£205	£205	£0
Water heating	£270	£270	£0
Lighting	£62	£62	£0
Generated (PV)	-£182	-£182	£0
Total cost of fuels	£355	£355	£0
Total cost of uses	£355	£355	£0
Delivered energy	54 kWh/m²	54 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	20 kWh/m²	20 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5778 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day)	126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	

Distribution loss (46)m = 0.15 x (45)m

32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss / Combi loss

Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS / PV diverter / Solar input / FGHRS

Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
									Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.4800	11.2829	0.7600	0.7000	0.7700	31.1149	(81)
Northwest	1.7600	11.2829	0.7600	0.7000	0.7700	7.3212	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	38.4361	78.2378	140.9596	231.4961	311.1762	331.7468	310.3423	247.4085	171.7614	95.6128	48.3625	31.3888	(83)
Total gains	678.0599	715.5316	759.2448	814.4498	858.9788	847.8517	807.7907	748.1209	690.6831	646.7939	638.3664	655.1716	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area	0.9764	0.9639	0.9274	0.8294	0.6565	0.4690	0.3397	0.3832	0.6115	0.8657	0.9581	0.9806	(86)
MIT	20.4056	20.5074	20.6861	20.8756	20.9743	20.9973	20.9997	20.9994	20.9871	20.8607	20.6000	20.3652	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house	0.9712	0.9562	0.9128	0.8005	0.6142	0.4203	0.2876	0.3271	0.5559	0.8351	0.9480	0.9763	(89)
MIT 2	19.6384	19.7650	19.9831	20.2012	20.3022	20.3217	20.3233	20.3231	20.3146	20.1897	19.8819	19.5879	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.8784	19.9972	20.2030	20.4122	20.5124	20.5330	20.5349	20.5347	20.5249	20.3996	20.1065	19.8311	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8784	19.9972	20.2030	20.4122	20.5124	20.5330	20.5349	20.5347	20.5249	20.3996	20.1065	19.8311	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9672	0.9519	0.9099	0.8045	0.6262	0.4354	0.3039	0.3446	0.5727	0.8389	0.9442	0.9725	(94)
Useful gains	655.7966	681.1371	690.8226	655.2217	537.9059	369.1706	245.4621	257.8244	395.5660	542.5651	602.7527	637.1389	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	972.1424	942.1177	855.1113	718.3975	549.9250	370.2405	245.5492	258.0170	400.9364	611.5297	811.6507	975.4302	(97)
Space heating kWh	235.3613	175.3789	122.2307	45.4865	8.9422	0.0000	0.0000	0.0000	0.0000	51.3096	150.4066	251.6887	(98a)
Space heating requirement - total per year (kWh/year)												1040.8047	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	235.3613	175.3789	122.2307	45.4865	8.9422	0.0000	0.0000	0.0000	0.0000	51.3096	150.4066	251.6887	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1040.8047	
Space heating per m2										(98c) / (4) =		12.0047	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	235.3613	175.3789	122.2307	45.4865	8.9422	0.0000	0.0000	0.0000	0.0000	51.3096	150.4066	251.6887	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	353.0419	263.0684	183.3461	68.2298	13.4133	0.0000	0.0000	0.0000	0.0000	76.9644	225.6099	377.5331	
Space heating requirement	353.0419	263.0684	183.3461	68.2298	13.4133	0.0000	0.0000	0.0000	0.0000	76.9644	225.6099	377.5331	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1561.2070	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)

Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	15.6121	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4980.3078	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1561.2070	4.4400	69.3176	(340a)
Space heating total			69.3176	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			277.9086	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.7597	(357)
SAP value	87.6859	
SAP rating (Section 12)	88	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1516.9888	0.1571	65.4102	(367)
Electrical energy for heat distribution (space & water)	15.6121	0.0000	8.2685	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			228.7631	(373)
Space and water heating			228.7631	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			143.1882	(383)
CO2 emissions per m2			1.6500	(384)
EI value			98.5431	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 86.7000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5778	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.4800	13.7758	0.7600	0.7000	0.7700	37.9894	(81)
Northwest	1.7600	13.7758	0.7600	0.7000	0.7700	8.9387	(81)

Solar gains	46.9281	85.4061	152.2932	252.8092	326.2339	372.2643	342.0586	278.9737	195.9553	110.3656	58.2773	38.4694	(83)
Total gains	686.5519	722.6999	770.5784	835.7629	874.0366	888.3692	839.5070	779.6862	714.8770	661.5468	648.2812	662.2521	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area													
	0.9726	0.9589	0.9121	0.7995	0.6158	0.4066	0.2898	0.3280	0.5687	0.8330	0.9491	0.9776	(86)
MIT	20.4438	20.5418	20.7329	20.9032	20.9829	20.9989	20.9999	20.9998	20.9917	20.8956	20.6448	20.4023	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house													
	0.9667	0.9502	0.8948	0.7677	0.5723	0.3595	0.2396	0.2739	0.5133	0.7974	0.9369	0.9727	(89)
MIT 2	19.6863	19.8076	20.0386	20.2306	20.3098	20.3228	20.3234	20.3233	20.3180	20.2270	19.9365	19.6346	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9232	20.0373	20.2558	20.4410	20.5204	20.5343	20.5350	20.5349	20.5287	20.4361	20.1581	19.8747	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9232	20.0373	20.2558	20.4410	20.5204	20.5343	20.5350	20.5349	20.5287	20.4361	20.1581	19.8747	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9625	0.9460	0.8929	0.7735	0.5851	0.3743	0.2553	0.2908	0.5303	0.8037	0.9335	0.9687	(94)
Useful gains	660.8190	683.6528	688.0334	646.4592	511.3965	332.4745	214.3281	226.7692	379.1040	531.6722	605.1917	641.5340	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	956.2212	925.8952	827.2043	695.2337	519.2188	332.8768	214.3550	226.8312	382.4530	582.6043	789.9045	959.4338	(97)
Space heating kWh													
	219.7792	162.7869	103.5432	35.1176	5.8198	0.0000	0.0000	0.0000	0.0000	37.8935	132.9932	236.5174	(98a)
Space heating requirement - total per year (kWh/year)												934.4507	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	219.7792	162.7869	103.5432	35.1176	5.8198	0.0000	0.0000	0.0000	0.0000	37.8935	132.9932	236.5174	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												934.4507	
Space heating per m2											(98c) / (4) =	10.7780	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement													
	219.7792	162.7869	103.5432	35.1176	5.8198	0.0000	0.0000	0.0000	0.0000	37.8935	132.9932	236.5174	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	329.6688	244.1804	155.3147	52.6764	8.7296	0.0000	0.0000	0.0000	0.0000	56.8402	199.4898	354.7761	
Space heating requirement													
	329.6688	244.1804	155.3147	52.6764	8.7296	0.0000	0.0000	0.0000	0.0000	56.8402	199.4898	354.7761	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1401.6761	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												14.0168	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1054.7470	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4724.2508	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1401.6761	6.5500	91.8098	(340a)
Space heating total			91.8098	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			355.1148	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1474.4472	0.1576	58.9159	(367)
Electrical energy for heat distribution (space & water)	14.0168	0.0000	8.0250	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			222.0253	(373)
Space and water heating			222.0253	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			124.1923	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)

Space and Water heating from Heat pump	1474.4472	1.5835	591.8858	(467)
Electrical energy for heat distribution (space & water)	14.0168	0.0000	84.9749	(472)
Overall CO2 factor for heat network			0.4252	(486)
Total CO2 associated with community systems			2350.9733	(473)
Space and water heating			2350.9733	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1707.1382	(483)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.75	**TER**	10.28
Environmental	99 A	**% DER < TER**			82.98
CO_2 Emissions (t/year)	0.12	**DFEE**	21.17	**TFEE**	25.35
Compliance Check	See BREL	**% DFEE < TFEE**			16.49
% DPER < TPER	58.73	**DPER**	22.41	**TPER**	54.30

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17650.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 203.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674 (64)
12Total per year (kWh/year)												2752 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.4800	11.2829	0.7600	0.7000	0.7700	31.1149	(75)
Northeast	1.7600	11.2829	0.7600	0.7000	0.7700	7.3212	(75)

Solar gains	38.4361	78.2378	140.9596	231.4961	311.1762	331.7468	310.3423	247.4085	171.7614	95.6128	48.3625	31.3888 (83)
Total gains	623.6086	677.6503	715.1060	786.5301	838.8873	841.7455	801.4341	739.5305	678.4742	618.3659	602.1101	604.9300 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	
alpha	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	
util living area	0.9833	0.9704	0.9409	0.8436	0.6688	0.4721	0.3423	0.3875	0.6205	0.8818	0.9662	0.9860	(86)
MIT	20.3155	20.4461	20.6298	20.8539	20.9692	20.9968	20.9996	20.9992	20.9847	20.8345	20.5442	20.2789	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house	0.9795	0.9640	0.9285	0.8161	0.6265	0.4231	0.2898	0.3308	0.5647	0.8535	0.9578	0.9829	(89)
MIT 2	19.5268	19.6903	19.9167	20.1780	20.2976	20.3214	20.3233	20.3231	20.3127	20.1617	19.8147	19.4807	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.7735	19.9267	20.1398	20.3895	20.5077	20.5327	20.5348	20.5346	20.5229	20.3722	20.0429	19.7304	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7735	19.9267	20.1398	20.3895	20.5077	20.5327	20.5348	20.5346	20.5229	20.3722	20.0429	19.7304	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9758	0.9596	0.9247	0.8189	0.6382	0.4384	0.3063	0.3486	0.5815	0.8558	0.9537	0.9795	(94)
Useful gains	608.5285	650.2624	661.2796	644.1099	535.4045	368.9798	245.4403	257.7753	394.5215	529.1754	574.2577	592.5002	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	965.5972	937.7155	851.1668	716.9808	549.6284	370.2178	245.5466	258.0112	400.8127	609.8148	807.6784	969.1464	(97)
Space heating kWh	265.6591	193.1685	141.2761	52.4671	10.5826	0.0000	0.0000	0.0000	0.0000	59.9957	168.0629	280.2248	(98a)
Space heating requirement - total per year (kWh/year)												1171.4367	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	265.6591	193.1685	141.2761	52.4671	10.5826	0.0000	0.0000	0.0000	0.0000	59.9957	168.0629	280.2248	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1171.4367	
Space heating per m2											(98c) / (4) =	13.5114	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	265.6591	193.1685	141.2761	52.4671	10.5826	0.0000	0.0000	0.0000	0.0000	59.9957	168.0629	280.2248	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	398.4886	289.7527	211.9141	78.7006	15.8739	0.0000	0.0000	0.0000	0.0000	89.9936	252.0944	420.3371	
Space heating requirement	398.4886	289.7527	211.9141	78.7006	15.8739	0.0000	0.0000	0.0000	0.0000	89.9936	252.0944	420.3371	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1757.1550	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												17.5716	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5176.2558	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1569.2416	0.1570	73.5751	(367)
Electrical energy for heat distribution (space & water)	17.5716	0.0000	8.5747	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			237.2342	(373)
Space and water heating			237.2342	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			151.6593	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.7500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1569.2416	1.5813	740.9565	(467)
Electrical energy for heat distribution (space & water)	17.5716	0.0000	90.5651	(472)
Overall CO2 factor for heat network			0.4258	(486)
Total CO2 associated with community systems			2505.6341	(473)
Space and water heating			2505.6341	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1942.6908	(483)
Dwelling Primary energy Rate (DPER)			22.4100	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
Heatloss Floor 1			43.3500	0.1300	5.6355			(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1247			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E5 Ground floor (normal)	6.7700	0.1600	1.0832
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P1 Party wall - Ground floor	19.4300	0.0800	1.5544
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0424 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.1671 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	71.4535	71.2501	71.0507	70.1143	69.9391	69.1235	69.1235	68.9725	69.4377	69.9391	70.2935	70.6641	(39)
Average = Sum(39)m / 12 =												70.1135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8241	0.8218	0.8195	0.8087	0.8067	0.7973	0.7973	0.7955	0.8009	0.8067	0.8108	0.8150	(40)
HLP (average)												0.8087	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
										Total per year (kWh/year) = Sum(64)m =		2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.2400	11.2829	0.6300	0.7000	0.7700	31.8615	(75)

Solar gains	31.8615	64.8550	116.8481	191.8981	257.9487	275.0006	257.2574	205.0886	142.3812	79.2579	40.0900	26.0197	(83)
Total gains	610.6987	657.9322	684.6591	740.5967	779.3244	775.6640	739.0138	687.8753	639.7586	595.6757	587.5022	593.2254	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3015	70.5022	70.7000	71.6442	71.8237	72.6712	72.6712	72.8303	72.3424	71.8237	71.4616	71.0868	
alpha	5.6868	5.7001	5.7133	5.7763	5.7882	5.8447	5.8447	5.8554	5.8228	5.7882	5.7641	5.7391	
util living area													
	0.9891	0.9816	0.9653	0.9037	0.7660	0.5609	0.4102	0.4585	0.7083	0.9232	0.9781	0.9906	(86)
MIT	20.1002	20.2341	20.4354	20.7255	20.9181	20.9888	20.9985	20.9972	20.9602	20.7280	20.3835	20.0826	(87)
Th 2	20.2325	20.2345	20.2365	20.2458	20.2475	20.2557	20.2557	20.2572	20.2526	20.2475	20.2440	20.2403	(88)
util rest of house													
	0.9864	0.9772	0.9566	0.8811	0.7210	0.4994	0.3415	0.3858	0.6452	0.9002	0.9719	0.9883	(89)
MIT 2	19.1820	19.3529	19.6067	19.9647	20.1768	20.2487	20.2551	20.2560	20.2241	19.9751	19.5503	19.1658	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.4692	19.6285	19.8659	20.2027	20.4087	20.4802	20.4876	20.4878	20.4544	20.2106	19.8110	19.4526	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4692	19.6285	19.8659	20.2027	20.4087	20.4802	20.4876	20.4878	20.4544	20.2106	19.8110	19.4526	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9829	0.9727	0.9516	0.8797	0.7311	0.5182	0.3630	0.4086	0.6630	0.8989	0.9675	0.9851	(94)
Useful gains	600.2650	640.0008	651.5065	651.4839	569.7516	401.9764	268.2623	281.0472	424.1381	535.4769	568.4330	584.4028	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1083.8952	1049.4082	949.6600	792.4801	609.0781	406.4585	268.7253	281.9468	441.2316	672.1574	893.4986	1077.8119	(97)
Space heating kWh	359.8209	275.1218	221.8262	101.5173	29.2589	0.0000	0.0000	0.0000	0.0000	101.6902	234.0472	367.0963	(98a)
Space heating requirement - total per year (kWh/year)												1690.3787	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	359.8209	275.1218	221.8262	101.5173	29.2589	0.0000	0.0000	0.0000	0.0000	101.6902	234.0472	367.0963	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1690.3787	
Space heating per m2											(98c) / (4) =	19.4969	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	359.8209	275.1218	221.8262	101.5173	29.2589	0.0000	0.0000	0.0000	0.0000	101.6902	234.0472	367.0963	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	389.8384	298.0734	240.3317	109.9862	31.6998	0.0000	0.0000	0.0000	0.0000	110.1736	253.5723	397.7208	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.0244	84.7033	84.0834	82.6842	80.9056	79.8000	79.8000	79.8000	79.8000	82.6632	84.3275	85.0913	(217)
Fuel for water heating, kWh/month	274.8401	243.8732	261.0578	233.9526	232.0562	212.3443	209.9929	218.2535	220.5242	236.9480	246.3898	271.7280	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.0522	-34.0491	-51.2340	-60.3739	-67.5059	-63.8722	-63.0931	-58.3837	-50.4758	-40.1585	-25.8892	-19.7533	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.6843	-18.6438	-37.7720	-57.7989	-77.4856	-78.2579	-77.3368	-64.9856	-46.9877	-27.0053	-11.7029	-6.8394	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1831.3962	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2861.9606	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1071.3411	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3932.3940	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1831.3962	0.2100	384.5932	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2861.9606	0.2100	601.0117	(264)
Space and water heating			985.6049	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	0.1336	-74.5440	
PV Unit electricity exported	-513.5003	0.1254	-64.3679	
Total			-138.9120	(269)
Total CO2, kg/year			891.0069	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.2800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1831.3962	1.1300	2069.4777	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2861.9606	1.1300	3234.0155	(278)
Space and water heating			5303.4933	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	1.4938	-833.3127	
PV Unit electricity exported	-513.5003	0.4601	-236.2611	
Total			-1069.5738	(283)
Total Primary energy kWh/year			4708.1791	(286)
Target Primary Energy Rate (TPER)			54.3000	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.75	**TER**	10.28
Environmental	99 A	**% DER < TER**			82.98
CO_2 Emissions (t/year)	0.12	**DFEE**	21.17	**TFEE**	25.35
Compliance Check	See BREL	**% DFEE < TFEE**			16.49
% DPER < TPER	58.73	**DPER**	22.41	**TPER**	54.30

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		3 * 10 =	30.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1412	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.2912	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2257	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2878	0.2821	0.2765	0.2483	0.2426	0.2144	0.2144	0.2088	0.2257	0.2426	0.2539	0.2652	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5414	0.5398	0.5382	0.5308	0.5294	0.5230	0.5230	0.5218	0.5255	0.5294	0.5322	0.5352	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		18083.8300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							208.5794	(35)

Thermal bridges (User defined value 0.030 * total exposed area)												2.7933	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	27.3548	(37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9510	37.8383	37.7278	37.2089	37.1118	36.6599	36.6599	36.5762	36.8339	37.1118	37.3082	37.5135	(38)
Heat transfer coeff	65.3058	65.1931	65.0826	64.5637	64.4666	64.0147	64.0147	63.9310	64.1888	64.4666	64.6630	64.8684	(39)
Average = Sum(39)m / 12 =												64.5633	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7532	0.7519	0.7507	0.7447	0.7436	0.7383	0.7383	0.7374	0.7404	0.7436	0.7458	0.7482	(40)
HLP (average)												0.7447	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778	(42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses													
	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												64.3029	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)											Total = Sum(45)m =	1067.9337	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
											Total per year (kWh/year) = Sum(64)m =	907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)													
	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												614.3496	(64a)
Heat gains from water heating, kWh/month													
	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains													
	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.4800	11.2829	0.7600	0.7000	0.7700	31.1149	(75)
Northeast	1.7600	11.2829	0.7600	0.7000	0.7700	7.3212	(75)

Solar gains	38.4361	78.2378	140.9596	231.4961	311.1762	331.7468	310.3423	247.4085	171.7614	95.6128	48.3625	31.3888	(83)
Total gains	516.6645	571.9626	612.3192	690.7385	747.2108	754.4150	717.0745	653.1903	589.7415	524.7848	501.8521	498.9376	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.9194	77.0524	77.1832	77.8035	77.9207	78.4708	78.4708	78.5736	78.2580	77.9207	77.6840	77.4381	
alpha	6.1280	6.1368	6.1455	6.1869	6.1947	6.2314	6.2314	6.2382	6.2172	6.1947	6.1789	6.1625	
util living area													
	0.9946	0.9889	0.9742	0.9079	0.7514	0.5375	0.3921	0.4485	0.7149	0.9425	0.9878	0.9956	(86)

MIT	20.1050	20.2487	20.4610	20.7604	20.9407	20.9934	20.9992	20.9983	20.9669	20.7265	20.3734	20.0786	(87)
Th 2	20.2940	20.2952	20.2963	20.3015	20.3025	20.3071	20.3071	20.3079	20.3053	20.3025	20.3005	20.2985	(88)
util rest of house	0.9932	0.9861	0.9676	0.8867	0.7080	0.4815	0.3307	0.3819	0.6551	0.9243	0.9842	0.9945	(89)
MIT 2	19.4695	19.6127	19.8221	20.1093	20.2628	20.3039	20.3068	20.3073	20.2867	20.0841	19.7414	19.4469	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.6683	19.8117	20.0219	20.3129	20.4749	20.5196	20.5234	20.5235	20.4994	20.2851	19.9391	19.6445	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6683	19.8117	20.0219	20.3129	20.4749	20.5196	20.5234	20.5235	20.4994	20.2851	19.9391	19.6445	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9916	0.9838	0.9646	0.8871	0.7191	0.4988	0.3499	0.4027	0.6724	0.9238	0.9819	0.9931	(94)
Useful gains	512.3407	562.6691	590.6481	612.7361	537.3508	376.3383	250.9194	263.0685	396.5687	484.8014	492.7573	495.5027	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1003.6372	972.1378	880.0433	736.8622	565.6855	378.9390	251.1559	263.6166	410.7727	624.3641	830.2160	1001.8609	(97)
Space heating kWh	365.5246	275.1630	215.3100	89.3708	21.0810	0.0000	0.0000	0.0000	0.0000	103.8347	242.9703	376.7305	(98a)
Space heating requirement - total per year (kWh/year)												1689.9849	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	365.5246	275.1630	215.3100	89.3708	21.0810	0.0000	0.0000	0.0000	0.0000	103.8347	242.9703	376.7305	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1689.9849	
Space heating per m2											(98c) / (4) =	19.4923	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	601.7381	473.7088	485.8756	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9561	0.9816	0.9673	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	575.3518	465.0010	470.0086	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	817.6695	777.0574	705.1508	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	174.4687	232.1699	174.9458	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	43.6172	58.0425	43.7365	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												145.3961	(107)
Energy for space heating												19.4923	(99)
Energy for space cooling												1.6770	(108)
Total												21.1693	(109)
Fabric Energy Efficiency (DFEE)												21.2	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
Heatloss Floor 1			43.3500	0.1300	5.6355			(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1247			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	6.2700	0.0500	0.3135
E2 Other lintels (including other steel lintels)	2.5200	0.0500	0.1260
E3 Sill	20.7200	0.0500	1.0360
E4 Jamb	13.5400	0.0000	0.0000
E6 Intermediate floor within a dwelling	6.7700	0.1600	1.0832
E5 Ground floor (normal)	22.0000	0.0600	1.3200
E18 Party wall between dwellings	12.6600	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	19.4300	0.0800	1.5544
P1 Party wall - Ground floor	6.7700	0.0200	0.1354
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0700	0.4739
E7 Party floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0424 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.1671 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	71.4535	71.2501	71.0507	70.1143	69.9391	69.1235	69.1235	68.9725	69.4377	69.9391	70.2935	70.6641	(39)
Average = Sum(39)m / 12 =												70.1135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8241	0.8218	0.8195	0.8087	0.8067	0.7973	0.7973	0.7955	0.8009	0.8067	0.8108	0.8150	(40)
HLP (average)												0.8087	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122 (71)

Water heating gains (Table 5)

	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778 (72)

Total internal gains

	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.2400	11.2829	0.6300	0.7000	0.7700	31.8615	(75)

Solar gains	31.8615	64.8550	116.8481	191.8981	257.9487	275.0006	257.2574	205.0886	142.3812	79.2579	40.0900	26.0197 (83)
Total gains	510.0899	558.5798	588.2077	651.1405	693.9833	697.6688	663.9896	610.8704	560.3613	508.4300	493.5796	493.5684 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3015	70.5022	70.7000	71.6442	71.8237	72.6712	72.6712	72.8303	72.3424	71.8237	71.4616	71.0868	
alpha	5.6868	5.7001	5.7133	5.7763	5.7882	5.8447	5.8447	5.8554	5.8228	5.7882	5.7641	5.7391	
util living area													
	0.9954	0.9914	0.9821	0.9395	0.8237	0.6172	0.4555	0.5139	0.7792	0.9585	0.9902	0.9962	(86)
MIT	19.9532	20.0935	20.3082	20.6374	20.8792	20.9818	20.9973	20.9949	20.9348	20.6320	20.2521	19.9358	(87)
Th 2	20.2325	20.2345	20.2365	20.2458	20.2475	20.2557	20.2557	20.2572	20.2526	20.2475	20.2440	20.2403	(88)
util rest of house													
	0.9942	0.9892	0.9772	0.9231	0.7824	0.5518	0.3797	0.4336	0.7181	0.9439	0.9873	0.9952	(89)
MIT 2	19.2684	19.4094	19.6232	19.9479	20.1634	20.2466	20.2548	20.2554	20.2145	19.9488	19.5752	19.2575	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.4826	19.6234	19.8375	20.1636	20.3873	20.4766	20.4871	20.4867	20.4398	20.1625	19.7869	19.4697	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4826	19.6234	19.8375	20.1636	20.3873	20.4766	20.4871	20.4867	20.4398	20.1625	19.7869	19.4697	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9927	0.9869	0.9741	0.9211	0.7906	0.5717	0.4034	0.4587	0.7344	0.9419	0.9850	0.9939	(94)
Useful gains	506.3670	551.2829	572.9584	599.7604	548.6434	398.8371	267.8803	280.2250	411.5341	478.8976	486.1605	490.5445	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1084.8524	1049.0418	947.6380	789.7370	607.5835	406.2094	268.6902	281.8719	440.2191	668.7944	891.8096	1079.0183	(97)
Space heating kWh													
	430.3931	334.4939	278.7616	136.7831	43.8514	0.0000	0.0000	0.0000	0.0000	141.2832	292.0673	437.8245	(98a)
Space heating requirement - total per year (kWh/year)												2095.4582	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	430.3931	334.4939	278.7616	136.7831	43.8514	0.0000	0.0000	0.0000	0.0000	141.2832	292.0673	437.8245	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2095.4582	
Space heating per m2										(98c) / (4) =		24.1691	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	649.7609	511.5139	524.1907	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9082	0.9553	0.9311	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	590.1016	488.6471	488.0516	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	751.3428	715.0101	655.6860	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	116.0937	168.4141	124.7200	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	29.0234	42.1035	31.1800	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												102.3069	(107)
Energy for space heating												24.1691	(99)
Energy for space cooling												1.1800	(108)
Total												25.3491	(109)
Fabric Energy Efficiency (TFEE)												25.3	(109)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.75	**TER**	10.28
Environmental	99 A	**% DER < TER**			82.98
CO_2 Emissions (t/year)	0.12	**DFEE**	21.17	**TFEE**	25.35
Compliance Check	See BREL	**% DFEE < TFEE**			16.49
% DPER < TPER	58.73	**DPER**	22.41	**TPER**	54.30

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17650.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 203.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674 (64)
12Total per year (kWh/year)												2752 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.4800	11.2829	0.7600	0.7000	0.7700	31.1149	(75)
Northeast	1.7600	11.2829	0.7600	0.7000	0.7700	7.3212	(75)

Solar gains	38.4361	78.2378	140.9596	231.4961	311.1762	331.7468	310.3423	247.4085	171.7614	95.6128	48.3625	31.3888 (83)
Total gains	623.6086	677.6503	715.1060	786.5301	838.8873	841.7455	801.4341	739.5305	678.4742	618.3659	602.1101	604.9300 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	
alpha	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	
util living area	0.9833	0.9704	0.9409	0.8436	0.6688	0.4721	0.3423	0.3875	0.6205	0.8818	0.9662	0.9860	(86)
MIT	20.3155	20.4461	20.6298	20.8539	20.9692	20.9968	20.9996	20.9992	20.9847	20.8345	20.5442	20.2789	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house	0.9795	0.9640	0.9285	0.8161	0.6265	0.4231	0.2898	0.3308	0.5647	0.8535	0.9578	0.9829	(89)
MIT 2	19.5268	19.6903	19.9167	20.1780	20.2976	20.3214	20.3233	20.3231	20.3127	20.1617	19.8147	19.4807	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.7735	19.9267	20.1398	20.3895	20.5077	20.5327	20.5348	20.5346	20.5229	20.3722	20.0429	19.7304	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7735	19.9267	20.1398	20.3895	20.5077	20.5327	20.5348	20.5346	20.5229	20.3722	20.0429	19.7304	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9758	0.9596	0.9247	0.8189	0.6382	0.4384	0.3063	0.3486	0.5815	0.8558	0.9537	0.9795	(94)
Useful gains	608.5285	650.2624	661.2796	644.1099	535.4045	368.9798	245.4403	257.7753	394.5215	529.1754	574.2577	592.5002	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	965.5972	937.7155	851.1668	716.9808	549.6284	370.2178	245.5466	258.0112	400.8127	609.8148	807.6784	969.1464	(97)
Space heating kWh	265.6591	193.1685	141.2761	52.4671	10.5826	0.0000	0.0000	0.0000	0.0000	59.9957	168.0629	280.2248	(98a)
Space heating requirement - total per year (kWh/year)												1171.4367	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	265.6591	193.1685	141.2761	52.4671	10.5826	0.0000	0.0000	0.0000	0.0000	59.9957	168.0629	280.2248	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1171.4367	
Space heating per m2											(98c) / (4) =	13.5114	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	265.6591	193.1685	141.2761	52.4671	10.5826	0.0000	0.0000	0.0000	0.0000	59.9957	168.0629	280.2248	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	398.4886	289.7527	211.9141	78.7006	15.8739	0.0000	0.0000	0.0000	0.0000	89.9936	252.0944	420.3371	
Space heating requirement	398.4886	289.7527	211.9141	78.7006	15.8739	0.0000	0.0000	0.0000	0.0000	89.9936	252.0944	420.3371	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1757.1550	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												17.5716	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5176.2558	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1569.2416	0.1570	73.5751	(367)
Electrical energy for heat distribution (space & water)	17.5716	0.0000	8.5747	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			237.2342	(373)
Space and water heating			237.2342	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			151.6593	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.7500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1569.2416	1.5813	740.9565	(467)
Electrical energy for heat distribution (space & water)	17.5716	0.0000	90.5651	(472)
Overall CO2 factor for heat network			0.4258	(486)
Total CO2 associated with community systems			2505.6341	(473)
Space and water heating			2505.6341	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1942.6908	(483)
Dwelling Primary energy Rate (DPER)			22.4100	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
Heatloss Floor 1			43.3500	0.1300	5.6355			(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1247			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E5 Ground floor (normal)	6.7700	0.1600	1.0832
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P1 Party wall - Ground floor	19.4300	0.0800	1.5544
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0424 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.1671 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	71.4535	71.2501	71.0507	70.1143	69.9391	69.1235	69.1235	68.9725	69.4377	69.9391	70.2935	70.6641	(39)
Average = Sum(39)m / 12 =												70.1135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8241	0.8218	0.8195	0.8087	0.8067	0.7973	0.7973	0.7955	0.8009	0.8067	0.8108	0.8150	(40)
HLP (average)												0.8087	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
										Total per year (kWh/year) = Sum(64)m =		2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.2400	11.2829	0.6300	0.7000	0.7700	31.8615	(75)

Solar gains	31.8615	64.8550	116.8481	191.8981	257.9487	275.0006	257.2574	205.0886	142.3812	79.2579	40.0900	26.0197	(83)
Total gains	610.6987	657.9322	684.6591	740.5967	779.3244	775.6640	739.0138	687.8753	639.7586	595.6757	587.5022	593.2254	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3015	70.5022	70.7000	71.6442	71.8237	72.6712	72.6712	72.8303	72.3424	71.8237	71.4616	71.0868	
alpha	5.6868	5.7001	5.7133	5.7763	5.7882	5.8447	5.8447	5.8554	5.8228	5.7882	5.7641	5.7391	
util living area													
	0.9891	0.9816	0.9653	0.9037	0.7660	0.5609	0.4102	0.4585	0.7083	0.9232	0.9781	0.9906	(86)
MIT	20.1002	20.2341	20.4354	20.7255	20.9181	20.9888	20.9985	20.9972	20.9602	20.7280	20.3835	20.0826	(87)
Th 2	20.2325	20.2345	20.2365	20.2458	20.2475	20.2557	20.2557	20.2572	20.2526	20.2475	20.2440	20.2403	(88)
util rest of house													
	0.9864	0.9772	0.9566	0.8811	0.7210	0.4994	0.3415	0.3858	0.6452	0.9002	0.9719	0.9883	(89)
MIT 2	19.1820	19.3529	19.6067	19.9647	20.1768	20.2487	20.2551	20.2560	20.2241	19.9751	19.5503	19.1658	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.4692	19.6285	19.8659	20.2027	20.4087	20.4802	20.4876	20.4878	20.4544	20.2106	19.8110	19.4526	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4692	19.6285	19.8659	20.2027	20.4087	20.4802	20.4876	20.4878	20.4544	20.2106	19.8110	19.4526	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9829	0.9727	0.9516	0.8797	0.7311	0.5182	0.3630	0.4086	0.6630	0.8989	0.9675	0.9851	(94)
Useful gains	600.2650	640.0008	651.5065	651.4839	569.7516	401.9764	268.2623	281.0472	424.1381	535.4769	568.4330	584.4028	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1083.8952	1049.4082	949.6600	792.4801	609.0781	406.4585	268.7253	281.9468	441.2316	672.1574	893.4986	1077.8119	(97)
Space heating kWh	359.8209	275.1218	221.8262	101.5173	29.2589	0.0000	0.0000	0.0000	0.0000	101.6902	234.0472	367.0963	(98a)
Space heating requirement - total per year (kWh/year)												1690.3787	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	359.8209	275.1218	221.8262	101.5173	29.2589	0.0000	0.0000	0.0000	0.0000	101.6902	234.0472	367.0963	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1690.3787	
Space heating per m2											(98c) / (4) =	19.4969	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	359.8209	275.1218	221.8262	101.5173	29.2589	0.0000	0.0000	0.0000	0.0000	101.6902	234.0472	367.0963	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	389.8384	298.0734	240.3317	109.9862	31.6998	0.0000	0.0000	0.0000	0.0000	110.1736	253.5723	397.7208	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.0244	84.7033	84.0834	82.6842	80.9056	79.8000	79.8000	79.8000	79.8000	82.6632	84.3275	85.0913	(217)
Fuel for water heating, kWh/month	274.8401	243.8732	261.0578	233.9526	232.0562	212.3443	209.9929	218.2535	220.5242	236.9480	246.3898	271.7280	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.0522	-34.0491	-51.2340	-60.3739	-67.5059	-63.8722	-63.0931	-58.3837	-50.4758	-40.1585	-25.8892	-19.7533	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.6843	-18.6438	-37.7720	-57.7989	-77.4856	-78.2579	-77.3368	-64.9856	-46.9877	-27.0053	-11.7029	-6.8394	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1831.3962	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2861.9606	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1071.3411	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3932.3940	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1831.3962	0.2100	384.5932	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2861.9606	0.2100	601.0117	(264)
Space and water heating			985.6049	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	0.1336	-74.5440	
PV Unit electricity exported	-513.5003	0.1254	-64.3679	
Total			-138.9120	(269)
Total CO2, kg/year			891.0069	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.2800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1831.3962	1.1300	2069.4777	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2861.9606	1.1300	3234.0155	(278)
Space and water heating			5303.4933	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	1.4938	-833.3127	
PV Unit electricity exported	-513.5003	0.4601	-236.2611	
Total			-1069.5738	(283)
Total Primary energy kWh/year			4708.1791	(286)
Target Primary Energy Rate (TPER)			54.3000	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.75	**TER**	10.28
Environmental	99 A	**% DER < TER**			82.98
CO_2 Emissions (t/year)	0.12	**DFEE**	21.17	**TFEE**	25.35
Compliance Check	See BREL	**% DFEE < TFEE**			16.49
% DPER < TPER	58.73	**DPER**	22.41	**TPER**	54.30

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.4800	11.2829	0.7600	0.7000	0.7700	31.1149	(75)
Northeast	1.7600	11.2829	0.7600	0.7000	0.7700	7.3212	(75)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	38.4361	78.2378	140.9596	231.4961	311.1762	331.7468	310.3423	247.4085	171.7614	95.6128	48.3625	31.3888	(83)
Total gains	678.0599	715.5316	759.2448	814.4498	858.9788	847.8517	807.7907	748.1209	690.6831	646.7939	638.3664	655.1716	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area													
	0.9764	0.9639	0.9274	0.8294	0.6565	0.4690	0.3397	0.3832	0.6115	0.8657	0.9581	0.9806	(86)
MIT	20.4056	20.5074	20.6861	20.8756	20.9743	20.9973	20.9997	20.9994	20.9871	20.8607	20.6000	20.3652	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house													
	0.9712	0.9562	0.9128	0.8005	0.6142	0.4203	0.2876	0.3271	0.5559	0.8351	0.9480	0.9763	(89)
MIT 2	19.6384	19.7650	19.9831	20.2012	20.3022	20.3217	20.3233	20.3231	20.3146	20.1897	19.8819	19.5879	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8784	19.9972	20.2030	20.4122	20.5124	20.5330	20.5349	20.5347	20.5249	20.3996	20.1065	19.8311	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8784	19.9972	20.2030	20.4122	20.5124	20.5330	20.5349	20.5347	20.5249	20.3996	20.1065	19.8311	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9672	0.9519	0.9099	0.8045	0.6262	0.4354	0.3039	0.3446	0.5727	0.8389	0.9442	0.9725	(94)
Useful gains	655.7966	681.1371	690.8226	655.2217	537.9059	369.1706	245.4621	257.8244	395.5660	542.5651	602.7527	637.1389	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	972.1424	942.1177	855.1113	718.3975	549.9250	370.2405	245.5492	258.0170	400.9364	611.5297	811.6507	975.4302	(97)
Space heating kWh													
	235.3613	175.3789	122.2307	45.4865	8.9422	0.0000	0.0000	0.0000	0.0000	51.3096	150.4066	251.6887	(98a)
Space heating requirement - total per year (kWh/year)												1040.8047	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	235.3613	175.3789	122.2307	45.4865	8.9422	0.0000	0.0000	0.0000	0.0000	51.3096	150.4066	251.6887	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1040.8047	
Space heating per m2											(98c) / (4) =	12.0047	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	235.3613	175.3789	122.2307	45.4865	8.9422	0.0000	0.0000	0.0000	0.0000	51.3096	150.4066	251.6887	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	353.0419	263.0684	183.3461	68.2298	13.4133	0.0000	0.0000	0.0000	0.0000	76.9644	225.6099	377.5331	
Space heating requirement													
	353.0419	263.0684	183.3461	68.2298	13.4133	0.0000	0.0000	0.0000	0.0000	76.9644	225.6099	377.5331	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1561.2070	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												15.6121	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4980.3078	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1561.2070	4.4400	69.3176	(340a)
Space heating total			69.3176	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			277.9086	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7597 (357)
SAP value		87.6859
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1516.9888	0.1571	65.4102	(367)
Electrical energy for heat distribution (space & water)	15.6121	0.0000	8.2685	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			228.7631	(373)
Space and water heating			228.7631	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			143.1882	(383)
CO2 emissions per m2			1.6500	(384)
EI value			98.5431	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			3.0000 (17)
Infiltration rate			0.1500 (18)
Number of sides sheltered			3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7750 (20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)

Average = Sum(39)m / 12 = 62.4033

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)

Total per year (kWh/year) = Sum(64)m = 2751.6674 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.4800	13.7758	0.7600	0.7000	0.7700	37.9894	(75)
Northeast	1.7600	13.7758	0.7600	0.7000	0.7700	8.9387	(75)

Solar gains	46.9281	85.4061	152.2932	252.8092	326.2339	372.2643	342.0586	278.9737	195.9553	110.3656	58.2773	38.4694	(83)
Total gains	686.5519	722.6999	770.5784	835.7629	874.0366	888.3692	839.5070	779.6862	714.8770	661.5468	648.2812	662.2521	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area													
	0.9726	0.9589	0.9121	0.7995	0.6158	0.4066	0.2898	0.3280	0.5687	0.8330	0.9491	0.9776	(86)
MIT	20.4438	20.5418	20.7329	20.9032	20.9829	20.9989	20.9999	20.9998	20.9917	20.8956	20.6448	20.4023	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house													
	0.9667	0.9502	0.8948	0.7677	0.5723	0.3595	0.2396	0.2739	0.5133	0.7974	0.9369	0.9727	(89)
MIT 2	19.6863	19.8076	20.0386	20.2306	20.3098	20.3228	20.3234	20.3233	20.3180	20.2270	19.9365	19.6346	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9232	20.0373	20.2558	20.4410	20.5204	20.5343	20.5350	20.5349	20.5287	20.4361	20.1581	19.8747	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9232	20.0373	20.2558	20.4410	20.5204	20.5343	20.5350	20.5349	20.5287	20.4361	20.1581	19.8747	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9625	0.9460	0.8929	0.7735	0.5851	0.3743	0.2553	0.2908	0.5303	0.8037	0.9335	0.9687	(94)
Useful gains	660.8190	683.6528	688.0334	646.4592	511.3965	332.4745	214.3281	226.7692	379.1040	531.6722	605.1917	641.5340	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	956.2212	925.8952	827.2043	695.2337	519.2188	332.8768	214.3550	226.8312	382.4530	582.6043	789.9045	959.4338	(97)
Space heating kWh													
	219.7792	162.7869	103.5432	35.1176	5.8198	0.0000	0.0000	0.0000	0.0000	37.8935	132.9932	236.5174	(98a)
Space heating requirement - total per year (kWh/year)												934.4507	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	219.7792	162.7869	103.5432	35.1176	5.8198	0.0000	0.0000	0.0000	0.0000	37.8935	132.9932	236.5174	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												934.4507	
Space heating per m2											(98c) / (4) =	10.7780	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	219.7792	162.7869	103.5432	35.1176	5.8198	0.0000	0.0000	0.0000	0.0000	37.8935	132.9932	236.5174	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	329.6688	244.1804	155.3147	52.6764	8.7296	0.0000	0.0000	0.0000	0.0000	56.8402	199.4898	354.7761	
Space heating requirement													
	329.6688	244.1804	155.3147	52.6764	8.7296	0.0000	0.0000	0.0000	0.0000	56.8402	199.4898	354.7761	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)

Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year	
Space heating fuel - community heating	1401.6761 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	14.0168 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)	
mechanical ventilation fans (SFP = 0.1292)	33.4924 (330a)
Total electricity for the above, kWh/year	33.4924 (331)
Electricity for lighting (calculated in Appendix L)	216.3282 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4724.2508 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1401.6761	6.5500	91.8098	(340a)
Space heating total			91.8098	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			355.1148	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1474.4472	0.1576	58.9159	(367)
Electrical energy for heat distribution (space & water)	14.0168	0.0000	8.0250	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			222.0253	(373)
Space and water heating			222.0253	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			124.1923	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1474.4472	1.5835	591.8858	(467)
Electrical energy for heat distribution (space & water)	14.0168	0.0000	84.9749	(472)
Overall CO2 factor for heat network			0.4252	(486)
Total CO2 associated with community systems			2350.9733	(473)
Space and water heating			2350.9733	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1707.1382	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Southwest

Current energy efficiency rating: B 88
Current environmental impact rating: A 99

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£71	£71	£0
Community scheme	£466	£466	£0
Space heating	£205	£205	£0
Water heating	£270	£270	£0
Lighting	£62	£62	£0
Generated (PV)	-£182	-£182	£0
Total cost of fuels	£355	£355	£0
Total cost of uses	£355	£355	£0
Delivered energy	54 kWh/m²	54 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	20 kWh/m²	20 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5778 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day)	126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	

Distribution loss (46)m = 0.15 x (45)m

32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss / Combi loss

Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS / PV diverter / Solar input / FGHRS

Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
									Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.4800	11.2829	0.7600	0.7000	0.7700	31.1149	(75)
Northeast	1.7600	11.2829	0.7600	0.7000	0.7700	7.3212	(75)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	38.4361	78.2378	140.9596	231.4961	311.1762	331.7468	310.3423	247.4085	171.7614	95.6128	48.3625	31.3888	(83)
Total gains	678.0599	715.5316	759.2448	814.4498	858.9788	847.8517	807.7907	748.1209	690.6831	646.7939	638.3664	655.1716	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area	0.9764	0.9639	0.9274	0.8294	0.6565	0.4690	0.3397	0.3832	0.6115	0.8657	0.9581	0.9806	(86)
MIT	20.4056	20.5074	20.6861	20.8756	20.9743	20.9973	20.9997	20.9994	20.9871	20.8607	20.6000	20.3652	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house	0.9712	0.9562	0.9128	0.8005	0.6142	0.4203	0.2876	0.3271	0.5559	0.8351	0.9480	0.9763	(89)
MIT 2	19.6384	19.7650	19.9831	20.2012	20.3022	20.3217	20.3233	20.3231	20.3146	20.1897	19.8819	19.5879	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8784	19.9972	20.2030	20.4122	20.5124	20.5330	20.5349	20.5347	20.5249	20.3996	20.1065	19.8311	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8784	19.9972	20.2030	20.4122	20.5124	20.5330	20.5349	20.5347	20.5249	20.3996	20.1065	19.8311	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9672	0.9519	0.9099	0.8045	0.6262	0.4354	0.3039	0.3446	0.5727	0.8389	0.9442	0.9725	(94)
Useful gains	655.7966	681.1371	690.8226	655.2217	537.9059	369.1706	245.4621	257.8244	395.5660	542.5651	602.7527	637.1389	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	972.1424	942.1177	855.1113	718.3975	549.9250	370.2405	245.5492	258.0170	400.9364	611.5297	811.6507	975.4302	(97)
Space heating kWh	235.3613	175.3789	122.2307	45.4865	8.9422	0.0000	0.0000	0.0000	0.0000	51.3096	150.4066	251.6887	(98a)
Space heating requirement - total per year (kWh/year)												1040.8047	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	235.3613	175.3789	122.2307	45.4865	8.9422	0.0000	0.0000	0.0000	0.0000	51.3096	150.4066	251.6887	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1040.8047	
Space heating per m2										(98c) / (4) =		12.0047	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	235.3613	175.3789	122.2307	45.4865	8.9422	0.0000	0.0000	0.0000	0.0000	51.3096	150.4066	251.6887	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	353.0419	263.0684	183.3461	68.2298	13.4133	0.0000	0.0000	0.0000	0.0000	76.9644	225.6099	377.5331	
Space heating requirement													
	353.0419	263.0684	183.3461	68.2298	13.4133	0.0000	0.0000	0.0000	0.0000	76.9644	225.6099	377.5331	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1561.2070	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)

Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	15.6121	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4980.3078	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1561.2070	4.4400	69.3176	(340a)
Space heating total			69.3176	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			277.9086	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.7597	(357)
SAP value	87.6859	
SAP rating (Section 12)	88	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1516.9888	0.1571	65.4102	(367)
Electrical energy for heat distribution (space & water)	15.6121	0.0000	8.2685	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			228.7631	(373)
Space and water heating			228.7631	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			143.1882	(383)
CO2 emissions per m2			1.6500	(384)
EI value			98.5431	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 86.7000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5778	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.4800	13.7758	0.7600	0.7000	0.7700	37.9894	(75)
Northeast	1.7600	13.7758	0.7600	0.7000	0.7700	8.9387	(75)

Solar gains	46.9281	85.4061	152.2932	252.8092	326.2339	372.2643	342.0586	278.9737	195.9553	110.3656	58.2773	38.4694	(83)
Total gains	686.5519	722.6999	770.5784	835.7629	874.0366	888.3692	839.5070	779.6862	714.8770	661.5468	648.2812	662.2521	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area													
	0.9726	0.9589	0.9121	0.7995	0.6158	0.4066	0.2898	0.3280	0.5687	0.8330	0.9491	0.9776	(86)
MIT	20.4438	20.5418	20.7329	20.9032	20.9829	20.9989	20.9999	20.9998	20.9917	20.8956	20.6448	20.4023	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house													
	0.9667	0.9502	0.8948	0.7677	0.5723	0.3595	0.2396	0.2739	0.5133	0.7974	0.9369	0.9727	(89)
MIT 2	19.6863	19.8076	20.0386	20.2306	20.3098	20.3228	20.3234	20.3233	20.3180	20.2270	19.9365	19.6346	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9232	20.0373	20.2558	20.4410	20.5204	20.5343	20.5350	20.5349	20.5287	20.4361	20.1581	19.8747	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9232	20.0373	20.2558	20.4410	20.5204	20.5343	20.5350	20.5349	20.5287	20.4361	20.1581	19.8747	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9625	0.9460	0.8929	0.7735	0.5851	0.3743	0.2553	0.2908	0.5303	0.8037	0.9335	0.9687	(94)
Useful gains	660.8190	683.6528	688.0334	646.4592	511.3965	332.4745	214.3281	226.7692	379.1040	531.6722	605.1917	641.5340	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	956.2212	925.8952	827.2043	695.2337	519.2188	332.8768	214.3550	226.8312	382.4530	582.6043	789.9045	959.4338	(97)
Space heating kWh													
	219.7792	162.7869	103.5432	35.1176	5.8198	0.0000	0.0000	0.0000	0.0000	37.8935	132.9932	236.5174	(98a)
Space heating requirement - total per year (kWh/year)												934.4507	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	219.7792	162.7869	103.5432	35.1176	5.8198	0.0000	0.0000	0.0000	0.0000	37.8935	132.9932	236.5174	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												934.4507	
Space heating per m2											(98c) / (4) =	10.7780	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement													
	219.7792	162.7869	103.5432	35.1176	5.8198	0.0000	0.0000	0.0000	0.0000	37.8935	132.9932	236.5174	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	329.6688	244.1804	155.3147	52.6764	8.7296	0.0000	0.0000	0.0000	0.0000	56.8402	199.4898	354.7761	
Space heating requirement													
	329.6688	244.1804	155.3147	52.6764	8.7296	0.0000	0.0000	0.0000	0.0000	56.8402	199.4898	354.7761	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1401.6761	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												14.0168	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1054.7470	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4724.2508	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1401.6761	6.5500	91.8098	(340a)
Space heating total			91.8098	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			355.1148	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1474.4472	0.1576	58.9159	(367)
Electrical energy for heat distribution (space & water)	14.0168	0.0000	8.0250	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			222.0253	(373)
Space and water heating			222.0253	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			124.1923	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)

Space and Water heating from Heat pump	1474.4472	1.5835	591.8858	(467)
Electrical energy for heat distribution (space & water)	14.0168	0.0000	84.9749	(472)
Overall CO2 factor for heat network			0.4252	(486)
Total CO2 associated with community systems			2350.9733	(473)
Space and water heating			2350.9733	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1707.1382	(483)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.65	**TER**	9.93
Environmental	99 A	**% DER < TER**			83.38
CO_2 Emissions (t/year)	0.12	**DFEE**	19.61	**TFEE**	23.82
Compliance Check	See BREL	**% DFEE < TFEE**			17.65
% DPER < TPER	59.18	**DPER**	21.41	**TPER**	52.44

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17650.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 203.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
12Total per year (kWh/year)												2752	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(76)
East	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(76)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201 (83)
Total gains	652.0784	730.2946	789.6905	869.3922	912.9689	904.3786	866.5575	814.6416	757.3995	678.0557	637.1713	628.5612 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	
alpha	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	
util living area	0.9792	0.9585	0.9131	0.7944	0.6214	0.4401	0.3167	0.3520	0.5611	0.8423	0.9566	0.9831	(86)
MIT	20.3560	20.5138	20.7068	20.8972	20.9792	20.9978	20.9998	20.9996	20.9911	20.8757	20.5885	20.3132	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house	0.9747	0.9501	0.8968	0.7638	0.5803	0.3942	0.2681	0.3004	0.5089	0.8097	0.9463	0.9794	(89)
MIT 2	19.5774	19.7734	20.0073	20.2235	20.3063	20.3221	20.3233	20.3232	20.3174	20.2052	19.8684	19.5237	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8209	20.0050	20.2261	20.4342	20.5168	20.5334	20.5349	20.5348	20.5281	20.4149	20.0937	19.7707	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8209	20.0050	20.2261	20.4342	20.5168	20.5334	20.5349	20.5348	20.5281	20.4149	20.0937	19.7707	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9706	0.9456	0.8943	0.7690	0.5922	0.4085	0.2833	0.3166	0.5248	0.8144	0.9423	0.9756	(94)
Useful gains	632.9262	690.5459	706.2003	668.5908	540.6690	369.4323	245.4840	257.8883	397.5186	552.2070	600.4044	613.2422	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	968.5573	942.6040	856.5525	719.7730	550.1974	370.2664	245.5515	258.0238	401.1349	612.4828	810.8472	971.6605	(97)
Space heating kWh	249.7095	169.3831	111.8620	36.8511	7.0892	0.0000	0.0000	0.0000	0.0000	44.8452	151.5189	266.6632	(98a)
Space heating requirement - total per year (kWh/year)												1037.9222	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	249.7095	169.3831	111.8620	36.8511	7.0892	0.0000	0.0000	0.0000	0.0000	44.8452	151.5189	266.6632	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1037.9222	
Space heating per m2											(98c) / (4) =	11.9714	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	249.7095	169.3831	111.8620	36.8511	7.0892	0.0000	0.0000	0.0000	0.0000	44.8452	151.5189	266.6632	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	374.5643	254.0746	167.7930	55.2767	10.6338	0.0000	0.0000	0.0000	0.0000	67.2678	227.2783	399.9948	
Space heating requirement	374.5643	254.0746	167.7930	55.2767	10.6338	0.0000	0.0000	0.0000	0.0000	67.2678	227.2783	399.9948	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1556.8833	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												15.5688	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4975.9841	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1515.8358	0.1576	65.4275	(367)
Electrical energy for heat distribution (space & water)	15.5688	0.0000	8.2692	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			228.7810	(373)
Space and water heating			228.7810	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			143.2061	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1515.8358	1.5834	657.3707	(467)
Electrical energy for heat distribution (space & water)	15.5688	0.0000	87.4306	(472)
Overall CO2 factor for heat network			0.4255	(486)
Total CO2 associated with community systems			2418.9139	(473)
Space and water heating			2418.9139	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1855.9706	(483)
Dwelling Primary energy Rate (DPER)			21.4100	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
Heatloss Floor 1			43.3500	0.1300	5.6355			(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1247			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E5 Ground floor (normal)	6.7700	0.1600	1.0832
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P1 Party wall - Ground floor	19.4300	0.0800	1.5544
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0424 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.1671 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	71.4535	71.2501	71.0507	70.1143	69.9391	69.1235	69.1235	68.9725	69.4377	69.9391	70.2935	70.6641	(39)
Average = Sum(39)m / 12 =												70.1135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8241	0.8218	0.8195	0.8087	0.8067	0.7973	0.7973	0.7955	0.8009	0.8067	0.8108	0.8150	(40)
HLP (average)												0.8087	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
										Total per year (kWh/year) = Sum(64)m =		2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(76)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)
Total gains	634.2986	701.5715	746.4857	809.2850	840.7342	827.5835	792.9978	750.1384	705.1835	645.1554	616.5661	612.8145	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3015	70.5022	70.7000	71.6442	71.8237	72.6712	72.6712	72.8303	72.3424	71.8237	71.4616	71.0868	
alpha	5.6868	5.7001	5.7133	5.7763	5.7882	5.8447	5.8447	5.8554	5.8228	5.7882	5.7641	5.7391	
util living area	0.9869	0.9755	0.9506	0.8718	0.7256	0.5281	0.3827	0.4214	0.6547	0.8987	0.9728	0.9890	(86)
MIT	20.1338	20.2930	20.5099	20.7811	20.9380	20.9918	20.9989	20.9982	20.9732	20.7737	20.4221	20.1108	(87)
Th 2	20.2325	20.2345	20.2365	20.2458	20.2475	20.2557	20.2557	20.2572	20.2526	20.2475	20.2440	20.2403	(88)
util rest of house	0.9838	0.9698	0.9391	0.8450	0.6794	0.4693	0.3184	0.3541	0.5925	0.8711	0.9654	0.9863	(89)
MIT 2	19.2244	19.4263	19.6971	20.0263	20.1952	20.2506	20.2553	20.2564	20.2340	20.0258	19.5980	19.2015	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.5089	19.6974	19.9513	20.2624	20.4275	20.4824	20.4879	20.4884	20.4653	20.2597	19.8558	19.4860	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5089	19.6974	19.9513	20.2624	20.4275	20.4824	20.4879	20.4884	20.4653	20.2597	19.8558	19.4860	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9800	0.9649	0.9341	0.8456	0.6908	0.4874	0.3385	0.3752	0.6107	0.8716	0.9608	0.9829	(94)
Useful gains	621.5918	676.9382	697.2896	684.3671	580.8200	403.3397	268.4262	281.4173	430.6569	562.3167	592.4069	602.3346	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1086.7269	1054.3197	955.7277	796.6638	610.3965	406.6140	268.7448	281.9902	441.9886	675.5921	896.6507	1080.1680	(97)
Space heating kWh	346.0605	253.6004	192.2779	80.8537	22.0049	0.0000	0.0000	0.0000	0.0000	84.2769	219.0556	355.5081	(98a)
Space heating requirement - total per year (kWh/year)												1553.6380	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	346.0605	253.6004	192.2779	80.8537	22.0049	0.0000	0.0000	0.0000	0.0000	84.2769	219.0556	355.5081	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1553.6380	
Space heating per m2											(98c) / (4) =	17.9197	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	346.0605	253.6004	192.2779	80.8537	22.0049	0.0000	0.0000	0.0000	0.0000	84.2769	219.0556	355.5081	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	374.9301	274.7566	208.3185	87.5988	23.8406	0.0000	0.0000	0.0000	0.0000	91.3076	237.3300	385.1659	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9387	84.5209	83.7641	82.2575	80.6576	79.8000	79.8000	79.8000	79.8000	82.3096	84.1786	85.0212	(217)
Fuel for water heating, kWh/month	275.1175	244.3994	262.0528	235.1664	232.7696	212.3443	209.9929	218.2535	220.5242	237.9658	246.8257	271.9522	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.0522	-34.0491	-51.2340	-60.3739	-67.5059	-63.8722	-63.0931	-58.3837	-50.4758	-40.1585	-25.8892	-19.7533	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.6843	-18.6438	-37.7720	-57.7989	-77.4856	-78.2579	-77.3368	-64.9856	-46.9877	-27.0053	-11.7029	-6.8394	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1683.2481	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2867.3643	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1071.3411	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3789.6495	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1683.2481	0.2100	353.4821	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2867.3643	0.2100	602.1465	(264)
Space and water heating			955.6286	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	0.1336	-74.5440	
PV Unit electricity exported	-513.5003	0.1254	-64.3679	
Total			-138.9120	(269)
Total CO2, kg/year			861.0306	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.9300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1683.2481	1.1300	1902.0704	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2867.3643	1.1300	3240.1217	(278)
Space and water heating			5142.1920	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	1.4938	-833.3127	
PV Unit electricity exported	-513.5003	0.4601	-236.2611	
Total			-1069.5738	(283)
Total Primary energy kWh/year			4546.8779	(286)
Target Primary Energy Rate (TPER)			52.4400	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.65	**TER**	9.93
Environmental	99 A	**% DER < TER**			83.38
CO_2 Emissions (t/year)	0.12	**DFEE**	19.61	**TFEE**	23.82
Compliance Check	See BREL	**% DFEE < TFEE**			17.65
% DPER < TPER	59.18	**DPER**	21.41	**TPER**	52.44

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2257	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2878	0.2821	0.2765	0.2483	0.2426	0.2144	0.2144	0.2088	0.2257	0.2426	0.2539	0.2652	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5414	0.5398	0.5382	0.5308	0.5294	0.5230	0.5230	0.5218	0.5255	0.5294	0.5322	0.5352	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		18083.8300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							208.5794	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9510	37.8383	37.7278	37.2089	37.1118	36.6599	36.6599	36.5762	36.8339	37.1118	37.3082	37.5135	(38)
Heat transfer coeff	65.3058	65.1931	65.0826	64.5637	64.4666	64.0147	64.0147	63.9310	64.1888	64.4666	64.6630	64.8684	(39)
Average = Sum(39)m / 12 =												64.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7532	0.7519	0.7507	0.7447	0.7436	0.7383	0.7383	0.7374	0.7404	0.7436	0.7458	0.7482	(40)
HLP (average)												0.7447	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
									Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)											908	(64)

Electric shower(s)

54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =					614.3496	(64a)

Heat gains from water heating, kWh/month

37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(76)
East	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(76)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	545.1343	624.6069	686.9038	773.6007	821.2924	817.0482	782.1979	728.3014	668.6668	584.4747	536.9133	522.5689	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.9194	77.0524	77.1832	77.8035	77.9207	78.4708	78.4708	78.5736	78.2580	77.9207	77.6840	77.4381	
alpha	6.1280	6.1368	6.1455	6.1869	6.1947	6.2314	6.2314	6.2382	6.2172	6.1947	6.1789	6.1625	
util living area	0.9928	0.9828	0.9569	0.8650	0.6987	0.4980	0.3597	0.4030	0.6442	0.9127	0.9829	0.9944	(86)

MIT	20.1474	20.3236	20.5553	20.8258	20.9600	20.9957	20.9995	20.9990	20.9811	20.7869	20.4232	20.1142	(87)
Th 2	20.2940	20.2952	20.2963	20.3015	20.3025	20.3071	20.3071	20.3079	20.3053	20.3025	20.3005	20.2985	(88)
util rest of house	0.9910	0.9787	0.9469	0.8386	0.6548	0.4455	0.3033	0.3428	0.5858	0.8884	0.9781	0.9929	(89)
MIT 2	19.5115	19.6862	19.9120	20.1657	20.2764	20.3050	20.3069	20.3076	20.2951	20.1373	19.7900	19.4822	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.7104	19.8856	20.1132	20.3722	20.4902	20.5210	20.5236	20.5239	20.5097	20.3405	19.9880	19.6799	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7104	19.8856	20.1132	20.3722	20.4902	20.5210	20.5236	20.5239	20.5097	20.3405	19.9880	19.6799	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9892	0.9758	0.9439	0.8415	0.6669	0.4618	0.3209	0.3616	0.6034	0.8899	0.9754	0.9914	(94)
Useful gains	539.2247	609.5155	648.3454	650.9535	547.7288	377.3310	251.0226	263.3471	403.4594	520.1241	523.7266	518.0501	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1006.3914	976.9551	885.9846	740.6854	566.6755	379.0332	251.1663	263.6444	411.4276	627.9374	833.3797	1004.1547	(97)
Space heating kWh	347.5720	246.9194	176.8036	64.6070	14.0964	0.0000	0.0000	0.0000	0.0000	80.2131	222.9502	361.6619	(98a)
Space heating requirement - total per year (kWh/year)												1514.8235	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	347.5720	246.9194	176.8036	64.6070	14.0964	0.0000	0.0000	0.0000	0.0000	80.2131	222.9502	361.6619	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1514.8235	
Space heating per m2											(98c) / (4) =	17.4720	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	601.7381	473.7088	485.8756	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9701	0.9885	0.9812	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	583.7487	468.2440	476.7501	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	890.8770	853.1757	792.9430	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	221.1324	286.3892	235.2475	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	55.2831	71.5973	58.8119	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												185.6923	(107)
Energy for space heating												17.4720	(99)
Energy for space cooling												2.1418	(108)
Total												19.6138	(109)
Fabric Energy Efficiency (DFEE)												19.6	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
Heatloss Floor 1			43.3500	0.1300	5.6355			(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1247			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	6.2700	0.0500	0.3135
E2 Other lintels (including other steel lintels)	2.5200	0.0500	0.1260
E3 Sill	20.7200	0.0500	1.0360
E4 Jamb	13.5400	0.0000	0.0000
E6 Intermediate floor within a dwelling	6.7700	0.1600	1.0832
E5 Ground floor (normal)	22.0000	0.0600	1.3200
E18 Party wall between dwellings	12.6600	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	19.4300	0.0800	1.5544
P1 Party wall - Ground floor	6.7700	0.0200	0.1354
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0700	0.4739
E7 Party floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0424 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.1671 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	71.4535	71.2501	71.0507	70.1143	69.9391	69.1235	69.1235	68.9725	69.4377	69.9391	70.2935	70.6641	(39)
Average = Sum(39)m / 12 =												70.1135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8241	0.8218	0.8195	0.8087	0.8067	0.7973	0.7973	0.7955	0.8009	0.8067	0.8108	0.8150	(40)
HLP (average)												0.8087	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122 (71)

Water heating gains (Table 5)

	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778 (72)

Total internal gains

	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(76)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088 (83)
Total gains	533.6898	602.2192	650.0344	719.8289	755.3931	749.5884	717.9735	673.1335	625.7862	557.9097	522.6435	513.1575 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3015	70.5022	70.7000	71.6442	71.8237	72.6712	72.6712	72.8303	72.3424	71.8237	71.4616	71.0868	
alpha	5.6868	5.7001	5.7133	5.7763	5.7882	5.8447	5.8447	5.8554	5.8228	5.7882	5.7641	5.7391	
util living area	0.9943	0.9878	0.9722	0.9127	0.7821	0.5788	0.4220	0.4683	0.7204	0.9399	0.9872	0.9954	(86)
MIT	19.9881	20.1562	20.3911	20.7067	20.9086	20.9869	20.9982	20.9968	20.9566	20.6888	20.2937	19.9650	(87)
Th 2	20.2325	20.2345	20.2365	20.2458	20.2475	20.2557	20.2557	20.2572	20.2526	20.2475	20.2440	20.2403	(88)
util rest of house	0.9928	0.9847	0.9650	0.8915	0.7378	0.5159	0.3514	0.3942	0.6574	0.9205	0.9834	0.9942	(89)
MIT 2	19.3031	19.4712	19.7034	20.0101	20.1855	20.2492	20.2551	20.2561	20.2282	20.0005	19.6160	19.2865	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.5174	19.6854	19.9185	20.2280	20.4117	20.4800	20.4876	20.4878	20.4560	20.2158	19.8280	19.4988	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5174	19.6854	19.9185	20.2280	20.4117	20.4800	20.4876	20.4878	20.4560	20.2158	19.8280	19.4988	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9910	0.9819	0.9614	0.8909	0.7480	0.5352	0.3735	0.4174	0.6753	0.9196	0.9807	0.9927	(94)
Useful gains	528.9006	591.3161	624.9258	641.3079	565.0433	401.1637	268.1836	280.9411	422.5869	513.0475	512.5746	509.3875	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1087.3358	1053.4647	953.3951	794.2554	609.2891	406.4436	268.7227	281.9472	441.3491	672.5188	894.6974	1081.0736	(97)
Space heating kWh	415.4757	310.5639	244.3812	110.1222	32.9189	0.0000	0.0000	0.0000	0.0000	118.6466	275.1285	425.3345	(98a)
Space heating requirement - total per year (kWh/year)												1932.5715	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	415.4757	310.5639	244.3812	110.1222	32.9189	0.0000	0.0000	0.0000	0.0000	118.6466	275.1285	425.3345	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1932.5715	
Space heating per m2										(98c) / (4) =		22.2903	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	649.7609	511.5139	524.1907	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9306	0.9687	0.9544	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	604.6778	495.5119	500.2837	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	812.0280	778.1082	728.4611	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	149.2922	210.2516	169.7640	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	37.3230	52.5629	42.4410	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												132.3270	(107)
Energy for space heating												22.2903	(99)
Energy for space cooling												1.5263	(108)
Total												23.8166	(109)
Fabric Energy Efficiency (TFEE)												23.8	(109)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.65	**TER**	9.93
Environmental	99 A	**% DER < TER**			83.38
CO_2 Emissions (t/year)	0.12	**DFEE**	19.61	**TFEE**	23.82
Compliance Check	See BREL	**% DFEE < TFEE**			17.65
% DPER < TPER	59.18	**DPER**	21.41	**TPER**	52.44

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17650.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 203.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
12Total per year (kWh/year)												2752	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(76)
East	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(76)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201 (83)
Total gains	652.0784	730.2946	789.6905	869.3922	912.9689	904.3786	866.5575	814.6416	757.3995	678.0557	637.1713	628.5612 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	
alpha	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	
util living area	0.9792	0.9585	0.9131	0.7944	0.6214	0.4401	0.3167	0.3520	0.5611	0.8423	0.9566	0.9831	(86)
MIT	20.3560	20.5138	20.7068	20.8972	20.9792	20.9978	20.9998	20.9996	20.9911	20.8757	20.5885	20.3132	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house	0.9747	0.9501	0.8968	0.7638	0.5803	0.3942	0.2681	0.3004	0.5089	0.8097	0.9463	0.9794	(89)
MIT 2	19.5774	19.7734	20.0073	20.2235	20.3063	20.3221	20.3233	20.3232	20.3174	20.2052	19.8684	19.5237	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8209	20.0050	20.2261	20.4342	20.5168	20.5334	20.5349	20.5348	20.5281	20.4149	20.0937	19.7707	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8209	20.0050	20.2261	20.4342	20.5168	20.5334	20.5349	20.5348	20.5281	20.4149	20.0937	19.7707	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9706	0.9456	0.8943	0.7690	0.5922	0.4085	0.2833	0.3166	0.5248	0.8144	0.9423	0.9756	(94)
Useful gains	632.9262	690.5459	706.2003	668.5908	540.6690	369.4323	245.4840	257.8883	397.5186	552.2070	600.4044	613.2422	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	968.5573	942.6040	856.5525	719.7730	550.1974	370.2664	245.5515	258.0238	401.1349	612.4828	810.8472	971.6605	(97)
Space heating kWh	249.7095	169.3831	111.8620	36.8511	7.0892	0.0000	0.0000	0.0000	0.0000	44.8452	151.5189	266.6632	(98a)
Space heating requirement - total per year (kWh/year)												1037.9222	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	249.7095	169.3831	111.8620	36.8511	7.0892	0.0000	0.0000	0.0000	0.0000	44.8452	151.5189	266.6632	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1037.9222	
Space heating per m2											(98c) / (4) =	11.9714	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	249.7095	169.3831	111.8620	36.8511	7.0892	0.0000	0.0000	0.0000	0.0000	44.8452	151.5189	266.6632	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	374.5643	254.0746	167.7930	55.2767	10.6338	0.0000	0.0000	0.0000	0.0000	67.2678	227.2783	399.9948	
Space heating requirement	374.5643	254.0746	167.7930	55.2767	10.6338	0.0000	0.0000	0.0000	0.0000	67.2678	227.2783	399.9948	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1556.8833	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												15.5688	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4975.9841	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1515.8358	0.1576	65.4275	(367)
Electrical energy for heat distribution (space & water)	15.5688	0.0000	8.2692	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			228.7810	(373)
Space and water heating			228.7810	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			143.2061	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1515.8358	1.5834	657.3707	(467)
Electrical energy for heat distribution (space & water)	15.5688	0.0000	87.4306	(472)
Overall CO2 factor for heat network			0.4255	(486)
Total CO2 associated with community systems			2418.9139	(473)
Space and water heating			2418.9139	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1855.9706	(483)
Dwelling Primary energy Rate (DPER)			21.4100	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
Heatloss Floor 1			43.3500	0.1300	5.6355			(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1247			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E5 Ground floor (normal)	6.7700	0.1600	1.0832
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P1 Party wall - Ground floor	19.4300	0.0800	1.5544
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0424 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.1671 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	71.4535	71.2501	71.0507	70.1143	69.9391	69.1235	69.1235	68.9725	69.4377	69.9391	70.2935	70.6641	(39)
Average = Sum(39)m / 12 =												70.1135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8241	0.8218	0.8195	0.8087	0.8067	0.7973	0.7973	0.7955	0.8009	0.8067	0.8108	0.8150	(40)
HLP (average)												0.8087	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
										Total per year (kWh/year) = Sum(64)m =		2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(76)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)
Total gains	634.2986	701.5715	746.4857	809.2850	840.7342	827.5835	792.9978	750.1384	705.1835	645.1554	616.5661	612.8145	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3015	70.5022	70.7000	71.6442	71.8237	72.6712	72.6712	72.8303	72.3424	71.8237	71.4616	71.0868	
alpha	5.6868	5.7001	5.7133	5.7763	5.7882	5.8447	5.8447	5.8554	5.8228	5.7882	5.7641	5.7391	
util living area	0.9869	0.9755	0.9506	0.8718	0.7256	0.5281	0.3827	0.4214	0.6547	0.8987	0.9728	0.9890	(86)
MIT	20.1338	20.2930	20.5099	20.7811	20.9380	20.9918	20.9989	20.9982	20.9732	20.7737	20.4221	20.1108	(87)
Th 2	20.2325	20.2345	20.2365	20.2458	20.2475	20.2557	20.2557	20.2572	20.2526	20.2475	20.2440	20.2403	(88)
util rest of house	0.9838	0.9698	0.9391	0.8450	0.6794	0.4693	0.3184	0.3541	0.5925	0.8711	0.9654	0.9863	(89)
MIT 2	19.2244	19.4263	19.6971	20.0263	20.1952	20.2506	20.2553	20.2564	20.2340	20.0258	19.5980	19.2015	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.5089	19.6974	19.9513	20.2624	20.4275	20.4824	20.4879	20.4884	20.4653	20.2597	19.8558	19.4860	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5089	19.6974	19.9513	20.2624	20.4275	20.4824	20.4879	20.4884	20.4653	20.2597	19.8558	19.4860	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9800	0.9649	0.9341	0.8456	0.6908	0.4874	0.3385	0.3752	0.6107	0.8716	0.9608	0.9829	(94)
Useful gains	621.5918	676.9382	697.2896	684.3671	580.8200	403.3397	268.4262	281.4173	430.6569	562.3167	592.4069	602.3346	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1086.7269	1054.3197	955.7277	796.6638	610.3965	406.6140	268.7448	281.9902	441.9886	675.5921	896.6507	1080.1680	(97)
Space heating kWh	346.0605	253.6004	192.2779	80.8537	22.0049	0.0000	0.0000	0.0000	0.0000	84.2769	219.0556	355.5081	(98a)
Space heating requirement - total per year (kWh/year)												1553.6380	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	346.0605	253.6004	192.2779	80.8537	22.0049	0.0000	0.0000	0.0000	0.0000	84.2769	219.0556	355.5081	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1553.6380	
Space heating per m2											(98c) / (4) =	17.9197	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	346.0605	253.6004	192.2779	80.8537	22.0049	0.0000	0.0000	0.0000	0.0000	84.2769	219.0556	355.5081	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	374.9301	274.7566	208.3185	87.5988	23.8406	0.0000	0.0000	0.0000	0.0000	91.3076	237.3300	385.1659	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9387	84.5209	83.7641	82.2575	80.6576	79.8000	79.8000	79.8000	79.8000	82.3096	84.1786	85.0212	(217)
Fuel for water heating, kWh/month	275.1175	244.3994	262.0528	235.1664	232.7696	212.3443	209.9929	218.2535	220.5242	237.9658	246.8257	271.9522	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.0522	-34.0491	-51.2340	-60.3739	-67.5059	-63.8722	-63.0931	-58.3837	-50.4758	-40.1585	-25.8892	-19.7533	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.6843	-18.6438	-37.7720	-57.7989	-77.4856	-78.2579	-77.3368	-64.9856	-46.9877	-27.0053	-11.7029	-6.8394	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1683.2481	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2867.3643	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1071.3411	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3789.6495	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1683.2481	0.2100	353.4821	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2867.3643	0.2100	602.1465	(264)
Space and water heating			955.6286	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	0.1336	-74.5440	
PV Unit electricity exported	-513.5003	0.1254	-64.3679	
Total			-138.9120	(269)
Total CO2, kg/year			861.0306	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.9300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1683.2481	1.1300	1902.0704	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2867.3643	1.1300	3240.1217	(278)
Space and water heating			5142.1920	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	1.4938	-833.3127	
PV Unit electricity exported	-513.5003	0.4601	-236.2611	
Total			-1069.5738	(283)
Total Primary energy kWh/year			4546.8779	(286)
Target Primary Energy Rate (TPER)			52.4400	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.65	**TER**	9.93
Environmental	99 A	**% DER < TER**			83.38
CO_2 Emissions (t/year)	0.12	**DFEE**	19.61	**TFEE**	23.82
Compliance Check	See BREL	**% DFEE < TFEE**			17.65
% DPER < TPER	59.18	**DPER**	21.41	**TPER**	52.44

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
									Total per year (kWh/year) = Sum(64)m =			2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(76)
East	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(76)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	706.5297	768.1759	833.8294	897.3119	933.0604	910.4848	872.9142	823.2320	769.6084	706.4837	673.4276	678.8029	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area	0.9712	0.9505	0.8969	0.7797	0.6102	0.4373	0.3144	0.3484	0.5533	0.8250	0.9472	0.9769	(86)
MIT	20.4434	20.5707	20.7545	20.9133	20.9828	20.9981	20.9998	20.9996	20.9925	20.8965	20.6410	20.3976	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house	0.9651	0.9407	0.8785	0.7482	0.5693	0.3917	0.2661	0.2973	0.5014	0.7906	0.9350	0.9719	(89)
MIT 2	19.6853	19.8421	20.0623	20.2402	20.3094	20.3223	20.3233	20.3233	20.3184	20.2266	19.9311	19.6283	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9224	20.0700	20.2788	20.4507	20.5201	20.5337	20.5349	20.5348	20.5293	20.4362	20.1532	19.8689	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9224	20.0700	20.2788	20.4507	20.5201	20.5337	20.5349	20.5348	20.5293	20.4362	20.1532	19.8689	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9609	0.9365	0.8772	0.7544	0.5813	0.4059	0.2812	0.3133	0.5173	0.7966	0.9316	0.9679	(94)
Useful gains	678.9085	719.4095	731.3969	676.9021	542.3988	369.5665	245.4983	257.9174	398.1471	562.8187	627.3317	656.9944	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	974.8915	946.6594	859.8430	720.8045	550.4004	370.2822	245.5532	258.0272	401.2087	613.8092	814.5609	977.7911	(97)
Space heating kWh	220.2114	152.7119	95.5639	31.6097	5.9532	0.0000	0.0000	0.0000	0.0000	37.9370	134.8051	238.6728	(98a)
Space heating requirement - total per year (kWh/year)												917.4649	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	220.2114	152.7119	95.5639	31.6097	5.9532	0.0000	0.0000	0.0000	0.0000	37.9370	134.8051	238.6728	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												917.4649	
Space heating per m2											(98c) / (4) =	10.5821	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	220.2114	152.7119	95.5639	31.6097	5.9532	0.0000	0.0000	0.0000	0.0000	37.9370	134.8051	238.6728	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	330.3170	229.0679	143.3458	47.4146	8.9298	0.0000	0.0000	0.0000	0.0000	56.9055	202.2076	358.0092	
Space heating requirement	330.3170	229.0679	143.3458	47.4146	8.9298	0.0000	0.0000	0.0000	0.0000	56.9055	202.2076	358.0092	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1376.1973	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												13.7620	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4795.2981	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1376.1973	4.4400	61.1032	(340a)
Space heating total			61.1032	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			269.6942	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7372 (357)
SAP value		88.0499
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1467.6529	0.1577	57.8697	(367)
Electrical energy for heat distribution (space & water)	13.7620	0.0000	7.9858	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			220.9398	(373)
Space and water heating			220.9398	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			135.3649	(383)
CO2 emissions per m2			1.5600	(384)
EI value			98.6227	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)

Average = Sum(39)m / 12 = 62.4033

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)

Total per year (kWh/year) = Sum(64)m = 2751.6674 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	7.4800	23.7835	0.7600	0.7000	0.7700	65.5876	(76)
East	1.7600	23.7835	0.7600	0.7000	0.7700	15.4324	(76)

Solar gains	81.0200	140.8292	228.1692	335.8028	395.8111	434.4066	405.9044	355.9037	279.8628	176.2264	99.5150	67.0100	(83)
Total gains	720.6439	778.1231	846.4545	918.7565	943.6137	950.5115	903.3528	856.6161	798.7845	727.4075	689.5188	690.7928	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area													
	0.9657	0.9434	0.8775	0.7484	0.5741	0.3803	0.2694	0.2986	0.5119	0.7847	0.9343	0.9726	(86)
MIT	20.4879	20.6061	20.7954	20.9335	20.9883	20.9992	20.9999	20.9999	20.9954	20.9265	20.6900	20.4405	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house													
	0.9585	0.9323	0.8564	0.7149	0.5324	0.3361	0.2227	0.2494	0.4609	0.7460	0.9195	0.9667	(89)
MIT 2	19.7406	19.8853	20.1096	20.2611	20.3143	20.3230	20.3234	20.3234	20.3204	20.2573	19.9899	19.6820	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9743	20.1108	20.3241	20.4714	20.5251	20.5345	20.5350	20.5350	20.5316	20.4666	20.2089	19.9193	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9743	20.1108	20.3241	20.4714	20.5251	20.5345	20.5350	20.5350	20.5316	20.4666	20.2089	19.9193	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9542	0.9284	0.8564	0.7225	0.5450	0.3499	0.2373	0.2648	0.4767	0.7545	0.9167	0.9625	(94)
Useful gains	687.6309	722.3789	724.9117	663.7583	514.2262	332.6205	214.3390	226.7993	380.7829	548.8609	632.0886	664.9114	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	959.4096	930.4829	831.4699	697.1320	519.5167	332.8923	214.3562	226.8346	382.6299	584.5089	793.0766	962.2142	(97)
Space heating kWh													
	202.2034	139.8458	79.2793	24.0291	3.9361	0.0000	0.0000	0.0000	0.0000	26.5221	115.9113	221.1932	(98a)
Space heating requirement - total per year (kWh/year)												812.9203	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	202.2034	139.8458	79.2793	24.0291	3.9361	0.0000	0.0000	0.0000	0.0000	26.5221	115.9113	221.1932	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												812.9203	
Space heating per m2											(98c) / (4) =	9.3762	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump-Space and Water	1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.5000 (306)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)
Space heating:	
Space heating requirement	

	202.2034	139.8458	79.2793	24.0291	3.9361	0.0000	0.0000	0.0000	0.0000	26.5221	115.9113	221.1932	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	303.3050	209.7688	118.9189	36.0436	5.9042	0.0000	0.0000	0.0000	0.0000	39.7831	173.8669	331.7899	
Space heating requirement													
	303.3050	209.7688	118.9189	36.0436	5.9042	0.0000	0.0000	0.0000	0.0000	39.7831	173.8669	331.7899	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)

Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year	
Space heating fuel - community heating	1219.3805 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	12.1938 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)	
mechanical ventilation fans (SFP = 0.1292)	33.4924 (330a)
Total electricity for the above, kWh/year	33.4924 (331)
Electricity for lighting (calculated in Appendix L)	216.3282 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4541.9552 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1219.3805	6.5500	79.8694	(340a)
Space heating total			79.8694	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			343.1745	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1425.8351	0.1582	51.4336	(367)
Electrical energy for heat distribution (space & water)	12.1938	0.0000	7.7444	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			214.2623	(373)
Space and water heating			214.2623	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			116.4294	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1425.8351	1.5855	515.5619	(467)
Electrical energy for heat distribution (space & water)	12.1938	0.0000	82.1128	(472)
Overall CO2 factor for heat network			0.4249	(486)
Total CO2 associated with community systems			2271.7872	(473)
Space and water heating			2271.7872	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1627.9520	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - West

Current energy efficiency rating: B 88
Current environmental impact rating: A 99

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£71	£71	£0
Community scheme	£454	£454	£0
Space heating	£193	£193	£0
Water heating	£270	£270	£0
Lighting	£62	£62	£0
Generated (PV)	-£182	-£182	£0
Total cost of fuels	£343	£343	£0
Total cost of uses	£343	£343	£0
Delivered energy	52 kWh/m²	52 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	19 kWh/m²	19 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5778 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day)	126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	

Distribution loss (46)m = 0.15 x (45)m

32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss / Combi loss

Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS / PV diverter / Solar input / FGHRS

Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
									Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(76)
East	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	706.5297	768.1759	833.8294	897.3119	933.0604	910.4848	872.9142	823.2320	769.6084	706.4837	673.4276	678.8029	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area	0.9712	0.9505	0.8969	0.7797	0.6102	0.4373	0.3144	0.3484	0.5533	0.8250	0.9472	0.9769	(86)
MIT	20.4434	20.5707	20.7545	20.9133	20.9828	20.9981	20.9998	20.9996	20.9925	20.8965	20.6410	20.3976	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house	0.9651	0.9407	0.8785	0.7482	0.5693	0.3917	0.2661	0.2973	0.5014	0.7906	0.9350	0.9719	(89)
MIT 2	19.6853	19.8421	20.0623	20.2402	20.3094	20.3223	20.3233	20.3233	20.3184	20.2266	19.9311	19.6283	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.9224	20.0700	20.2788	20.4507	20.5201	20.5337	20.5349	20.5348	20.5293	20.4362	20.1532	19.8689	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9224	20.0700	20.2788	20.4507	20.5201	20.5337	20.5349	20.5348	20.5293	20.4362	20.1532	19.8689	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9609	0.9365	0.8772	0.7544	0.5813	0.4059	0.2812	0.3133	0.5173	0.7966	0.9316	0.9679	(94)
Useful gains	678.9085	719.4095	731.3969	676.9021	542.3988	369.5665	245.4983	257.9174	398.1471	562.8187	627.3317	656.9944	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	974.8915	946.6594	859.8430	720.8045	550.4004	370.2822	245.5532	258.0272	401.2087	613.8092	814.5609	977.7911	(97)
Space heating kWh	220.2114	152.7119	95.5639	31.6097	5.9532	0.0000	0.0000	0.0000	0.0000	37.9370	134.8051	238.6728	(98a)
Space heating requirement - total per year (kWh/year)												917.4649	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	220.2114	152.7119	95.5639	31.6097	5.9532	0.0000	0.0000	0.0000	0.0000	37.9370	134.8051	238.6728	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												917.4649	
Space heating per m2										(98c) / (4) =		10.5821	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	220.2114	152.7119	95.5639	31.6097	5.9532	0.0000	0.0000	0.0000	0.0000	37.9370	134.8051	238.6728	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	330.3170	229.0679	143.3458	47.4146	8.9298	0.0000	0.0000	0.0000	0.0000	56.9055	202.2076	358.0092	
Space heating requirement													
	330.3170	229.0679	143.3458	47.4146	8.9298	0.0000	0.0000	0.0000	0.0000	56.9055	202.2076	358.0092	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1376.1973	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)

Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	13.7620	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4795.2981	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1376.1973	4.4400	61.1032	(340a)
Space heating total			61.1032	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			269.6942	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.7372	(357)
SAP value	88.0499	
SAP rating (Section 12)	88	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1467.6529	0.1577	57.8697	(367)
Electrical energy for heat distribution (space & water)	13.7620	0.0000	7.9858	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			220.9398	(373)
Space and water heating			220.9398	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			135.3649	(383)
CO2 emissions per m2			1.5600	(384)
EI value			98.6227	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5778	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	7.4800	23.7835	0.7600	0.7000	0.7700	65.5876	(76)
East	1.7600	23.7835	0.7600	0.7000	0.7700	15.4324	(76)

Solar gains	81.0200	140.8292	228.1692	335.8028	395.8111	434.4066	405.9044	355.9037	279.8628	176.2264	99.5150	67.0100	(83)
Total gains	720.6439	778.1231	846.4545	918.7565	943.6137	950.5115	903.3528	856.6161	798.7845	727.4075	689.5188	690.7928	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area													
	0.9657	0.9434	0.8775	0.7484	0.5741	0.3803	0.2694	0.2986	0.5119	0.7847	0.9343	0.9726	(86)
MIT	20.4879	20.6061	20.7954	20.9335	20.9883	20.9992	20.9999	20.9999	20.9954	20.9265	20.6900	20.4405	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house													
	0.9585	0.9323	0.8564	0.7149	0.5324	0.3361	0.2227	0.2494	0.4609	0.7460	0.9195	0.9667	(89)
MIT 2	19.7406	19.8853	20.1096	20.2611	20.3143	20.3230	20.3234	20.3234	20.3204	20.2573	19.9899	19.6820	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9743	20.1108	20.3241	20.4714	20.5251	20.5345	20.5350	20.5350	20.5316	20.4666	20.2089	19.9193	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9743	20.1108	20.3241	20.4714	20.5251	20.5345	20.5350	20.5350	20.5316	20.4666	20.2089	19.9193	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9542	0.9284	0.8564	0.7225	0.5450	0.3499	0.2373	0.2648	0.4767	0.7545	0.9167	0.9625	(94)
Useful gains	687.6309	722.3789	724.9117	663.7583	514.2262	332.6205	214.3390	226.7993	380.7829	548.8609	632.0886	664.9114	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	959.4096	930.4829	831.4699	697.1320	519.5167	332.8923	214.3562	226.8346	382.6299	584.5089	793.0766	962.2142	(97)
Space heating kWh													
	202.2034	139.8458	79.2793	24.0291	3.9361	0.0000	0.0000	0.0000	0.0000	26.5221	115.9113	221.1932	(98a)
Space heating requirement - total per year (kWh/year)												812.9203	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	202.2034	139.8458	79.2793	24.0291	3.9361	0.0000	0.0000	0.0000	0.0000	26.5221	115.9113	221.1932	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												812.9203	
Space heating per m2											(98c) / (4) =	9.3762	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement													
	202.2034	139.8458	79.2793	24.0291	3.9361	0.0000	0.0000	0.0000	0.0000	26.5221	115.9113	221.1932	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	303.3050	209.7688	118.9189	36.0436	5.9042	0.0000	0.0000	0.0000	0.0000	39.7831	173.8669	331.7899	
Space heating requirement													
	303.3050	209.7688	118.9189	36.0436	5.9042	0.0000	0.0000	0.0000	0.0000	39.7831	173.8669	331.7899	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1219.3805	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												12.1938	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1054.7470	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4541.9552	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1219.3805	6.5500	79.8694	(340a)
Space heating total			79.8694	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			343.1745	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1425.8351	0.1582	51.4336	(367)
Electrical energy for heat distribution (space & water)	12.1938	0.0000	7.7444	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			214.2623	(373)
Space and water heating			214.2623	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			116.4294	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)

Space and Water heating from Heat pump	1425.8351	1.5855	515.5619	(467)
Electrical energy for heat distribution (space & water)	12.1938	0.0000	82.1128	(472)
Overall CO2 factor for heat network			0.4249	(486)
Total CO2 associated with community systems			2271.7872	(473)
Space and water heating			2271.7872	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1627.9520	(483)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	84 B	**DER**	2.83	**TER**	9.27
Environmental	98 A	**% DER < TER**			69.47
CO_2 Emissions (t/year)	0.23	**DFEE**	15.84	**TFEE**	19.14
Compliance Check	See BREL	**% DFEE < TFEE**			17.26
% DPER < TPER	39.04	**DPER**	30.03	**TPER**	49.26

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers
67.4410 66.4275 64.9507 62.1249 60.0396 57.7140 56.3922 57.8579 59.4646 61.9615 64.8480 67.1826 (42a)
Hot water usage for baths
29.1251 28.6925 28.0834 26.9603 26.1193 25.1868 24.6831 25.2880 25.9466 26.9444 28.0906 29.0266 (42b)
Hot water usage for other uses
41.0293 39.5373 38.0453 36.5534 35.0614 33.5694 33.5694 35.0614 36.5534 38.0453 39.5373 41.0293 (42c)
Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	

Distribution loss (46)m = 0.15 x (45)m
32.6876 28.7625 30.2196 25.7989 24.4779 21.4821 20.7979 21.9548 22.5592 25.8407 28.3104 32.2324 (46)
Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 (56)
If cylinder contains dedicated solar storage
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 (57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month
273.1943 241.6777 256.7410 225.4866 218.4626 196.7075 193.9297 201.6421 203.8882 227.5485 242.2299 270.1592 (62)

WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h
273.1943 241.6777 256.7410 225.4866 218.4626 196.7075 193.9297 201.6421 203.8882 227.5485 242.2299 270.1592 (64)
Total per year (kWh/year) = Sum(64)m = 2751.6674 (64)
12Total per year (kWh/year) 2752 (64)
Electric shower(s)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month
116.6790 103.6989 111.2083 99.9826 98.4807 90.4135 90.3235 92.8879 92.8011 101.5018 105.5497 115.6698 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	652.0784	730.2946	789.6905	869.3922	912.9689	904.3786	866.5575	814.6416	757.3995	678.0557	637.1713	628.5612	(84)

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7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area	0.9652	0.9339	0.8716	0.7324	0.5591	0.3925	0.2821	0.3136	0.5027	0.7855	0.9310	0.9714	(86)
MIT	20.4706	20.6231	20.7918	20.9369	20.9888	20.9989	20.9999	20.9998	20.9954	20.9198	20.6824	20.4275	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house	0.9589	0.9231	0.8531	0.7034	0.5245	0.3556	0.2432	0.2723	0.4598	0.7530	0.9180	0.9661	(89)
MIT 2	19.7815	19.9685	20.1697	20.3317	20.3839	20.3927	20.3933	20.3933	20.3901	20.3170	20.0437	19.7278	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9970	20.1732	20.3643	20.5210	20.5731	20.5823	20.5830	20.5830	20.5794	20.5055	20.2435	19.9467	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9970	20.1732	20.3643	20.5210	20.5731	20.5823	20.5830	20.5830	20.5794	20.5055	20.2435	19.9467	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9542	0.9188	0.8522	0.7096	0.5349	0.3671	0.2554	0.2852	0.4730	0.7593	0.9145	0.9616	(94)
Useful gains	622.2063	670.9826	672.9501	616.9622	488.3069	332.0142	221.2813	232.3592	358.2729	514.8198	582.6685	604.4037	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	872.1794	848.6313	770.3487	645.7029	493.0207	332.3965	221.3114	232.4203	360.0175	550.3839	730.2945	874.9365	(97)
Space heating kWh	185.9800	119.3799	72.4646	20.6933	3.5071	0.0000	0.0000	0.0000	0.0000	26.4597	106.2907	201.2764	(98a)
Space heating requirement - total per year (kWh/year)												736.0516	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	185.9800	119.3799	72.4646	20.6933	3.5071	0.0000	0.0000	0.0000	0.0000	26.4597	106.2907	201.2764	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												736.0516	
Space heating per m2											(98c) / (4) =	8.4896	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	185.9800	119.3799	72.4646	20.6933	3.5071	0.0000	0.0000	0.0000	0.0000	26.4597	106.2907	201.2764	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	278.9699	179.0698	108.6969	31.0400	5.2606	0.0000	0.0000	0.0000	0.0000	39.6896	159.4361	301.9146	
Space heating requirement	278.9699	179.0698	108.6969	31.0400	5.2606	0.0000	0.0000	0.0000	0.0000	39.6896	159.4361	301.9146	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1104.0774	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												11.0408	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5481.3991	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1395.0876	0.1581	46.5525	(367)
Electrical energy for heat distribution (space & water)	11.0408	0.0000	7.5614	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			209.1981	(373)
Space and water heating			209.1981	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Total CO2, kg/year			245.0668	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.8300	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1395.0876	1.5853	466.7424	(467)
Electrical energy for heat distribution (space & water)	11.0408	0.0000	80.2821	(472)
Overall CO2 factor for heat network			0.4246	(486)
Total CO2 associated with community systems			2221.1370	(473)
Space and water heating			2221.1370	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Total Primary energy kWh/year			2603.6158	(483)
Dwelling Primary energy Rate (DPER)			30.0300	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4892			(33)
Main dwelling								

Party Wall	79.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	13.5400	0.0700	0.9478
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.0900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8787 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.3679 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	63.6543	63.4509	63.2515	62.3151	62.1399	61.3243	61.3243	61.1733	61.6385	62.1399	62.4943	62.8649	(39)
Average = Sum(39)m / 12 =												62.3143	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7342	0.7318	0.7295	0.7187	0.7167	0.7073	0.7073	0.7056	0.7109	0.7167	0.7208	0.7251	(40)
HLP (average)												0.7187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
										Total per year (kWh/year) = Sum(64)m =		2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(80)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)
Total gains	634.2986	701.5715	746.4857	809.2850	840.7342	827.5835	792.9978	750.1384	705.1835	645.1554	616.5661	612.8145	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4565	69.6791	69.8987	70.9491	71.1492	72.0954	72.0954	72.2734	71.7280	71.1492	70.7457	70.3287	
alpha	5.6304	5.6453	5.6599	5.7299	5.7433	5.8064	5.8064	5.8182	5.7819	5.7433	5.7164	5.6886	
util living area													
	0.9772	0.9591	0.9222	0.8197	0.6603	0.4709	0.3398	0.3743	0.5898	0.8524	0.9546	0.9805	(86)
MIT	20.2328	20.3960	20.6036	20.8425	20.9604	20.9952	20.9994	20.9990	20.9837	20.8325	20.5134	20.2101	(87)
Th 2	20.3107	20.3128	20.3148	20.3243	20.3261	20.3344	20.3344	20.3359	20.3312	20.3261	20.3225	20.3187	(88)
util rest of house													
	0.9727	0.9513	0.9080	0.7918	0.6193	0.4232	0.2886	0.3207	0.5371	0.8225	0.9447	0.9766	(89)
MIT 2	19.4173	19.6225	19.8789	20.1658	20.2918	20.3312	20.3341	20.3354	20.3193	20.1616	19.7789	19.3951	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.6724	19.8645	20.1056	20.3774	20.5009	20.5389	20.5422	20.5430	20.5271	20.3715	20.0086	19.6500	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6724	19.8645	20.1056	20.3774	20.5009	20.5389	20.5422	20.5430	20.5271	20.3715	20.0086	19.6500	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9675	0.9454	0.9032	0.7941	0.6301	0.4380	0.3046	0.3375	0.5528	0.8247	0.9393	0.9718	(94)
Useful gains	613.7056	663.2556	674.2084	642.6879	529.7738	362.4578	241.5837	253.1356	389.8443	532.0560	579.1531	595.5527	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	978.5208	949.5103	860.5766	715.2179	546.8866	364.2008	241.7535	253.4398	396.1594	607.1981	806.7171	971.2628	(97)
Space heating kWh													
	271.4225	192.3632	138.6579	52.2216	12.7319	0.0000	0.0000	0.0000	0.0000	55.9057	163.8461	279.5283	(98a)
Space heating requirement - total per year (kWh/year)												1166.6772	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	271.4225	192.3632	138.6579	52.2216	12.7319	0.0000	0.0000	0.0000	0.0000	55.9057	163.8461	279.5283	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1166.6772	
Space heating per m2											(98c) / (4) =	13.4565	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	271.4225	192.3632	138.6579	52.2216	12.7319	0.0000	0.0000	0.0000	0.0000	55.9057	163.8461	279.5283	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	294.0655	208.4108	150.2252	56.5781	13.7941	0.0000	0.0000	0.0000	0.0000	60.5695	177.5147	302.8476	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.3964	83.9003	83.0590	81.5571	80.3170	79.8000	79.8000	79.8000	79.8000	81.6372	83.5327	84.4864	(217)
Fuel for water heating, kWh/month													
	276.8852	246.2073	264.2776	237.1858	233.7569	212.3443	209.9929	218.2535	220.5242	239.9258	248.7341	273.6737	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1264.0056	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2881.7612	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:

Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3599.0721	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1264.0056	0.2100	265.4412	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2881.7612	0.2100	605.1699	(264)
Space and water heating			870.6110	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			803.7093	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.2700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1264.0056	1.1300	1428.3263	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2881.7612	1.1300	3256.3902	(278)
Space and water heating			4684.7165	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4270.9436	(286)
Target Primary Energy Rate (TPER)			49.2600	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	84 B	**DER**	2.83	**TER**	9.27
Environmental	98 A	**% DER < TER**			69.47
CO_2 Emissions (t/year)	0.23	**DFEE**	15.84	**TFEE**	19.14
Compliance Check	See BREL	**% DFEE < TFEE**			17.26
% DPER < TPER	39.04	**DPER**	30.03	**TPER**	49.26

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		3 * 10 =	30.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1412	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.2912	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2257	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2878	0.2821	0.2765	0.2483	0.2426	0.2144	0.2144	0.2088	0.2257	0.2426	0.2539	0.2652	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5414	0.5398	0.5382	0.5308	0.5294	0.5230	0.5230	0.5218	0.5255	0.5294	0.5322	0.5352	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15916.3300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							183.5794	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9510	37.8383	37.7278	37.2089	37.1118	36.6599	36.6599	36.5762	36.8339	37.1118	37.3082	37.5135	(38)
Heat transfer coeff	58.4658	58.3531	58.2426	57.7237	57.6266	57.1747	57.1747	57.0910	57.3488	57.6266	57.8230	58.0284	(39)
Average = Sum(39)m / 12 =												57.7233	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6743	0.6730	0.6718	0.6658	0.6647	0.6595	0.6595	0.6585	0.6615	0.6647	0.6669	0.6693	(40)
HLP (average)												0.6658	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =					614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	545.1343	624.6069	686.9038	773.6007	821.2924	817.0482	782.1979	728.3014	668.6668	584.4747	536.9133	522.5689	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.6203	75.7664	75.9101	76.5925	76.7215	77.3280	77.3280	77.4413	77.0932	76.7215	76.4609	76.1904	
alpha	6.0414	6.0511	6.0607	6.1062	6.1148	6.1552	6.1552	6.1628	6.1395	6.1148	6.0974	6.0794	
util living area	0.9867	0.9700	0.9305	0.8118	0.6350	0.4461	0.3214	0.3602	0.5819	0.8700	0.9699	0.9894	(86)

MIT	20.2292	20.4133	20.6387	20.8759	20.9747	20.9975	20.9997	20.9994	20.9884	20.8399	20.5016	20.1941	(87)
Th 2	20.3635	20.3647	20.3658	20.3712	20.3721	20.3768	20.3768	20.3776	20.3750	20.3721	20.3701	20.3680	(88)
util rest of house	0.9840	0.9641	0.9177	0.7846	0.5967	0.4033	0.2760	0.3116	0.5326	0.8430	0.9630	0.9872	(89)
MIT 2	19.6555	19.8367	20.0541	20.2740	20.3551	20.3755	20.3767	20.3774	20.3684	20.2480	19.9294	19.6246	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.8349	20.0171	20.2370	20.4623	20.5489	20.5700	20.5716	20.5720	20.5623	20.4332	20.1083	19.8027	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8349	20.0171	20.2370	20.4623	20.5489	20.5700	20.5716	20.5720	20.5623	20.4332	20.1083	19.8027	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9812	0.9604	0.9149	0.7888	0.6077	0.4166	0.2902	0.3268	0.5476	0.8458	0.9597	0.9847	(94)
Useful gains	534.8770	599.8596	628.4294	610.1828	499.0816	340.4100	226.9938	238.0202	366.1294	494.3458	515.2661	514.5863	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	908.2631	882.1289	800.0787	667.4170	509.9331	341.3344	227.0735	238.1838	370.6058	566.6520	752.1823	905.4017	(97)
Space heating kWh	277.7993	189.6850	127.7071	41.2086	8.0736	0.0000	0.0000	0.0000	0.0000	53.7958	170.5796	290.7667	(98a)
Space heating requirement - total per year (kWh/year)												1159.6156	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	277.7993	189.6850	127.7071	41.2086	8.0736	0.0000	0.0000	0.0000	0.0000	53.7958	170.5796	290.7667	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1159.6156	
Space heating per m2											(98c) / (4) =	13.3750	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	537.4421	423.0928	433.8916	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9818	0.9932	0.9888	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	527.6770	420.2290	429.0462	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	890.8770	853.1757	792.9430	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	261.5040	322.1124	270.7392	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	65.3760	80.5281	67.6848	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												213.5889	(107)
Energy for space heating												13.3750	(99)
Energy for space cooling												2.4635	(108)
Total												15.8386	(109)
Fabric Energy Efficiency (DFEE)												15.8	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4892			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	13.5400	0.0700	0.9478
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.0900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8787 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.3679 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff													
	63.6543	63.4509	63.2515	62.3151	62.1399	61.3243	61.3243	61.1733	61.6385	62.1399	62.4943	62.8649	(39)
Average = Sum(39)m / 12 =												62.3143	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7342	0.7318	0.7295	0.7187	0.7167	0.7073	0.7073	0.7056	0.7109	0.7167	0.7208	0.7251	(40)
HLP (average)												0.7187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses													
	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												64.3029	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)													
	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.3496	(64a)
Heat gains from water heating, kWh/month													
	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains													
	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(80)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)
Total gains	533.6898	602.2192	650.0344	719.8289	755.3931	749.5884	717.9735	673.1335	625.7862	557.9097	522.6435	513.1575	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4565	69.6791	69.8987	70.9491	71.1492	72.0954	72.0954	72.2734	71.7280	71.1492	70.7457	70.3287	
alpha	5.6304	5.6453	5.6599	5.7299	5.7433	5.8064	5.8064	5.8182	5.7819	5.7433	5.7164	5.6886	
util living area													
	0.9896	0.9786	0.9538	0.8704	0.7188	0.5177	0.3750	0.4165	0.6545	0.9066	0.9774	0.9915	(86)
MIT	20.0741	20.2513	20.4850	20.7785	20.9393	20.9923	20.9990	20.9982	20.9726	20.7557	20.3784	20.0503	(87)
Th 2	20.3107	20.3128	20.3148	20.3243	20.3261	20.3344	20.3344	20.3359	20.3312	20.3261	20.3225	20.3187	(88)
util rest of house													
	0.9874	0.9741	0.9442	0.8467	0.6777	0.4660	0.3187	0.3571	0.5991	0.8835	0.9719	0.9896	(89)
MIT 2	19.4587	19.6349	19.8641	20.1462	20.2842	20.3303	20.3340	20.3352	20.3152	20.1323	19.7695	19.4416	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.6512	19.8277	20.0584	20.3440	20.4891	20.5374	20.5420	20.5426	20.5209	20.3273	19.9600	19.6320	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6512	19.8277	20.0584	20.3440	20.4891	20.5374	20.5420	20.5426	20.5209	20.3273	19.9600	19.6320	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9847	0.9703	0.9401	0.8474	0.6880	0.4819	0.3363	0.3757	0.6152	0.8836	0.9684	0.9872	(94)
Useful gains	525.5027	584.3230	611.1006	609.9856	519.7004	361.2573	241.4534	252.8791	385.0027	492.9554	506.1062	506.6090	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	977.1671	947.1780	857.5870	713.1345	546.1555	364.1068	241.7420	253.4171	395.7713	604.4537	803.6748	970.1324	(97)
Space heating kWh													
	336.0384	243.8386	183.3859	74.2672	19.6826	0.0000	0.0000	0.0000	0.0000	82.9548	214.2494	344.8614	(98a)
Space heating requirement - total per year (kWh/year)												1499.2782	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	336.0384	243.8386	183.3859	74.2672	19.6826	0.0000	0.0000	0.0000	0.0000	82.9548	214.2494	344.8614	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1499.2782	
Space heating per m2											(98c) / (4) =	17.2927	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	576.4484	453.7998	464.9168	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9561	0.9813	0.9722	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	551.1187	445.3221	451.9778	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	812.0280	778.1082	728.4611	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	187.8547	247.5929	205.7036	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	46.9637	61.8982	51.4259	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												160.2878	(107)
Energy for space heating												17.2927	(99)
Energy for space cooling												1.8488	(108)
Total												19.1415	(109)
Fabric Energy Efficiency (TFEE)												19.1	(109)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	84 B	**DER**	2.83	**TER**	9.27
Environmental	98 A	**% DER < TER**			69.47
CO_2 Emissions (t/year)	0.23	**DFEE**	15.84	**TFEE**	19.14
Compliance Check	See BREL	**% DFEE < TFEE**			17.26
% DPER < TPER	39.04	**DPER**	30.03	**TPER**	49.26

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers
67.4410 66.4275 64.9507 62.1249 60.0396 57.7140 56.3922 57.8579 59.4646 61.9615 64.8480 67.1826 (42a)
Hot water usage for baths
29.1251 28.6925 28.0834 26.9603 26.1193 25.1868 24.6831 25.2880 25.9466 26.9444 28.0906 29.0266 (42b)
Hot water usage for other uses
41.0293 39.5373 38.0453 36.5534 35.0614 33.5694 33.5694 35.0614 36.5534 38.0453 39.5373 41.0293 (42c)
Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	

Distribution loss (46)m = 0.15 x (45)m
32.6876 28.7625 30.2196 25.7989 24.4779 21.4821 20.7979 21.9548 22.5592 25.8407 28.3104 32.2324 (46)
Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 (56)
If cylinder contains dedicated solar storage
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 (57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month
273.1943 241.6777 256.7410 225.4866 218.4626 196.7075 193.9297 201.6421 203.8882 227.5485 242.2299 270.1592 (62)

WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h
273.1943 241.6777 256.7410 225.4866 218.4626 196.7075 193.9297 201.6421 203.8882 227.5485 242.2299 270.1592 (64)
Total per year (kWh/year) = Sum(64)m = 2751.6674 (64)
12Total per year (kWh/year) 2752 (64)
Electric shower(s)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month
116.6790 103.6989 111.2083 99.9826 98.4807 90.4135 90.3235 92.8879 92.8011 101.5018 105.5497 115.6698 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	652.0784	730.2946	789.6905	869.3922	912.9689	904.3786	866.5575	814.6416	757.3995	678.0557	637.1713	628.5612	(84)

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7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area	0.9652	0.9339	0.8716	0.7324	0.5591	0.3925	0.2821	0.3136	0.5027	0.7855	0.9310	0.9714	(86)
MIT	20.4706	20.6231	20.7918	20.9369	20.9888	20.9989	20.9999	20.9998	20.9954	20.9198	20.6824	20.4275	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house	0.9589	0.9231	0.8531	0.7034	0.5245	0.3556	0.2432	0.2723	0.4598	0.7530	0.9180	0.9661	(89)
MIT 2	19.7815	19.9685	20.1697	20.3317	20.3839	20.3927	20.3933	20.3933	20.3901	20.3170	20.0437	19.7278	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9970	20.1732	20.3643	20.5210	20.5731	20.5823	20.5830	20.5830	20.5794	20.5055	20.2435	19.9467	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9970	20.1732	20.3643	20.5210	20.5731	20.5823	20.5830	20.5830	20.5794	20.5055	20.2435	19.9467	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9542	0.9188	0.8522	0.7096	0.5349	0.3671	0.2554	0.2852	0.4730	0.7593	0.9145	0.9616	(94)
Useful gains	622.2063	670.9826	672.9501	616.9622	488.3069	332.0142	221.2813	232.3592	358.2729	514.8198	582.6685	604.4037	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	872.1794	848.6313	770.3487	645.7029	493.0207	332.3965	221.3114	232.4203	360.0175	550.3839	730.2945	874.9365	(97)
Space heating kWh	185.9800	119.3799	72.4646	20.6933	3.5071	0.0000	0.0000	0.0000	0.0000	26.4597	106.2907	201.2764	(98a)
Space heating requirement - total per year (kWh/year)												736.0516	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	185.9800	119.3799	72.4646	20.6933	3.5071	0.0000	0.0000	0.0000	0.0000	26.4597	106.2907	201.2764	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												736.0516	
Space heating per m2											(98c) / (4) =	8.4896	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	185.9800	119.3799	72.4646	20.6933	3.5071	0.0000	0.0000	0.0000	0.0000	26.4597	106.2907	201.2764	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	278.9699	179.0698	108.6969	31.0400	5.2606	0.0000	0.0000	0.0000	0.0000	39.6896	159.4361	301.9146	
Space heating requirement	278.9699	179.0698	108.6969	31.0400	5.2606	0.0000	0.0000	0.0000	0.0000	39.6896	159.4361	301.9146	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1104.0774	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												11.0408	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5481.3991	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1395.0876	0.1581	46.5525	(367)
Electrical energy for heat distribution (space & water)	11.0408	0.0000	7.5614	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			209.1981	(373)
Space and water heating			209.1981	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Total CO2, kg/year			245.0668	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.8300	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1395.0876	1.5853	466.7424	(467)
Electrical energy for heat distribution (space & water)	11.0408	0.0000	80.2821	(472)
Overall CO2 factor for heat network			0.4246	(486)
Total CO2 associated with community systems			2221.1370	(473)
Space and water heating			2221.1370	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Total Primary energy kWh/year			2603.6158	(483)
Dwelling Primary energy Rate (DPER)			30.0300	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4892			(33)
Main dwelling								

Party Wall	79.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	13.5400	0.0700	0.9478
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.0900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8787 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.3679 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	63.6543	63.4509	63.2515	62.3151	62.1399	61.3243	61.3243	61.1733	61.6385	62.1399	62.4943	62.8649	(39)
Average = Sum(39)m / 12 =												62.3143	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7342	0.7318	0.7295	0.7187	0.7167	0.7073	0.7073	0.7056	0.7109	0.7167	0.7208	0.7251	(40)
HLP (average)												0.7187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
										Total per year (kWh/year) = Sum(64)m =		2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(80)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)
Total gains	634.2986	701.5715	746.4857	809.2850	840.7342	827.5835	792.9978	750.1384	705.1835	645.1554	616.5661	612.8145	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4565	69.6791	69.8987	70.9491	71.1492	72.0954	72.0954	72.2734	71.7280	71.1492	70.7457	70.3287	
alpha	5.6304	5.6453	5.6599	5.7299	5.7433	5.8064	5.8064	5.8182	5.7819	5.7433	5.7164	5.6886	
util living area													
	0.9772	0.9591	0.9222	0.8197	0.6603	0.4709	0.3398	0.3743	0.5898	0.8524	0.9546	0.9805	(86)
MIT	20.2328	20.3960	20.6036	20.8425	20.9604	20.9952	20.9994	20.9990	20.9837	20.8325	20.5134	20.2101	(87)
Th 2	20.3107	20.3128	20.3148	20.3243	20.3261	20.3344	20.3344	20.3359	20.3312	20.3261	20.3225	20.3187	(88)
util rest of house													
	0.9727	0.9513	0.9080	0.7918	0.6193	0.4232	0.2886	0.3207	0.5371	0.8225	0.9447	0.9766	(89)
MIT 2	19.4173	19.6225	19.8789	20.1658	20.2918	20.3312	20.3341	20.3354	20.3193	20.1616	19.7789	19.3951	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.6724	19.8645	20.1056	20.3774	20.5009	20.5389	20.5422	20.5430	20.5271	20.3715	20.0086	19.6500	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6724	19.8645	20.1056	20.3774	20.5009	20.5389	20.5422	20.5430	20.5271	20.3715	20.0086	19.6500	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9675	0.9454	0.9032	0.7941	0.6301	0.4380	0.3046	0.3375	0.5528	0.8247	0.9393	0.9718	(94)
Useful gains	613.7056	663.2556	674.2084	642.6879	529.7738	362.4578	241.5837	253.1356	389.8443	532.0560	579.1531	595.5527	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	978.5208	949.5103	860.5766	715.2179	546.8866	364.2008	241.7535	253.4398	396.1594	607.1981	806.7171	971.2628	(97)
Space heating kWh													
	271.4225	192.3632	138.6579	52.2216	12.7319	0.0000	0.0000	0.0000	0.0000	55.9057	163.8461	279.5283	(98a)
Space heating requirement - total per year (kWh/year)												1166.6772	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	271.4225	192.3632	138.6579	52.2216	12.7319	0.0000	0.0000	0.0000	0.0000	55.9057	163.8461	279.5283	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1166.6772	
Space heating per m2											(98c) / (4) =	13.4565	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	271.4225	192.3632	138.6579	52.2216	12.7319	0.0000	0.0000	0.0000	0.0000	55.9057	163.8461	279.5283	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	294.0655	208.4108	150.2252	56.5781	13.7941	0.0000	0.0000	0.0000	0.0000	60.5695	177.5147	302.8476	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.3964	83.9003	83.0590	81.5571	80.3170	79.8000	79.8000	79.8000	79.8000	81.6372	83.5327	84.4864	(217)
Fuel for water heating, kWh/month													
	276.8852	246.2073	264.2776	237.1858	233.7569	212.3443	209.9929	218.2535	220.5242	239.9258	248.7341	273.6737	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1264.0056	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2881.7612	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:

Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3599.0721	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1264.0056	0.2100	265.4412	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2881.7612	0.2100	605.1699	(264)
Space and water heating			870.6110	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			803.7093	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.2700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1264.0056	1.1300	1428.3263	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2881.7612	1.1300	3256.3902	(278)
Space and water heating			4684.7165	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4270.9436	(286)
Target Primary Energy Rate (TPER)			49.2600	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	84 B	**DER**	2.83	**TER**	9.27
Environmental	98 A	**% DER < TER**			69.47
CO_2 Emissions (t/year)	0.23	**DFEE**	15.84	**TFEE**	19.14
Compliance Check	See BREL	**% DFEE < TFEE**			17.26
% DPER < TPER	39.04	**DPER**	30.03	**TPER**	49.26

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201 (83)
Total gains	706.5297	768.1759	833.8294	897.3119	933.0604	910.4848	872.9142	823.2320	769.6084	706.4837	673.4276	678.8029 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9504	0.9194	0.8478	0.7146	0.5478	0.3899	0.2800	0.3103	0.4950	0.7634	0.9147	0.9594	(86)
MIT	20.5453	20.6661	20.8249	20.9449	20.9900	20.9990	20.9999	20.9998	20.9958	20.9317	20.7227	20.4996	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9421	0.9071	0.8277	0.6855	0.5137	0.3532	0.2414	0.2695	0.4526	0.7301	0.8996	0.9524	(89)
MIT 2	19.8732	20.0200	20.2072	20.3398	20.3849	20.3927	20.3933	20.3933	20.3903	20.3289	20.0911	19.8170	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0835	20.2221	20.4004	20.5291	20.5742	20.5823	20.5831	20.5830	20.5797	20.5175	20.2887	20.0305	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0835	20.2221	20.4004	20.5291	20.5742	20.5823	20.5831	20.5830	20.5797	20.5175	20.2887	20.0305	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9373	0.9032	0.8279	0.6921	0.5239	0.3647	0.2535	0.2823	0.4657	0.7372	0.8967	0.9475	(94)
Useful gains	662.2410	693.8477	690.3523	621.0549	488.8709	332.0304	221.2827	232.3633	358.4350	520.8163	603.8839	643.1916	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	876.9824	851.3467	772.3535	646.1499	493.0804	332.3982	221.3116	232.4208	360.0346	551.0482	732.8068	879.5958	(97)
Space heating kWh	159.7676	105.8393	61.0089	18.0685	3.1318	0.0000	0.0000	0.0000	0.0000	22.4926	92.8245	175.8847	(98a)
Space heating requirement - total per year (kWh/year)												639.0180	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	159.7676	105.8393	61.0089	18.0685	3.1318	0.0000	0.0000	0.0000	0.0000	22.4926	92.8245	175.8847	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												639.0180	
Space heating per m2											(98c) / (4) =	7.3704	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	159.7676	105.8393	61.0089	18.0685	3.1318	0.0000	0.0000	0.0000	0.0000	22.4926	92.8245	175.8847	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	239.6514	158.7590	91.5134	27.1027	4.6977	0.0000	0.0000	0.0000	0.0000	33.7389	139.2368	263.8271	
Space heating requirement													
	239.6514	158.7590	91.5134	27.1027	4.6977	0.0000	0.0000	0.0000	0.0000	33.7389	139.2368	263.8271	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												958.5270	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												9.5853	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5335.8487	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	958.5270	4.4400	42.5586	(340a)
Space heating total			42.5586	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Total energy cost			359.0151	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9814 (357)
SAP value		84.0921
SAP rating (Section 12)		84 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1356.2741	0.1581	40.4211	(367)
Electrical energy for heat distribution (space & water)	9.5853	0.0000	7.3315	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			202.8368	(373)
Space and water heating			202.8368	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Total CO2, kg/year			238.7055	(383)
CO2 emissions per m2			2.7500	(384)
EI value			97.5713	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation		0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)											Total = Sum(45)m =	2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)

Water heating gains (Table 5)

	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702 (72)
Total internal gains												
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	23.7835	0.7600	0.7000	0.7700	65.5876	(80)
West	1.7600	23.7835	0.7600	0.7000	0.7700	15.4324	(80)

Solar gains	81.0200	140.8292	228.1692	335.8028	395.8111	434.4066	405.9044	355.9037	279.8628	176.2264	99.5150	67.0100	(83)
Total gains	720.6439	778.1231	846.4545	918.7565	943.6137	950.5115	903.3528	856.6161	798.7845	727.4075	689.5188	690.7928	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9419	0.9093	0.8241	0.6822	0.5142	0.3388	0.2399	0.2659	0.4573	0.7198	0.8966	0.9526	(86)
MIT	20.5878	20.6979	20.8575	20.9586	20.9933	20.9996	21.0000	20.9999	20.9974	20.9531	20.7662	20.5412	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9323	0.8956	0.8018	0.6520	0.4799	0.3035	0.2026	0.2266	0.4159	0.6840	0.8790	0.9445	(89)
MIT 2	19.9253	20.0582	20.2443	20.3540	20.3879	20.3931	20.3933	20.3933	20.3916	20.3506	20.1424	19.8685	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.1325	20.2583	20.4361	20.5431	20.5773	20.5828	20.5831	20.5831	20.5811	20.5390	20.3375	20.0789	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1325	20.2583	20.4361	20.5431	20.5773	20.5828	20.5831	20.5831	20.5811	20.5390	20.3375	20.0789	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9277	0.8923	0.8034	0.6596	0.4904	0.3145	0.2142	0.2389	0.4288	0.6928	0.8773	0.9397	(94)
Useful gains	668.5372	694.3477	680.0767	606.0205	462.7143	298.9472	193.5231	204.6251	342.4828	503.9794	604.9046	649.1319	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	863.0398	836.6906	746.5566	624.7035	465.4699	299.0871	193.5323	204.6438	343.4411	524.4633	713.2949	865.6165	(97)
Space heating kWh													
	144.7099	95.6544	49.4611	13.4518	2.0502	0.0000	0.0000	0.0000	0.0000	15.2400	78.0410	161.0646	(98a)
Space heating requirement - total per year (kWh/year)												559.6730	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	144.7099	95.6544	49.4611	13.4518	2.0502	0.0000	0.0000	0.0000	0.0000	15.2400	78.0410	161.0646	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												559.6730	
Space heating per m2											(98c) / (4) =	6.4553	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	144.7099	95.6544	49.4611	13.4518	2.0502	0.0000	0.0000	0.0000	0.0000	15.2400	78.0410	161.0646	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	217.0649	143.4817	74.1916	20.1776	3.0753	0.0000	0.0000	0.0000	0.0000	22.8600	117.0615	241.5969	
Space heating requirement													
	217.0649	143.4817	74.1916	20.1776	3.0753	0.0000	0.0000	0.0000	0.0000	22.8600	117.0615	241.5969	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year												
Space heating fuel - community heating											839.5095	(307)
Space heating fuel - secondary											0.0000	(309)
Water heating fuel - community heating											4127.5010	(310)
Efficiency of water heater											0.0000	(311)
Electricity used for heat distribution											8.3951	(313)
Space cooling fuel											0.0000	(321)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)												
mechanical ventilation fans (SFP = 0.1292)											33.4924	(330a)
Total electricity for the above, kWh/year											33.4924	(331)
Electricity for lighting (calculated in Appendix L)											216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											0.0000	(333)
Wind generation											0.0000	(334)
Hydro-electric generation (Appendix N)											0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)											0.0000	(335)
Appendix Q - special features												
Energy saved or generated											-0.0000	(336)
Energy used											0.0000	(337)
Total delivered energy for all uses											5216.8312	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	839.5095	6.5500	54.9879	(340a)
Space heating total			54.9879	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Total energy cost			500.3632	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1324.5361	0.1586	35.5058	(367)
Electrical energy for heat distribution (space & water)	8.3951	0.0000	7.1471	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			197.7373	(373)
Space and water heating			197.7373	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Total CO2, kg/year			233.6059	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1324.5361	1.5871	355.2976	(467)
Electrical energy for heat distribution (space & water)	8.3951	0.0000	76.1029	(472)
Overall CO2 factor for heat network			0.4239	(486)
Total CO2 associated with community systems			2105.5131	(473)
Space and water heating			2105.5131	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Total Primary energy kWh/year			2487.9919	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Be Clean

Current energy efficiency rating: B 84
Current environmental impact rating: A 98

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 84
Potential environmental impact rating: A 98

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)

Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£71	£71	£0
Community scheme	£429	£429	£0
Space heating	£169	£169	£0
Water heating	£270	£270	£0
Lighting	£62	£62	£0
Total cost of fuels	£500	£500	£0
Total cost of uses	£501	£501	£0
Delivered energy	60 kWh/m²	60 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	3 kg/m²	3 kg/m²	0 kg/m²
Primary energy	29 kWh/m²	29 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15916.3300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	183.5794	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	1.4928	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 20.5148	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778	(42)
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	706.5297	768.1759	833.8294	897.3119	933.0604	910.4848	872.9142	823.2320	769.6084	706.4837	673.4276	678.8029	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047

util living area													
	0.9504	0.9194	0.8478	0.7146	0.5478	0.3899	0.2800	0.3103	0.4950	0.7634	0.9147	0.9594	(86)
MIT	20.5453	20.6661	20.8249	20.9449	20.9900	20.9990	20.9999	20.9998	20.9958	20.9317	20.7227	20.4996	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9421	0.9071	0.8277	0.6855	0.5137	0.3532	0.2414	0.2695	0.4526	0.7301	0.8996	0.9524	(89)
MIT 2	19.8732	20.0200	20.2072	20.3398	20.3849	20.3927	20.3933	20.3933	20.3903	20.3289	20.0911	19.8170	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0835	20.2221	20.4004	20.5291	20.5742	20.5823	20.5831	20.5830	20.5797	20.5175	20.2887	20.0305	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0835	20.2221	20.4004	20.5291	20.5742	20.5823	20.5831	20.5830	20.5797	20.5175	20.2887	20.0305	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9373	0.9032	0.8279	0.6921	0.5239	0.3647	0.2535	0.2823	0.4657	0.7372	0.8967	0.9475	(94)
Useful gains	662.2410	693.8477	690.3523	621.0549	488.8709	332.0304	221.2827	232.3633	358.4350	520.8163	603.8839	643.1916	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	876.9824	851.3467	772.3535	646.1499	493.0804	332.3982	221.3116	232.4208	360.0346	551.0482	732.8068	879.5958	(97)
Space heating kWh													
	159.7676	105.8393	61.0089	18.0685	3.1318	0.0000	0.0000	0.0000	0.0000	22.4926	92.8245	175.8847	(98a)
Space heating requirement - total per year (kWh/year)												639.0180	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	159.7676	105.8393	61.0089	18.0685	3.1318	0.0000	0.0000	0.0000	0.0000	22.4926	92.8245	175.8847	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												639.0180	
Space heating per m2											(98c) / (4) =	7.3704	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	159.7676	105.8393	61.0089	18.0685	3.1318	0.0000	0.0000	0.0000	0.0000	22.4926	92.8245	175.8847	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	239.6514	158.7590	91.5134	27.1027	4.6977	0.0000	0.0000	0.0000	0.0000	33.7389	139.2368	263.8271	
Space heating requirement													
	239.6514	158.7590	91.5134	27.1027	4.6977	0.0000	0.0000	0.0000	0.0000	33.7389	139.2368	263.8271	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												958.5270	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												9.5853	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5335.8487	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	958.5270	4.4400	42.5586	(340a)
Space heating total			42.5586	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Total energy cost			359.0151	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9814	(357)
SAP value		84.0921	
SAP rating (Section 12)		84	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1356.2741	0.1581	40.4211	(367)
Electrical energy for heat distribution (space & water)	9.5853	0.0000	7.3315	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			202.8368	(373)
Space and water heating			202.8368	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Total CO2, kg/year			238.7055	(383)
CO2 emissions per m2			2.7500	(384)
EI value			97.5713	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		1.4928 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5778 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m													
	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	23.7835	0.7600	0.7000	0.7700	65.5876	(80)
West	1.7600	23.7835	0.7600	0.7000	0.7700	15.4324	(80)

Solar gains	81.0200	140.8292	228.1692	335.8028	395.8111	434.4066	405.9044	355.9037	279.8628	176.2264	99.5150	67.0100	(83)
Total gains	720.6439	778.1231	846.4545	918.7565	943.6137	950.5115	903.3528	856.6161	798.7845	727.4075	689.5188	690.7928	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area	0.9419	0.9093	0.8241	0.6822	0.5142	0.3388	0.2399	0.2659	0.4573	0.7198	0.8966	0.9526	(86)
MIT	20.5878	20.6979	20.8575	20.9586	20.9933	20.9996	21.0000	20.9999	20.9974	20.9531	20.7662	20.5412	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house	0.9323	0.8956	0.8018	0.6520	0.4799	0.3035	0.2026	0.2266	0.4159	0.6840	0.8790	0.9445	(89)
MIT 2	19.9253	20.0582	20.2443	20.3540	20.3879	20.3931	20.3933	20.3933	20.3916	20.3506	20.1424	19.8685	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.1325	20.2583	20.4361	20.5431	20.5773	20.5828	20.5831	20.5831	20.5811	20.5390	20.3375	20.0789	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1325	20.2583	20.4361	20.5431	20.5773	20.5828	20.5831	20.5831	20.5811	20.5390	20.3375	20.0789	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9277	0.8923	0.8034	0.6596	0.4904	0.3145	0.2142	0.2389	0.4288	0.6928	0.8773	0.9397	(94)
Useful gains	668.5372	694.3477	680.0767	606.0205	462.7143	298.9472	193.5231	204.6251	342.4828	503.9794	604.9046	649.1319	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	863.0398	836.6906	746.5566	624.7035	465.4699	299.0871	193.5323	204.6438	343.4411	524.4633	713.2949	865.6165	(97)
Space heating kWh	144.7099	95.6544	49.4611	13.4518	2.0502	0.0000	0.0000	0.0000	0.0000	15.2400	78.0410	161.0646	(98a)
Space heating requirement - total per year (kWh/year)												559.6730	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	144.7099	95.6544	49.4611	13.4518	2.0502	0.0000	0.0000	0.0000	0.0000	15.2400	78.0410	161.0646	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												559.6730	
Space heating per m2											(98c) / (4) =	6.4553	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	144.7099	95.6544	49.4611	13.4518	2.0502	0.0000	0.0000	0.0000	0.0000	15.2400	78.0410	161.0646	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	217.0649	143.4817	74.1916	20.1776	3.0753	0.0000	0.0000	0.0000	0.0000	22.8600	117.0615	241.5969	
Space heating requirement	217.0649	143.4817	74.1916	20.1776	3.0753	0.0000	0.0000	0.0000	0.0000	22.8600	117.0615	241.5969	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												839.5095	(307)
Space heating fuel - secondary												0.0000	(309)

Water heating fuel - community heating	4127.5010	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	8.3951	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5216.8312	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	839.5095	6.5500	54.9879	(340a)
Space heating total			54.9879	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Total energy cost			500.3632	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1324.5361	0.1586	35.5058	(367)
Electrical energy for heat distribution (space & water)	8.3951	0.0000	7.1471	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			197.7373	(373)
Space and water heating			197.7373	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Total CO2, kg/year			233.6059	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1324.5361	1.5871	355.2976	(467)
Electrical energy for heat distribution (space & water)	8.3951	0.0000	76.1029	(472)
Overall CO2 factor for heat network			0.4239	(486)
Total CO2 associated with community systems			2105.5131	(473)
Space and water heating			2105.5131	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Total Primary energy kWh/year			2487.9919	(483)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.43	**TER**	9.27
Environmental	99 A	**% DER < TER**			84.57
CO_2 Emissions (t/year)	0.1	**DFEE**	15.84	**TFEE**	19.14
Compliance Check	See BREL	**% DFEE < TFEE**			17.26
% DPER < TPER	61.17	**DPER**	19.13	**TPER**	49.26

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss

Combi loss

Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS

PV diverter

Solar input

FGHRS

Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
									Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
12Total per year (kWh/year)											2752	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	652.0784	730.2946	789.6905	869.3922	912.9689	904.3786	866.5575	814.6416	757.3995	678.0557	637.1713	628.5612	(84)

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7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area	0.9652	0.9339	0.8716	0.7324	0.5591	0.3925	0.2821	0.3136	0.5027	0.7855	0.9310	0.9714	(86)
MIT	20.4706	20.6231	20.7918	20.9369	20.9888	20.9989	20.9999	20.9998	20.9954	20.9198	20.6824	20.4275	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house	0.9589	0.9231	0.8531	0.7034	0.5245	0.3556	0.2432	0.2723	0.4598	0.7530	0.9180	0.9661	(89)
MIT 2	19.7815	19.9685	20.1697	20.3317	20.3839	20.3927	20.3933	20.3933	20.3901	20.3170	20.0437	19.7278	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9970	20.1732	20.3643	20.5210	20.5731	20.5823	20.5830	20.5830	20.5794	20.5055	20.2435	19.9467	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9970	20.1732	20.3643	20.5210	20.5731	20.5823	20.5830	20.5830	20.5794	20.5055	20.2435	19.9467	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9542	0.9188	0.8522	0.7096	0.5349	0.3671	0.2554	0.2852	0.4730	0.7593	0.9145	0.9616	(94)
Useful gains	622.2063	670.9826	672.9501	616.9622	488.3069	332.0142	221.2813	232.3592	358.2729	514.8198	582.6685	604.4037	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	872.1794	848.6313	770.3487	645.7029	493.0207	332.3965	221.3114	232.4203	360.0175	550.3839	730.2945	874.9365	(97)
Space heating kWh	185.9800	119.3799	72.4646	20.6933	3.5071	0.0000	0.0000	0.0000	0.0000	26.4597	106.2907	201.2764	(98a)
Space heating requirement - total per year (kWh/year)												736.0516	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	185.9800	119.3799	72.4646	20.6933	3.5071	0.0000	0.0000	0.0000	0.0000	26.4597	106.2907	201.2764	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												736.0516	
Space heating per m2											(98c) / (4) =	8.4896	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	185.9800	119.3799	72.4646	20.6933	3.5071	0.0000	0.0000	0.0000	0.0000	26.4597	106.2907	201.2764	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	278.9699	179.0698	108.6969	31.0400	5.2606	0.0000	0.0000	0.0000	0.0000	39.6896	159.4361	301.9146	
Space heating requirement	278.9699	179.0698	108.6969	31.0400	5.2606	0.0000	0.0000	0.0000	0.0000	39.6896	159.4361	301.9146	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1104.0774	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												11.0408	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4523.1782	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1395.0876	0.1581	46.5525	(367)
Electrical energy for heat distribution (space & water)	11.0408	0.0000	7.5614	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			209.1981	(373)
Space and water heating			209.1981	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			123.6233	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.4300	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1395.0876	1.5853	466.7424	(467)
Electrical energy for heat distribution (space & water)	11.0408	0.0000	80.2821	(472)
Overall CO2 factor for heat network			0.4246	(486)
Total CO2 associated with community systems			2221.1370	(473)
Space and water heating			2221.1370	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1658.1937	(483)
Dwelling Primary energy Rate (DPER)			19.1300	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4892			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	13.5400	0.0700	0.9478
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.0900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8787 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.3679 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	63.6543	63.4509	63.2515	62.3151	62.1399	61.3243	61.3243	61.1733	61.6385	62.1399	62.4943	62.8649	(39)
Average = Sum(39)m / 12 =												62.3143	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7342	0.7318	0.7295	0.7187	0.7167	0.7073	0.7073	0.7056	0.7109	0.7167	0.7208	0.7251	(40)
HLP (average)												0.7187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(80)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)
Total gains	634.2986	701.5715	746.4857	809.2850	840.7342	827.5835	792.9978	750.1384	705.1835	645.1554	616.5661	612.8145	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4565	69.6791	69.8987	70.9491	71.1492	72.0954	72.0954	72.2734	71.7280	71.1492	70.7457	70.3287	
alpha	5.6304	5.6453	5.6599	5.7299	5.7433	5.8064	5.8064	5.8182	5.7819	5.7433	5.7164	5.6886	
util living area	0.9772	0.9591	0.9222	0.8197	0.6603	0.4709	0.3398	0.3743	0.5898	0.8524	0.9546	0.9805	(86)
MIT	20.2328	20.3960	20.6036	20.8425	20.9604	20.9952	20.9994	20.9990	20.9837	20.8325	20.5134	20.2101	(87)
Th 2	20.3107	20.3128	20.3148	20.3243	20.3261	20.3344	20.3344	20.3359	20.3312	20.3261	20.3225	20.3187	(88)
util rest of house	0.9727	0.9513	0.9080	0.7918	0.6193	0.4232	0.2886	0.3207	0.5371	0.8225	0.9447	0.9766	(89)
MIT 2	19.4173	19.6225	19.8789	20.1658	20.2918	20.3312	20.3341	20.3354	20.3193	20.1616	19.7789	19.3951	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.6724	19.8645	20.1056	20.3774	20.5009	20.5389	20.5422	20.5430	20.5271	20.3715	20.0086	19.6500	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6724	19.8645	20.1056	20.3774	20.5009	20.5389	20.5422	20.5430	20.5271	20.3715	20.0086	19.6500	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9675	0.9454	0.9032	0.7941	0.6301	0.4380	0.3046	0.3375	0.5528	0.8247	0.9393	0.9718	(94)
Useful gains	613.7056	663.2556	674.2084	642.6879	529.7738	362.4578	241.5837	253.1356	389.8443	532.0560	579.1531	595.5527	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	978.5208	949.5103	860.5766	715.2179	546.8866	364.2008	241.7535	253.4398	396.1594	607.1981	806.7171	971.2628	(97)
Space heating kWh	271.4225	192.3632	138.6579	52.2216	12.7319	0.0000	0.0000	0.0000	0.0000	55.9057	163.8461	279.5283	(98a)
Space heating requirement - total per year (kWh/year)												1166.6772	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	271.4225	192.3632	138.6579	52.2216	12.7319	0.0000	0.0000	0.0000	0.0000	55.9057	163.8461	279.5283	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1166.6772	
Space heating per m2										(98c) / (4) =		13.4565	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	271.4225	192.3632	138.6579	52.2216	12.7319	0.0000	0.0000	0.0000	0.0000	55.9057	163.8461	279.5283	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	294.0655	208.4108	150.2252	56.5781	13.7941	0.0000	0.0000	0.0000	0.0000	60.5695	177.5147	302.8476	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.3964	83.9003	83.0590	81.5571	80.3170	79.8000	79.8000	79.8000	79.8000	81.6372	83.5327	84.4864	(217)
Fuel for water heating, kWh/month	276.8852	246.2073	264.2776	237.1858	233.7569	212.3443	209.9929	218.2535	220.5242	239.9258	248.7341	273.6737	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1264.0056	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2881.7612	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3599.0721	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1264.0056	0.2100	265.4412	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2881.7612	0.2100	605.1699	(264)
Space and water heating			870.6110	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			803.7093	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.2700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1264.0056	1.1300	1428.3263	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2881.7612	1.1300	3256.3902	(278)
Space and water heating			4684.7165	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4270.9436	(286)
Target Primary Energy Rate (TPER)			49.2600	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.43	**TER**	9.27
Environmental	99 A	**% DER < TER**			84.57
CO_2 Emissions (t/year)	0.1	**DFEE**	15.84	**TFEE**	19.14
Compliance Check	See BREL	**% DFEE < TFEE**			17.26
% DPER < TPER	61.17	**DPER**	19.13	**TPER**	49.26

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		3 * 10 =	30.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1412	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.2912	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2257	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2878	0.2821	0.2765	0.2483	0.2426	0.2144	0.2144	0.2088	0.2257	0.2426	0.2539	0.2652	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5414	0.5398	0.5382	0.5308	0.5294	0.5230	0.5230	0.5218	0.5255	0.5294	0.5322	0.5352	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15916.3300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							183.5794	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9510	37.8383	37.7278	37.2089	37.1118	36.6599	36.6599	36.5762	36.8339	37.1118	37.3082	37.5135	(38)
Heat transfer coeff	58.4658	58.3531	58.2426	57.7237	57.6266	57.1747	57.1747	57.0910	57.3488	57.6266	57.8230	58.0284	(39)
Average = Sum(39)m / 12 =												57.7233	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6743	0.6730	0.6718	0.6658	0.6647	0.6595	0.6595	0.6585	0.6615	0.6647	0.6669	0.6693	(40)
HLP (average)												0.6658	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =					614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	545.1343	624.6069	686.9038	773.6007	821.2924	817.0482	782.1979	728.3014	668.6668	584.4747	536.9133	522.5689	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.6203	75.7664	75.9101	76.5925	76.7215	77.3280	77.3280	77.4413	77.0932	76.7215	76.4609	76.1904	
alpha	6.0414	6.0511	6.0607	6.1062	6.1148	6.1552	6.1552	6.1628	6.1395	6.1148	6.0974	6.0794	
util living area	0.9867	0.9700	0.9305	0.8118	0.6350	0.4461	0.3214	0.3602	0.5819	0.8700	0.9699	0.9894	(86)

MIT	20.2292	20.4133	20.6387	20.8759	20.9747	20.9975	20.9997	20.9994	20.9884	20.8399	20.5016	20.1941	(87)
Th 2	20.3635	20.3647	20.3658	20.3712	20.3721	20.3768	20.3768	20.3776	20.3750	20.3721	20.3701	20.3680	(88)
util rest of house	0.9840	0.9641	0.9177	0.7846	0.5967	0.4033	0.2760	0.3116	0.5326	0.8430	0.9630	0.9872	(89)
MIT 2	19.6555	19.8367	20.0541	20.2740	20.3551	20.3755	20.3767	20.3774	20.3684	20.2480	19.9294	19.6246	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.8349	20.0171	20.2370	20.4623	20.5489	20.5700	20.5716	20.5720	20.5623	20.4332	20.1083	19.8027	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8349	20.0171	20.2370	20.4623	20.5489	20.5700	20.5716	20.5720	20.5623	20.4332	20.1083	19.8027	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9812	0.9604	0.9149	0.7888	0.6077	0.4166	0.2902	0.3268	0.5476	0.8458	0.9597	0.9847	(94)
Useful gains	534.8770	599.8596	628.4294	610.1828	499.0816	340.4100	226.9938	238.0202	366.1294	494.3458	515.2661	514.5863	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	908.2631	882.1289	800.0787	667.4170	509.9331	341.3344	227.0735	238.1838	370.6058	566.6520	752.1823	905.4017	(97)
Space heating kWh	277.7993	189.6850	127.7071	41.2086	8.0736	0.0000	0.0000	0.0000	0.0000	53.7958	170.5796	290.7667	(98a)
Space heating requirement - total per year (kWh/year)												1159.6156	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	277.7993	189.6850	127.7071	41.2086	8.0736	0.0000	0.0000	0.0000	0.0000	53.7958	170.5796	290.7667	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1159.6156	
Space heating per m2											(98c) / (4) =	13.3750	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	537.4421	423.0928	433.8916	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9818	0.9932	0.9888	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	527.6770	420.2290	429.0462	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	890.8770	853.1757	792.9430	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	261.5040	322.1124	270.7392	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	65.3760	80.5281	67.6848	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												213.5889	(107)
Energy for space heating												13.3750	(99)
Energy for space cooling												2.4635	(108)
Total												15.8386	(109)
Fabric Energy Efficiency (DFEE)												15.8	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4892			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	13.5400	0.0700	0.9478
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.0900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8787 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.3679 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff													
	63.6543	63.4509	63.2515	62.3151	62.1399	61.3243	61.3243	61.1733	61.6385	62.1399	62.4943	62.8649	(39)
Average = Sum(39)m / 12 =												62.3143	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7342	0.7318	0.7295	0.7187	0.7167	0.7073	0.7073	0.7056	0.7109	0.7167	0.7208	0.7251	(40)
HLP (average)												0.7187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses													
	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												64.3029	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)													
	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.3496	(64a)
Heat gains from water heating, kWh/month													
	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains													
	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(80)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)
Total gains	533.6898	602.2192	650.0344	719.8289	755.3931	749.5884	717.9735	673.1335	625.7862	557.9097	522.6435	513.1575	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4565	69.6791	69.8987	70.9491	71.1492	72.0954	72.0954	72.2734	71.7280	71.1492	70.7457	70.3287	
alpha	5.6304	5.6453	5.6599	5.7299	5.7433	5.8064	5.8064	5.8182	5.7819	5.7433	5.7164	5.6886	
util living area													
	0.9896	0.9786	0.9538	0.8704	0.7188	0.5177	0.3750	0.4165	0.6545	0.9066	0.9774	0.9915	(86)
MIT	20.0741	20.2513	20.4850	20.7785	20.9393	20.9923	20.9990	20.9982	20.9726	20.7557	20.3784	20.0503	(87)
Th 2	20.3107	20.3128	20.3148	20.3243	20.3261	20.3344	20.3344	20.3359	20.3312	20.3261	20.3225	20.3187	(88)
util rest of house													
	0.9874	0.9741	0.9442	0.8467	0.6777	0.4660	0.3187	0.3571	0.5991	0.8835	0.9719	0.9896	(89)
MIT 2	19.4587	19.6349	19.8641	20.1462	20.2842	20.3303	20.3340	20.3352	20.3152	20.1323	19.7695	19.4416	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.6512	19.8277	20.0584	20.3440	20.4891	20.5374	20.5420	20.5426	20.5209	20.3273	19.9600	19.6320	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6512	19.8277	20.0584	20.3440	20.4891	20.5374	20.5420	20.5426	20.5209	20.3273	19.9600	19.6320	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9847	0.9703	0.9401	0.8474	0.6880	0.4819	0.3363	0.3757	0.6152	0.8836	0.9684	0.9872	(94)
Useful gains	525.5027	584.3230	611.1006	609.9856	519.7004	361.2573	241.4534	252.8791	385.0027	492.9554	506.1062	506.6090	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	977.1671	947.1780	857.5870	713.1345	546.1555	364.1068	241.7420	253.4171	395.7713	604.4537	803.6748	970.1324	(97)
Space heating kWh													
	336.0384	243.8386	183.3859	74.2672	19.6826	0.0000	0.0000	0.0000	0.0000	82.9548	214.2494	344.8614	(98a)
Space heating requirement - total per year (kWh/year)												1499.2782	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	336.0384	243.8386	183.3859	74.2672	19.6826	0.0000	0.0000	0.0000	0.0000	82.9548	214.2494	344.8614	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1499.2782	
Space heating per m2											(98c) / (4) =	17.2927	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	576.4484	453.7998	464.9168	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9561	0.9813	0.9722	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	551.1187	445.3221	451.9778	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	812.0280	778.1082	728.4611	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	187.8547	247.5929	205.7036	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	46.9637	61.8982	51.4259	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												160.2878	(107)
Energy for space heating												17.2927	(99)
Energy for space cooling												1.8488	(108)
Total												19.1415	(109)
Fabric Energy Efficiency (TFEE)												19.1	(109)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.43	**TER**	9.27
Environmental	99 A	**% DER < TER**			84.57
CO_2 Emissions (t/year)	0.1	**DFEE**	15.84	**TFEE**	19.14
Compliance Check	See BREL	**% DFEE < TFEE**			17.26
% DPER < TPER	61.17	**DPER**	19.13	**TPER**	49.26

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss

Combi loss

Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS

PV diverter

Solar input

FGHRS

Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
									Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
12Total per year (kWh/year)											2752	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	652.0784	730.2946	789.6905	869.3922	912.9689	904.3786	866.5575	814.6416	757.3995	678.0557	637.1713	628.5612	(84)

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7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area	0.9652	0.9339	0.8716	0.7324	0.5591	0.3925	0.2821	0.3136	0.5027	0.7855	0.9310	0.9714	(86)
MIT	20.4706	20.6231	20.7918	20.9369	20.9888	20.9989	20.9999	20.9998	20.9954	20.9198	20.6824	20.4275	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house	0.9589	0.9231	0.8531	0.7034	0.5245	0.3556	0.2432	0.2723	0.4598	0.7530	0.9180	0.9661	(89)
MIT 2	19.7815	19.9685	20.1697	20.3317	20.3839	20.3927	20.3933	20.3933	20.3901	20.3170	20.0437	19.7278	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9970	20.1732	20.3643	20.5210	20.5731	20.5823	20.5830	20.5830	20.5794	20.5055	20.2435	19.9467	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9970	20.1732	20.3643	20.5210	20.5731	20.5823	20.5830	20.5830	20.5794	20.5055	20.2435	19.9467	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9542	0.9188	0.8522	0.7096	0.5349	0.3671	0.2554	0.2852	0.4730	0.7593	0.9145	0.9616	(94)
Useful gains	622.2063	670.9826	672.9501	616.9622	488.3069	332.0142	221.2813	232.3592	358.2729	514.8198	582.6685	604.4037	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	872.1794	848.6313	770.3487	645.7029	493.0207	332.3965	221.3114	232.4203	360.0175	550.3839	730.2945	874.9365	(97)
Space heating kWh	185.9800	119.3799	72.4646	20.6933	3.5071	0.0000	0.0000	0.0000	0.0000	26.4597	106.2907	201.2764	(98a)
Space heating requirement - total per year (kWh/year)												736.0516	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	185.9800	119.3799	72.4646	20.6933	3.5071	0.0000	0.0000	0.0000	0.0000	26.4597	106.2907	201.2764	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												736.0516	
Space heating per m2											(98c) / (4) =	8.4896	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	185.9800	119.3799	72.4646	20.6933	3.5071	0.0000	0.0000	0.0000	0.0000	26.4597	106.2907	201.2764	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	278.9699	179.0698	108.6969	31.0400	5.2606	0.0000	0.0000	0.0000	0.0000	39.6896	159.4361	301.9146	
Space heating requirement	278.9699	179.0698	108.6969	31.0400	5.2606	0.0000	0.0000	0.0000	0.0000	39.6896	159.4361	301.9146	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1104.0774	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												11.0408	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4523.1782	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1395.0876	0.1581	46.5525	(367)
Electrical energy for heat distribution (space & water)	11.0408	0.0000	7.5614	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			209.1981	(373)
Space and water heating			209.1981	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			123.6233	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.4300	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1395.0876	1.5853	466.7424	(467)
Electrical energy for heat distribution (space & water)	11.0408	0.0000	80.2821	(472)
Overall CO2 factor for heat network			0.4246	(486)
Total CO2 associated with community systems			2221.1370	(473)
Space and water heating			2221.1370	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1658.1937	(483)
Dwelling Primary energy Rate (DPER)			19.1300	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4892			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	13.5400	0.0700	0.9478
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.0900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8787 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.3679 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	63.6543	63.4509	63.2515	62.3151	62.1399	61.3243	61.3243	61.1733	61.6385	62.1399	62.4943	62.8649	(39)
Average = Sum(39)m / 12 =												62.3143	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7342	0.7318	0.7295	0.7187	0.7167	0.7073	0.7073	0.7056	0.7109	0.7167	0.7208	0.7251	(40)
HLP (average)												0.7187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(80)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)
Total gains	634.2986	701.5715	746.4857	809.2850	840.7342	827.5835	792.9978	750.1384	705.1835	645.1554	616.5661	612.8145	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4565	69.6791	69.8987	70.9491	71.1492	72.0954	72.0954	72.2734	71.7280	71.1492	70.7457	70.3287	
alpha	5.6304	5.6453	5.6599	5.7299	5.7433	5.8064	5.8064	5.8182	5.7819	5.7433	5.7164	5.6886	
util living area	0.9772	0.9591	0.9222	0.8197	0.6603	0.4709	0.3398	0.3743	0.5898	0.8524	0.9546	0.9805	(86)
MIT	20.2328	20.3960	20.6036	20.8425	20.9604	20.9952	20.9994	20.9990	20.9837	20.8325	20.5134	20.2101	(87)
Th 2	20.3107	20.3128	20.3148	20.3243	20.3261	20.3344	20.3344	20.3359	20.3312	20.3261	20.3225	20.3187	(88)
util rest of house	0.9727	0.9513	0.9080	0.7918	0.6193	0.4232	0.2886	0.3207	0.5371	0.8225	0.9447	0.9766	(89)
MIT 2	19.4173	19.6225	19.8789	20.1658	20.2918	20.3312	20.3341	20.3354	20.3193	20.1616	19.7789	19.3951	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.6724	19.8645	20.1056	20.3774	20.5009	20.5389	20.5422	20.5430	20.5271	20.3715	20.0086	19.6500	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6724	19.8645	20.1056	20.3774	20.5009	20.5389	20.5422	20.5430	20.5271	20.3715	20.0086	19.6500	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9675	0.9454	0.9032	0.7941	0.6301	0.4380	0.3046	0.3375	0.5528	0.8247	0.9393	0.9718	(94)
Useful gains	613.7056	663.2556	674.2084	642.6879	529.7738	362.4578	241.5837	253.1356	389.8443	532.0560	579.1531	595.5527	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	978.5208	949.5103	860.5766	715.2179	546.8866	364.2008	241.7535	253.4398	396.1594	607.1981	806.7171	971.2628	(97)
Space heating kWh	271.4225	192.3632	138.6579	52.2216	12.7319	0.0000	0.0000	0.0000	0.0000	55.9057	163.8461	279.5283	(98a)
Space heating requirement - total per year (kWh/year)												1166.6772	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	271.4225	192.3632	138.6579	52.2216	12.7319	0.0000	0.0000	0.0000	0.0000	55.9057	163.8461	279.5283	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1166.6772	
Space heating per m2										(98c) / (4) =		13.4565	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	271.4225	192.3632	138.6579	52.2216	12.7319	0.0000	0.0000	0.0000	0.0000	55.9057	163.8461	279.5283	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	294.0655	208.4108	150.2252	56.5781	13.7941	0.0000	0.0000	0.0000	0.0000	60.5695	177.5147	302.8476	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.3964	83.9003	83.0590	81.5571	80.3170	79.8000	79.8000	79.8000	79.8000	81.6372	83.5327	84.4864	(217)
Fuel for water heating, kWh/month	276.8852	246.2073	264.2776	237.1858	233.7569	212.3443	209.9929	218.2535	220.5242	239.9258	248.7341	273.6737	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1264.0056	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2881.7612	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3599.0721	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1264.0056	0.2100	265.4412	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2881.7612	0.2100	605.1699	(264)
Space and water heating			870.6110	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			803.7093	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.2700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1264.0056	1.1300	1428.3263	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2881.7612	1.1300	3256.3902	(278)
Space and water heating			4684.7165	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4270.9436	(286)
Target Primary Energy Rate (TPER)			49.2600	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.43	**TER**	9.27
Environmental	99 A	**% DER < TER**			84.57
CO_2 Emissions (t/year)	0.1	**DFEE**	15.84	**TFEE**	19.14
Compliance Check	See BREL	**% DFEE < TFEE**			17.26
% DPER < TPER	61.17	**DPER**	19.13	**TPER**	49.26

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	706.5297	768.1759	833.8294	897.3119	933.0604	910.4848	872.9142	823.2320	769.6084	706.4837	673.4276	678.8029	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9504	0.9194	0.8478	0.7146	0.5478	0.3899	0.2800	0.3103	0.4950	0.7634	0.9147	0.9594	(86)
MIT	20.5453	20.6661	20.8249	20.9449	20.9900	20.9990	20.9999	20.9998	20.9958	20.9317	20.7227	20.4996	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9421	0.9071	0.8277	0.6855	0.5137	0.3532	0.2414	0.2695	0.4526	0.7301	0.8996	0.9524	(89)
MIT 2	19.8732	20.0200	20.2072	20.3398	20.3849	20.3927	20.3933	20.3933	20.3903	20.3289	20.0911	19.8170	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0835	20.2221	20.4004	20.5291	20.5742	20.5823	20.5831	20.5830	20.5797	20.5175	20.2887	20.0305	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0835	20.2221	20.4004	20.5291	20.5742	20.5823	20.5831	20.5830	20.5797	20.5175	20.2887	20.0305	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9373	0.9032	0.8279	0.6921	0.5239	0.3647	0.2535	0.2823	0.4657	0.7372	0.8967	0.9475	(94)
Useful gains	662.2410	693.8477	690.3523	621.0549	488.8709	332.0304	221.2827	232.3633	358.4350	520.8163	603.8839	643.1916	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	876.9824	851.3467	772.3535	646.1499	493.0804	332.3982	221.3116	232.4208	360.0346	551.0482	732.8068	879.5958	(97)
Space heating kWh													
	159.7676	105.8393	61.0089	18.0685	3.1318	0.0000	0.0000	0.0000	0.0000	22.4926	92.8245	175.8847	(98a)
Space heating requirement - total per year (kWh/year)												639.0180	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	159.7676	105.8393	61.0089	18.0685	3.1318	0.0000	0.0000	0.0000	0.0000	22.4926	92.8245	175.8847	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												639.0180	
Space heating per m2											(98c) / (4) =	7.3704	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	159.7676	105.8393	61.0089	18.0685	3.1318	0.0000	0.0000	0.0000	0.0000	22.4926	92.8245	175.8847	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	239.6514	158.7590	91.5134	27.1027	4.6977	0.0000	0.0000	0.0000	0.0000	33.7389	139.2368	263.8271	
Space heating requirement													
	239.6514	158.7590	91.5134	27.1027	4.6977	0.0000	0.0000	0.0000	0.0000	33.7389	139.2368	263.8271	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												958.5270	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												9.5853	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4377.6277	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	958.5270	4.4400	42.5586	(340a)
Space heating total			42.5586	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			251.1496	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.6865 (357)
SAP value		88.8716
SAP rating (Section 12)		89 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1356.2741	0.1581	40.4211	(367)
Electrical energy for heat distribution (space & water)	9.5853	0.0000	7.3315	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			202.8368	(373)
Space and water heating			202.8368	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			117.2620	(383)
CO2 emissions per m2			1.3500	(384)
EI value			98.8069	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)

Average = Sum(39)m / 12 = 55.5633

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss / Combi loss

Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS / PV diverter / Solar input / FGHRS

Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
									Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	23.7835	0.7600	0.7000	0.7700	65.5876	(80)
West	1.7600	23.7835	0.7600	0.7000	0.7700	15.4324	(80)

Solar gains	81.0200	140.8292	228.1692	335.8028	395.8111	434.4066	405.9044	355.9037	279.8628	176.2264	99.5150	67.0100	(83)
Total gains	720.6439	778.1231	846.4545	918.7565	943.6137	950.5115	903.3528	856.6161	798.7845	727.4075	689.5188	690.7928	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9419	0.9093	0.8241	0.6822	0.5142	0.3388	0.2399	0.2659	0.4573	0.7198	0.8966	0.9526	(86)
MIT	20.5878	20.6979	20.8575	20.9586	20.9933	20.9996	21.0000	20.9999	20.9974	20.9531	20.7662	20.5412	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9323	0.8956	0.8018	0.6520	0.4799	0.3035	0.2026	0.2266	0.4159	0.6840	0.8790	0.9445	(89)
MIT 2	19.9253	20.0582	20.2443	20.3540	20.3879	20.3931	20.3933	20.3933	20.3916	20.3506	20.1424	19.8685	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.1325	20.2583	20.4361	20.5431	20.5773	20.5828	20.5831	20.5831	20.5811	20.5390	20.3375	20.0789	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1325	20.2583	20.4361	20.5431	20.5773	20.5828	20.5831	20.5831	20.5811	20.5390	20.3375	20.0789	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9277	0.8923	0.8034	0.6596	0.4904	0.3145	0.2142	0.2389	0.4288	0.6928	0.8773	0.9397	(94)
Useful gains	668.5372	694.3477	680.0767	606.0205	462.7143	298.9472	193.5231	204.6251	342.4828	503.9794	604.9046	649.1319	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	863.0398	836.6906	746.5566	624.7035	465.4699	299.0871	193.5323	204.6438	343.4411	524.4633	713.2949	865.6165	(97)
Space heating kWh													
	144.7099	95.6544	49.4611	13.4518	2.0502	0.0000	0.0000	0.0000	0.0000	15.2400	78.0410	161.0646	(98a)
Space heating requirement - total per year (kWh/year)												559.6730	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	144.7099	95.6544	49.4611	13.4518	2.0502	0.0000	0.0000	0.0000	0.0000	15.2400	78.0410	161.0646	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												559.6730	
Space heating per m2											(98c) / (4) =	6.4553	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	144.7099	95.6544	49.4611	13.4518	2.0502	0.0000	0.0000	0.0000	0.0000	15.2400	78.0410	161.0646	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	217.0649	143.4817	74.1916	20.1776	3.0753	0.0000	0.0000	0.0000	0.0000	22.8600	117.0615	241.5969	
Space heating requirement													
	217.0649	143.4817	74.1916	20.1776	3.0753	0.0000	0.0000	0.0000	0.0000	22.8600	117.0615	241.5969	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)

Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year		
Space heating fuel - community heating	839.5095	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4127.5010	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	8.3951	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4162.0842	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	839.5095	6.5500	54.9879	(340a)
Space heating total			54.9879	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			318.2929	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1324.5361	0.1586	35.5058	(367)
Electrical energy for heat distribution (space & water)	8.3951	0.0000	7.1471	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			197.7373	(373)
Space and water heating			197.7373	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			99.9043	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1324.5361	1.5871	355.2976	(467)
Electrical energy for heat distribution (space & water)	8.3951	0.0000	76.1029	(472)
Overall CO2 factor for heat network			0.4239	(486)
Total CO2 associated with community systems			2105.5131	(473)
Space and water heating			2105.5131	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1461.6779	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Be Green

Current energy efficiency rating: B 89
Current environmental impact rating: A 99

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 89
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£71	£71	£0
Community scheme	£429	£429	£0
Space heating	£169	£169	£0
Water heating	£270	£270	£0
Lighting	£62	£62	£0
Generated (PV)	-£182	-£182	£0
Total cost of fuels	£318	£318	£0
Total cost of uses	£319	£319	£0
Delivered energy	48 kWh/m²	48 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	17 kWh/m²	17 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		1.4928 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5778 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day)	126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	706.5297	768.1759	833.8294	897.3119	933.0604	910.4848	872.9142	823.2320	769.6084	706.4837	673.4276	678.8029	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area	0.9504	0.9194	0.8478	0.7146	0.5478	0.3899	0.2800	0.3103	0.4950	0.7634	0.9147	0.9594	(86)
MIT	20.5453	20.6661	20.8249	20.9449	20.9900	20.9990	20.9999	20.9998	20.9958	20.9317	20.7227	20.4996	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house	0.9421	0.9071	0.8277	0.6855	0.5137	0.3532	0.2414	0.2695	0.4526	0.7301	0.8996	0.9524	(89)
MIT 2	19.8732	20.0200	20.2072	20.3398	20.3849	20.3927	20.3933	20.3933	20.3903	20.3289	20.0911	19.8170	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	20.0835	20.2221	20.4004	20.5291	20.5742	20.5823	20.5831	20.5830	20.5797	20.5175	20.2887	20.0305	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0835	20.2221	20.4004	20.5291	20.5742	20.5823	20.5831	20.5830	20.5797	20.5175	20.2887	20.0305	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9373	0.9032	0.8279	0.6921	0.5239	0.3647	0.2535	0.2823	0.4657	0.7372	0.8967	0.9475	(94)
Useful gains	662.2410	693.8477	690.3523	621.0549	488.8709	332.0304	221.2827	232.3633	358.4350	520.8163	603.8839	643.1916	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	876.9824	851.3467	772.3535	646.1499	493.0804	332.3982	221.3116	232.4208	360.0346	551.0482	732.8068	879.5958	(97)
Space heating kWh	159.7676	105.8393	61.0089	18.0685	3.1318	0.0000	0.0000	0.0000	0.0000	22.4926	92.8245	175.8847	(98a)
Space heating requirement - total per year (kWh/year)												639.0180	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	159.7676	105.8393	61.0089	18.0685	3.1318	0.0000	0.0000	0.0000	0.0000	22.4926	92.8245	175.8847	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												639.0180	
Space heating per m2										(98c) / (4) =		7.3704	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	159.7676	105.8393	61.0089	18.0685	3.1318	0.0000	0.0000	0.0000	0.0000	22.4926	92.8245	175.8847	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	239.6514	158.7590	91.5134	27.1027	4.6977	0.0000	0.0000	0.0000	0.0000	33.7389	139.2368	263.8271	
Space heating requirement													
	239.6514	158.7590	91.5134	27.1027	4.6977	0.0000	0.0000	0.0000	0.0000	33.7389	139.2368	263.8271	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												958.5270	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)

Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	9.5853	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4377.6277	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	958.5270	4.4400	42.5586	(340a)
Space heating total			42.5586	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			251.1496	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.6865	(357)
SAP value	88.8716	
SAP rating (Section 12)	89	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1356.2741	0.1581	40.4211	(367)
Electrical energy for heat distribution (space & water)	9.5853	0.0000	7.3315	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			202.8368	(373)
Space and water heating			202.8368	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			117.2620	(383)
CO2 emissions per m2			1.3500	(384)
EI value			98.8069	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		1.4928 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5778	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	23.7835	0.7600	0.7000	0.7700	65.5876	(80)
West	1.7600	23.7835	0.7600	0.7000	0.7700	15.4324	(80)

Solar gains	81.0200	140.8292	228.1692	335.8028	395.8111	434.4066	405.9044	355.9037	279.8628	176.2264	99.5150	67.0100	(83)
Total gains	720.6439	778.1231	846.4545	918.7565	943.6137	950.5115	903.3528	856.6161	798.7845	727.4075	689.5188	690.7928	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9419	0.9093	0.8241	0.6822	0.5142	0.3388	0.2399	0.2659	0.4573	0.7198	0.8966	0.9526	(86)
MIT	20.5878	20.6979	20.8575	20.9586	20.9933	20.9996	21.0000	20.9999	20.9974	20.9531	20.7662	20.5412	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9323	0.8956	0.8018	0.6520	0.4799	0.3035	0.2026	0.2266	0.4159	0.6840	0.8790	0.9445	(89)
MIT 2	19.9253	20.0582	20.2443	20.3540	20.3879	20.3931	20.3933	20.3933	20.3916	20.3506	20.1424	19.8685	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.1325	20.2583	20.4361	20.5431	20.5773	20.5828	20.5831	20.5831	20.5811	20.5390	20.3375	20.0789	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1325	20.2583	20.4361	20.5431	20.5773	20.5828	20.5831	20.5831	20.5811	20.5390	20.3375	20.0789	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9277	0.8923	0.8034	0.6596	0.4904	0.3145	0.2142	0.2389	0.4288	0.6928	0.8773	0.9397	(94)
Useful gains	668.5372	694.3477	680.0767	606.0205	462.7143	298.9472	193.5231	204.6251	342.4828	503.9794	604.9046	649.1319	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	863.0398	836.6906	746.5566	624.7035	465.4699	299.0871	193.5323	204.6438	343.4411	524.4633	713.2949	865.6165	(97)
Space heating kWh													
	144.7099	95.6544	49.4611	13.4518	2.0502	0.0000	0.0000	0.0000	0.0000	15.2400	78.0410	161.0646	(98a)
Space heating requirement - total per year (kWh/year)												559.6730	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	144.7099	95.6544	49.4611	13.4518	2.0502	0.0000	0.0000	0.0000	0.0000	15.2400	78.0410	161.0646	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												559.6730	
Space heating per m2											(98c) / (4) =	6.4553	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement

	144.7099	95.6544	49.4611	13.4518	2.0502	0.0000	0.0000	0.0000	0.0000	15.2400	78.0410	161.0646 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	217.0649	143.4817	74.1916	20.1776	3.0753	0.0000	0.0000	0.0000	0.0000	22.8600	117.0615	241.5969
Space heating requirement												
	217.0649	143.4817	74.1916	20.1776	3.0753	0.0000	0.0000	0.0000	0.0000	22.8600	117.0615	241.5969 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388
Water heating fuel												
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446 (331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year

Space heating fuel - community heating	839.5095 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	8.3951 (313)
Space cooling fuel	0.0000 (321)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)

mechanical ventilation fans (SFP = 0.1292)	33.4924 (330a)
Total electricity for the above, kWh/year	33.4924 (331)
Electricity for lighting (calculated in Appendix L)	216.3282 (332)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4162.0842 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	839.5095	6.5500	54.9879	(340a)
Space heating total			54.9879	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			318.2929	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1324.5361	0.1586	35.5058	(367)
Electrical energy for heat distribution (space & water)	8.3951	0.0000	7.1471	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			197.7373	(373)
Space and water heating			197.7373	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			99.9043	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)

Space and Water heating from Heat pump	1324.5361	1.5871	355.2976 (467)
Electrical energy for heat distribution (space & water)	8.3951	0.0000	76.1029 (472)
Overall CO2 factor for heat network			0.4239 (486)
Total CO2 associated with community systems			2105.5131 (473)
Space and water heating			2105.5131 (476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673 (478)
Energy for lighting	216.3282	1.5338	331.8115 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405
PV Unit electricity exported	-520.7528	0.4449	-231.6735
Total			-1026.3140 (480)
Total Primary energy kWh/year			1461.6779 (483)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	9.09	**TER**	9.63
Environmental	92 A	**% DER < TER**			5.61
CO_2 Emissions (t/year)	0.74	**DFEE**	15.84	**TFEE**	19.14
Compliance Check	See BREL	**% DFEE < TFEE**			17.26
% DPER < TPER	-1.27	**DPER**	51.87	**TPER**	51.22

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2796	12.8855	14.2401	13.7256	14.1482	13.6565	14.0893	14.1078	13.6737	14.1700	13.7658	14.2723	(61)
Total heat required for water heating calculated for each month	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
										Total per year (kWh/year) = Sum(64)m =		2267.8420	(64)
12Total per year (kWh/year)												2268	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	76.0275	66.9783	70.5469	60.6190	57.7963	51.0327	49.6244	52.1934	53.4246	60.8228	66.1962	75.0165	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	102.1874	99.6702	94.8210	84.1931	77.6833	70.8788	66.6995	70.1525	74.2008	81.7511	91.9392	100.8286	(72)
Total internal gains	533.5334	547.7688	522.4940	503.3624	476.0278	455.3032	436.3887	437.4252	452.0232	471.0771	502.0899	521.8995	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	600.4392	678.6509	738.0381	817.7206	861.2856	849.6831	811.8544	759.9447	702.7099	626.3797	585.5137	576.9196	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047

util living area												
	0.9763	0.9512	0.8979	0.7663	0.5901	0.4175	0.3010	0.3361	0.5401	0.8260	0.9514	0.9811 (86)
MIT	20.3941	20.5584	20.7464	20.9189	20.9850	20.9985	20.9998	20.9997	20.9931	20.8927	20.6182	20.3484 (87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934 (88)
util rest of house												
	0.9718	0.9427	0.8817	0.7379	0.5543	0.3783	0.2596	0.2919	0.4945	0.7956	0.9413	0.9773 (89)
MIT 2	19.6864	19.8902	20.1175	20.3132	20.3806	20.3924	20.3933	20.3932	20.3884	20.2891	19.9668	19.6290 (90)
Living area fraction										fLA = Living area / (4) =		0.3128 (91)
MIT	19.9077	20.0992	20.3142	20.5027	20.5696	20.5820	20.5830	20.5829	20.5776	20.4779	20.1706	19.8540 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.7577	19.9492	20.1642	20.3527	20.4196	20.4320	20.4330	20.4329	20.4276	20.3279	20.0206	19.7040 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9660	0.9354	0.8750	0.7359	0.5559	0.3808	0.2623	0.2948	0.4971	0.7921	0.9341	0.9721	(94)
Useful gains	580.0339	634.8211	645.7893	601.7707	478.7711	323.5825	212.9411	224.0105	349.3356	496.1589	546.9487	560.8454	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	858.8833	836.1833	759.2298	636.3486	484.4923	324.0427	212.9752	224.0821	351.5812	540.5169	717.9088	861.4544	(97)
Space heating kWh	207.4639	135.3154	84.3998	24.8961	4.2566	0.0000	0.0000	0.0000	0.0000	33.0023	123.0913	223.6531	(98a)
Space heating requirement - total per year (kWh/year)												836.0785	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	207.4639	135.3154	84.3998	24.8961	4.2566	0.0000	0.0000	0.0000	0.0000	33.0023	123.0913	223.6531	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												836.0785	
Space heating per m2											(98c) / (4) =	9.6434	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	207.4639	135.3154	84.3998	24.8961	4.2566	0.0000	0.0000	0.0000	0.0000	33.0023	123.0913	223.6531	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	233.1055	152.0398	94.8312	27.9732	4.7827	0.0000	0.0000	0.0000	0.0000	37.0813	138.3048	251.2956	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0940	87.9688	87.7715	87.4976	87.3391	87.3000	87.3000	87.3000	87.3000	87.5515	87.9350	88.1315	(217)
Fuel for water heating, kWh/month	263.5787	232.6231	245.7566	212.2557	203.0408	179.6911	174.9625	183.8181	187.9361	212.9508	230.2860	260.0146	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.1487	9.1665	10.1487	9.8213	10.1487	9.8213	10.1487	10.1487	9.8213	10.1487	9.8213	10.1487	(231)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												939.4140	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.3000	
Water heating fuel used												2586.9140	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												119.4924	(231)
Electricity for lighting (calculated in Appendix L)												216.3282	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)

Total delivered energy for all uses 3862.1487 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	939.4140	0.2100	197.2769	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2586.9140	0.2100	543.2519	(264)
Space and water heating			740.5289	(265)
Pumps, fans and electric keep-hot	119.4924	0.1387	16.5751	(267)
Energy for lighting	216.3282	0.1443	31.2229	(268)
Total CO2, kg/year			788.3268	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.0900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	939.4140	1.1300	1061.5379	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2586.9140	1.1300	2923.2128	(278)
Space and water heating			3984.7507	(279)
Pumps, fans and electric keep-hot	119.4924	1.5128	180.7681	(281)
Energy for lighting	216.3282	1.5338	331.8115	(282)
Total Primary energy kWh/year			4497.3303	(286)
Dwelling Primary energy Rate (DPER)			51.8700	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4892			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3	Sill	2.5200	0.0500	0.1260
E4	Jamb	20.7200	0.0500	1.0360
E6	Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E18	Party wall between dwellings	22.0000	0.0600	1.3200
P2	Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7	Party floor between dwellings (in blocks of flats)	13.5400	0.0700	0.9478
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	32.0900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8787 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.3679 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	63.6543	63.4509	63.2515	62.3151	62.1399	61.3243	61.3243	61.1733	61.6385	62.1399	62.4943	62.8649	(39)
Average = Sum(39)m / 12 =												62.3143	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7342	0.7318	0.7295	0.7187	0.7167	0.7073	0.7073	0.7056	0.7109	0.7167	0.7208	0.7251	(40)
HLP (average)												0.7187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	268.8764	237.7777	252.4231	221.3080	214.1447	192.5289	189.6118	197.3242	199.7096	223.2306	238.0513	265.8413	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	238.0452	210.5103	223.8702	197.6651	192.1104	173.6740	171.9383	178.5303	180.2015	200.2327	211.9975	235.5810	(64)
										Total per year (kWh/year) = Sum(64)m =		2414.3567	(64)
12Total per year (kWh/year)												2414	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	85.1973	75.2638	79.7266	69.5164	66.9990	59.9474	58.8418	61.4062	62.3349	70.0200	75.0836	84.1881	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	114.5125	111.9997	107.1594	96.5506	90.0524	83.2602	79.0885	82.5352	86.5763	94.1130	104.2827	113.1561	(72)
Total internal gains	545.8584	560.0984	534.8323	515.7198	488.3970	467.6846	448.7777	449.8079	464.3987	483.4390	514.4334	534.2270	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(80)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)
Total gains	601.3198	668.5927	713.5070	776.3062	807.7554	794.6048	760.0190	717.1596	672.2047	612.1767	583.5873	579.8358	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4565	69.6791	69.8987	70.9491	71.1492	72.0954	72.0954	72.2734	71.7280	71.1492	70.7457	70.3287	
alpha	5.6304	5.6453	5.6599	5.7299	5.7433	5.8064	5.8064	5.8182	5.7819	5.7433	5.7164	5.6886	
util living area	0.9820	0.9664	0.9340	0.8387	0.6822	0.4897	0.3545	0.3913	0.6155	0.8738	0.9637	0.9848	(86)
MIT	20.1820	20.3497	20.5654	20.8212	20.9533	20.9942	20.9993	20.9987	20.9798	20.8064	20.4680	20.1583	(87)
Th 2	20.3107	20.3128	20.3148	20.3243	20.3261	20.3344	20.3344	20.3359	20.3312	20.3261	20.3225	20.3187	(88)
util rest of house	0.9783	0.9598	0.9213	0.8122	0.6410	0.4404	0.3011	0.3353	0.5615	0.8462	0.9555	0.9817	(89)
MIT 2	19.3536	19.5655	19.8335	20.1428	20.2853	20.3305	20.3340	20.3353	20.3164	20.1334	19.7235	19.3300	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.6128	19.8108	20.0624	20.3550	20.4943	20.5381	20.5421	20.5428	20.5239	20.3439	19.9564	19.5891	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6128	19.8108	20.0624	20.3550	20.4943	20.5381	20.5421	20.5428	20.5239	20.3439	19.9564	19.5891	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9737	0.9541	0.9161	0.8135	0.6515	0.4556	0.3178	0.3528	0.5774	0.8470	0.9502	0.9775	(94)
Useful gains	585.4964	637.9120	653.6372	631.4926	526.2915	362.0142	241.5345	253.0432	388.1138	518.5033	554.5139	566.7803	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	974.7227	946.1035	857.8457	713.8172	546.4766	364.1502	241.7477	253.4290	395.9597	605.4848	803.4511	967.4329	(97)
Space heating kWh	289.5844	207.1047	151.9311	59.2737	15.0178	0.0000	0.0000	0.0000	0.0000	64.7143	179.2348	298.0855	(98a)
Space heating requirement - total per year (kWh/year)												1264.9462	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	289.5844	207.1047	151.9311	59.2737	15.0178	0.0000	0.0000	0.0000	0.0000	64.7143	179.2348	298.0855	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1264.9462	
Space heating per m2											(98c) / (4) =	14.5899	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 92.4000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	289.5844	207.1047	151.9311	59.2737	15.0178	0.0000	0.0000	0.0000	0.0000	64.7143	179.2348	298.0855	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	313.4030	224.1393	164.4276	64.1490	16.2530	0.0000	0.0000	0.0000	0.0000	70.0371	193.9771	322.6034	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	238.0452	210.5103	223.8702	197.6651	192.1104	173.6740	171.9383	178.5303	180.2015	200.2327	211.9975	235.5810	(64)
Efficiency of water heater												80.3000	(216)
(217)m	84.8025	84.3465	83.5683	82.1329	80.8672	80.3000	80.3000	80.3000	80.3000	82.2433	84.0238	84.8868	(217)
Fuel for water heating, kWh/month	280.7055	249.5781	267.8888	240.6649	237.5629	216.2814	214.1200	222.3291	224.4104	243.4639	252.3065	277.5238	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 1368.9894 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 80.3000

Water heating fuel used 2926.8352 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

Total electricity for the above, kWh/year 86.0000 (231)

Electricity for lighting (calculated in Appendix L) 224.3782 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation -857.0729 (233)

Wind generation 0.0000 (234)

Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3749.1299	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1368.9894	0.2100	287.4878	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2926.8352	0.2100	614.6354	(264)
Space and water heating			902.1232	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			835.2215	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.6300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1368.9894	1.1300	1546.9580	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2926.8352	1.1300	3307.3238	(278)
Space and water heating			4854.2818	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4440.5089	(286)
Target Primary Energy Rate (TPER)			51.2200	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	9.09	**TER**	9.63
Environmental	92 A	**% DER < TER**			5.61
CO_2 Emissions (t/year)	0.74	**DFEE**	15.84	**TFEE**	19.14
Compliance Check	See BREL	**% DFEE < TFEE**			17.26
% DPER < TPER	-1.27	**DPER**	51.87	**TPER**	51.22

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2257	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2878	0.2821	0.2765	0.2483	0.2426	0.2144	0.2144	0.2088	0.2257	0.2426	0.2539	0.2652	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5414	0.5398	0.5382	0.5308	0.5294	0.5230	0.5230	0.5218	0.5255	0.5294	0.5322	0.5352	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15916.3300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							183.5794	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9510	37.8383	37.7278	37.2089	37.1118	36.6599	36.6599	36.5762	36.8339	37.1118	37.3082	37.5135	(38)
Heat transfer coeff	58.4658	58.3531	58.2426	57.7237	57.6266	57.1747	57.1747	57.0910	57.3488	57.6266	57.8230	58.0284	(39)
Average = Sum(39)m / 12 =												57.7233	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6743	0.6730	0.6718	0.6658	0.6647	0.6595	0.6595	0.6585	0.6615	0.6647	0.6669	0.6693	(40)
HLP (average)												0.6658	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =					614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	545.1343	624.6069	686.9038	773.6007	821.2924	817.0482	782.1979	728.3014	668.6668	584.4747	536.9133	522.5689	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.6203	75.7664	75.9101	76.5925	76.7215	77.3280	77.3280	77.4413	77.0932	76.7215	76.4609	76.1904	
alpha	6.0414	6.0511	6.0607	6.1062	6.1148	6.1552	6.1552	6.1628	6.1395	6.1148	6.0974	6.0794	
util living area	0.9867	0.9700	0.9305	0.8118	0.6350	0.4461	0.3214	0.3602	0.5819	0.8700	0.9699	0.9894	(86)

MIT	20.2292	20.4133	20.6387	20.8759	20.9747	20.9975	20.9997	20.9994	20.9884	20.8399	20.5016	20.1941	(87)
Th 2	20.3635	20.3647	20.3658	20.3712	20.3721	20.3768	20.3768	20.3776	20.3750	20.3721	20.3701	20.3680	(88)
util rest of house	0.9840	0.9641	0.9177	0.7846	0.5967	0.4033	0.2760	0.3116	0.5326	0.8430	0.9630	0.9872	(89)
MIT 2	19.6555	19.8367	20.0541	20.2740	20.3551	20.3755	20.3767	20.3774	20.3684	20.2480	19.9294	19.6246	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.8349	20.0171	20.2370	20.4623	20.5489	20.5700	20.5716	20.5720	20.5623	20.4332	20.1083	19.8027	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8349	20.0171	20.2370	20.4623	20.5489	20.5700	20.5716	20.5720	20.5623	20.4332	20.1083	19.8027	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9812	0.9604	0.9149	0.7888	0.6077	0.4166	0.2902	0.3268	0.5476	0.8458	0.9597	0.9847	(94)
Useful gains	534.8770	599.8596	628.4294	610.1828	499.0816	340.4100	226.9938	238.0202	366.1294	494.3458	515.2661	514.5863	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	908.2631	882.1289	800.0787	667.4170	509.9331	341.3344	227.0735	238.1838	370.6058	566.6520	752.1823	905.4017	(97)
Space heating kWh	277.7993	189.6850	127.7071	41.2086	8.0736	0.0000	0.0000	0.0000	0.0000	53.7958	170.5796	290.7667	(98a)
Space heating requirement - total per year (kWh/year)												1159.6156	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	277.7993	189.6850	127.7071	41.2086	8.0736	0.0000	0.0000	0.0000	0.0000	53.7958	170.5796	290.7667	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1159.6156	
Space heating per m2											(98c) / (4) =	13.3750	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	537.4421	423.0928	433.8916	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9818	0.9932	0.9888	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	527.6770	420.2290	429.0462	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	890.8770	853.1757	792.9430	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	261.5040	322.1124	270.7392	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	65.3760	80.5281	67.6848	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												213.5889	(107)
Energy for space heating												13.3750	(99)
Energy for space cooling												2.4635	(108)
Total												15.8386	(109)
Fabric Energy Efficiency (DFEE)												15.8	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4892			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	13.5400	0.0700	0.9478
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.0900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8787 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.3679 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff													
	63.6543	63.4509	63.2515	62.3151	62.1399	61.3243	61.3243	61.1733	61.6385	62.1399	62.4943	62.8649	(39)
Average = Sum(39)m / 12 =												62.3143	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7342	0.7318	0.7295	0.7187	0.7167	0.7073	0.7073	0.7056	0.7109	0.7167	0.7208	0.7251	(40)
HLP (average)												0.7187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses													
	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												64.3029	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)													
	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.3496	(64a)
Heat gains from water heating, kWh/month													
	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains													
	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(80)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)
Total gains	533.6898	602.2192	650.0344	719.8289	755.3931	749.5884	717.9735	673.1335	625.7862	557.9097	522.6435	513.1575	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4565	69.6791	69.8987	70.9491	71.1492	72.0954	72.0954	72.2734	71.7280	71.1492	70.7457	70.3287	
alpha	5.6304	5.6453	5.6599	5.7299	5.7433	5.8064	5.8064	5.8182	5.7819	5.7433	5.7164	5.6886	
util living area													
	0.9896	0.9786	0.9538	0.8704	0.7188	0.5177	0.3750	0.4165	0.6545	0.9066	0.9774	0.9915	(86)
MIT	20.0741	20.2513	20.4850	20.7785	20.9393	20.9923	20.9990	20.9982	20.9726	20.7557	20.3784	20.0503	(87)
Th 2	20.3107	20.3128	20.3148	20.3243	20.3261	20.3344	20.3344	20.3359	20.3312	20.3261	20.3225	20.3187	(88)
util rest of house													
	0.9874	0.9741	0.9442	0.8467	0.6777	0.4660	0.3187	0.3571	0.5991	0.8835	0.9719	0.9896	(89)
MIT 2	19.4587	19.6349	19.8641	20.1462	20.2842	20.3303	20.3340	20.3352	20.3152	20.1323	19.7695	19.4416	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.6512	19.8277	20.0584	20.3440	20.4891	20.5374	20.5420	20.5426	20.5209	20.3273	19.9600	19.6320	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6512	19.8277	20.0584	20.3440	20.4891	20.5374	20.5420	20.5426	20.5209	20.3273	19.9600	19.6320	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9847	0.9703	0.9401	0.8474	0.6880	0.4819	0.3363	0.3757	0.6152	0.8836	0.9684	0.9872	(94)
Useful gains	525.5027	584.3230	611.1006	609.9856	519.7004	361.2573	241.4534	252.8791	385.0027	492.9554	506.1062	506.6090	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	977.1671	947.1780	857.5870	713.1345	546.1555	364.1068	241.7420	253.4171	395.7713	604.4537	803.6748	970.1324	(97)
Space heating kWh													
	336.0384	243.8386	183.3859	74.2672	19.6826	0.0000	0.0000	0.0000	0.0000	82.9548	214.2494	344.8614	(98a)
Space heating requirement - total per year (kWh/year)												1499.2782	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	336.0384	243.8386	183.3859	74.2672	19.6826	0.0000	0.0000	0.0000	0.0000	82.9548	214.2494	344.8614	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1499.2782	
Space heating per m2											(98c) / (4) =	17.2927	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	576.4484	453.7998	464.9168	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9561	0.9813	0.9722	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	551.1187	445.3221	451.9778	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	812.0280	778.1082	728.4611	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	187.8547	247.5929	205.7036	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	46.9637	61.8982	51.4259	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												160.2878	(107)
Energy for space heating												17.2927	(99)
Energy for space cooling												1.8488	(108)
Total												19.1415	(109)
Fabric Energy Efficiency (TFEE)												19.1	(109)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	9.09	**TER**	9.63
Environmental	92 A	**% DER < TER**			5.61
CO_2 Emissions (t/year)	0.74	**DFEE**	15.84	**TFEE**	19.14
Compliance Check	See BREL	**% DFEE < TFEE**			17.26
% DPER < TPER	-1.27	**DPER**	51.87	**TPER**	51.22

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2796	12.8855	14.2401	13.7256	14.1482	13.6565	14.0893	14.1078	13.6737	14.1700	13.7658	14.2723	(61)
Total heat required for water heating calculated for each month	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
										Total per year (kWh/year) = Sum(64)m =		2267.8420	(64)
12Total per year (kWh/year)												2268	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	76.0275	66.9783	70.5469	60.6190	57.7963	51.0327	49.6244	52.1934	53.4246	60.8228	66.1962	75.0165	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	102.1874	99.6702	94.8210	84.1931	77.6833	70.8788	66.6995	70.1525	74.2008	81.7511	91.9392	100.8286	(72)
Total internal gains	533.5334	547.7688	522.4940	503.3624	476.0278	455.3032	436.3887	437.4252	452.0232	471.0771	502.0899	521.8995	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	600.4392	678.6509	738.0381	817.7206	861.2856	849.6831	811.8544	759.9447	702.7099	626.3797	585.5137	576.9196	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047

util living area												
	0.9763	0.9512	0.8979	0.7663	0.5901	0.4175	0.3010	0.3361	0.5401	0.8260	0.9514	0.9811 (86)
MIT	20.3941	20.5584	20.7464	20.9189	20.9850	20.9985	20.9998	20.9997	20.9931	20.8927	20.6182	20.3484 (87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934 (88)
util rest of house												
	0.9718	0.9427	0.8817	0.7379	0.5543	0.3783	0.2596	0.2919	0.4945	0.7956	0.9413	0.9773 (89)
MIT 2	19.6864	19.8902	20.1175	20.3132	20.3806	20.3924	20.3933	20.3932	20.3884	20.2891	19.9668	19.6290 (90)
Living area fraction										fLA = Living area / (4) =		0.3128 (91)
MIT	19.9077	20.0992	20.3142	20.5027	20.5696	20.5820	20.5830	20.5829	20.5776	20.4779	20.1706	19.8540 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.7577	19.9492	20.1642	20.3527	20.4196	20.4320	20.4330	20.4329	20.4276	20.3279	20.0206	19.7040 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9660	0.9354	0.8750	0.7359	0.5559	0.3808	0.2623	0.2948	0.4971	0.7921	0.9341	0.9721	(94)
Useful gains	580.0339	634.8211	645.7893	601.7707	478.7711	323.5825	212.9411	224.0105	349.3356	496.1589	546.9487	560.8454	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	858.8833	836.1833	759.2298	636.3486	484.4923	324.0427	212.9752	224.0821	351.5812	540.5169	717.9088	861.4544	(97)
Space heating kWh	207.4639	135.3154	84.3998	24.8961	4.2566	0.0000	0.0000	0.0000	0.0000	33.0023	123.0913	223.6531	(98a)
Space heating requirement - total per year (kWh/year)												836.0785	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	207.4639	135.3154	84.3998	24.8961	4.2566	0.0000	0.0000	0.0000	0.0000	33.0023	123.0913	223.6531	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												836.0785	
Space heating per m2											(98c) / (4) =	9.6434	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	207.4639	135.3154	84.3998	24.8961	4.2566	0.0000	0.0000	0.0000	0.0000	33.0023	123.0913	223.6531	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	233.1055	152.0398	94.8312	27.9732	4.7827	0.0000	0.0000	0.0000	0.0000	37.0813	138.3048	251.2956	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0940	87.9688	87.7715	87.4976	87.3391	87.3000	87.3000	87.3000	87.3000	87.5515	87.9350	88.1315	(217)
Fuel for water heating, kWh/month	263.5787	232.6231	245.7566	212.2557	203.0408	179.6911	174.9625	183.8181	187.9361	212.9508	230.2860	260.0146	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.1487	9.1665	10.1487	9.8213	10.1487	9.8213	10.1487	10.1487	9.8213	10.1487	9.8213	10.1487	(231)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												939.4140	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.3000	
Water heating fuel used												2586.9140	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												119.4924	(231)
Electricity for lighting (calculated in Appendix L)												216.3282	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)

Total delivered energy for all uses 3862.1487 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	939.4140	0.2100	197.2769	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2586.9140	0.2100	543.2519	(264)
Space and water heating			740.5289	(265)
Pumps, fans and electric keep-hot	119.4924	0.1387	16.5751	(267)
Energy for lighting	216.3282	0.1443	31.2229	(268)
Total CO2, kg/year			788.3268	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.0900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	939.4140	1.1300	1061.5379	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2586.9140	1.1300	2923.2128	(278)
Space and water heating			3984.7507	(279)
Pumps, fans and electric keep-hot	119.4924	1.5128	180.7681	(281)
Energy for lighting	216.3282	1.5338	331.8115	(282)
Total Primary energy kWh/year			4497.3303	(286)
Dwelling Primary energy Rate (DPER)			51.8700	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4892			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3	Sill	2.5200	0.0500	0.1260
E4	Jamb	20.7200	0.0500	1.0360
E6	Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E18	Party wall between dwellings	22.0000	0.0600	1.3200
P2	Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7	Party floor between dwellings (in blocks of flats)	13.5400	0.0700	0.9478
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	32.0900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8787 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.3679 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	63.6543	63.4509	63.2515	62.3151	62.1399	61.3243	61.3243	61.1733	61.6385	62.1399	62.4943	62.8649	(39)
Average = Sum(39)m / 12 =												62.3143	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7342	0.7318	0.7295	0.7187	0.7167	0.7073	0.7073	0.7056	0.7109	0.7167	0.7208	0.7251	(40)
HLP (average)												0.7187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	268.8764	237.7777	252.4231	221.3080	214.1447	192.5289	189.6118	197.3242	199.7096	223.2306	238.0513	265.8413	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	238.0452	210.5103	223.8702	197.6651	192.1104	173.6740	171.9383	178.5303	180.2015	200.2327	211.9975	235.5810	(64)
										Total per year (kWh/year) = Sum(64)m =		2414.3567	(64)
12Total per year (kWh/year)												2414	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	85.1973	75.2638	79.7266	69.5164	66.9990	59.9474	58.8418	61.4062	62.3349	70.0200	75.0836	84.1881	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	114.5125	111.9997	107.1594	96.5506	90.0524	83.2602	79.0885	82.5352	86.5763	94.1130	104.2827	113.1561	(72)
Total internal gains	545.8584	560.0984	534.8323	515.7198	488.3970	467.6846	448.7777	449.8079	464.3987	483.4390	514.4334	534.2270	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(80)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)
Total gains	601.3198	668.5927	713.5070	776.3062	807.7554	794.6048	760.0190	717.1596	672.2047	612.1767	583.5873	579.8358	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4565	69.6791	69.8987	70.9491	71.1492	72.0954	72.0954	72.2734	71.7280	71.1492	70.7457	70.3287	
alpha	5.6304	5.6453	5.6599	5.7299	5.7433	5.8064	5.8064	5.8182	5.7819	5.7433	5.7164	5.6886	
util living area	0.9820	0.9664	0.9340	0.8387	0.6822	0.4897	0.3545	0.3913	0.6155	0.8738	0.9637	0.9848	(86)
MIT	20.1820	20.3497	20.5654	20.8212	20.9533	20.9942	20.9993	20.9987	20.9798	20.8064	20.4680	20.1583	(87)
Th 2	20.3107	20.3128	20.3148	20.3243	20.3261	20.3344	20.3344	20.3359	20.3312	20.3261	20.3225	20.3187	(88)
util rest of house	0.9783	0.9598	0.9213	0.8122	0.6410	0.4404	0.3011	0.3353	0.5615	0.8462	0.9555	0.9817	(89)
MIT 2	19.3536	19.5655	19.8335	20.1428	20.2853	20.3305	20.3340	20.3353	20.3164	20.1334	19.7235	19.3300	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.6128	19.8108	20.0624	20.3550	20.4943	20.5381	20.5421	20.5428	20.5239	20.3439	19.9564	19.5891	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6128	19.8108	20.0624	20.3550	20.4943	20.5381	20.5421	20.5428	20.5239	20.3439	19.9564	19.5891	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9737	0.9541	0.9161	0.8135	0.6515	0.4556	0.3178	0.3528	0.5774	0.8470	0.9502	0.9775	(94)
Useful gains	585.4964	637.9120	653.6372	631.4926	526.2915	362.0142	241.5345	253.0432	388.1138	518.5033	554.5139	566.7803	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	974.7227	946.1035	857.8457	713.8172	546.4766	364.1502	241.7477	253.4290	395.9597	605.4848	803.4511	967.4329	(97)
Space heating kWh	289.5844	207.1047	151.9311	59.2737	15.0178	0.0000	0.0000	0.0000	0.0000	64.7143	179.2348	298.0855	(98a)
Space heating requirement - total per year (kWh/year)												1264.9462	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	289.5844	207.1047	151.9311	59.2737	15.0178	0.0000	0.0000	0.0000	0.0000	64.7143	179.2348	298.0855	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1264.9462	
Space heating per m2											(98c) / (4) =	14.5899	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 92.4000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	289.5844	207.1047	151.9311	59.2737	15.0178	0.0000	0.0000	0.0000	0.0000	64.7143	179.2348	298.0855	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	313.4030	224.1393	164.4276	64.1490	16.2530	0.0000	0.0000	0.0000	0.0000	70.0371	193.9771	322.6034	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	238.0452	210.5103	223.8702	197.6651	192.1104	173.6740	171.9383	178.5303	180.2015	200.2327	211.9975	235.5810	(64)
Efficiency of water heater												80.3000	(216)
(217)m	84.8025	84.3465	83.5683	82.1329	80.8672	80.3000	80.3000	80.3000	80.3000	82.2433	84.0238	84.8868	(217)
Fuel for water heating, kWh/month	280.7055	249.5781	267.8888	240.6649	237.5629	216.2814	214.1200	222.3291	224.4104	243.4639	252.3065	277.5238	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 1368.9894 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 80.3000

Water heating fuel used 2926.8352 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

Total electricity for the above, kWh/year 86.0000 (231)

Electricity for lighting (calculated in Appendix L) 224.3782 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation -857.0729 (233)

Wind generation 0.0000 (234)

Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3749.1299	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1368.9894	0.2100	287.4878	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2926.8352	0.2100	614.6354	(264)
Space and water heating			902.1232	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			835.2215	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.6300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1368.9894	1.1300	1546.9580	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2926.8352	1.1300	3307.3238	(278)
Space and water heating			4854.2818	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4440.5089	(286)
Target Primary Energy Rate (TPER)			51.2200	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	9.09	**TER**	9.63
Environmental	92 A	**% DER < TER**			5.61
CO_2 Emissions (t/year)	0.74	**DFEE**	15.84	**TFEE**	19.14
Compliance Check	See BREL	**% DFEE < TFEE**			17.26
% DPER < TPER	-1.27	**DPER**	51.87	**TPER**	51.22

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2796	12.8855	14.2401	13.7256	14.1482	13.6565	14.0893	14.1078	13.6737	14.1700	13.7658	14.2723	(61)
Total heat required for water heating calculated for each month	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
									Total per year (kWh/year) = Sum(64)m =			2267.8420	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	76.0275	66.9783	70.5469	60.6190	57.7963	51.0327	49.6244	52.1934	53.4246	60.8228	66.1962	75.0165	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	102.1874	99.6702	94.8210	84.1931	77.6833	70.8788	66.6995	70.1525	74.2008	81.7511	91.9392	100.8286	(72)
Total internal gains	587.9847	585.6501	566.6328	531.2821	496.1193	461.4093	442.7453	446.0155	464.2321	499.5052	538.3462	572.1411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	654.8905	716.5322	782.1769	845.6403	881.3771	855.7892	818.2111	768.5351	714.9188	654.8078	621.7699	627.1612	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													

	0.9645	0.9388	0.8755	0.7478	0.5777	0.4146	0.2987	0.3324	0.5313	0.8037	0.9375	0.9717	(86)
MIT	20.4746	20.6065	20.7857	20.9292	20.9866	20.9985	20.9999	20.9997	20.9937	20.9086	20.6641	20.4254	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9581	0.9286	0.8574	0.7191	0.5424	0.3756	0.2576	0.2886	0.4864	0.7720	0.9254	0.9665	(89)
MIT 2	19.7864	19.9485	20.1627	20.3238	20.3820	20.3924	20.3933	20.3932	20.3889	20.3055	20.0219	19.7252	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0017	20.1543	20.3576	20.5132	20.5711	20.5820	20.5830	20.5829	20.5781	20.4941	20.2228	19.9442	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.8517	20.0043	20.2076	20.3632	20.4211	20.4320	20.4330	20.4329	20.4281	20.3441	20.0728	19.7942	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9514	0.9212	0.8514	0.7176	0.5440	0.3781	0.2603	0.2915	0.4890	0.7693	0.9181	0.9603	(94)
Useful gains	623.0781	660.0648	665.9093	606.8070	479.4899	323.6035	212.9429	224.0158	349.5597	503.7559	570.8160	602.2384	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	864.1042	839.2466	761.6395	636.9333	484.5755	324.0453	212.9754	224.0828	351.6081	541.4165	720.8097	866.4670	(97)
Space heating kWh													
	179.3234	120.4101	71.2233	21.6910	3.7837	0.0000	0.0000	0.0000	0.0000	28.0194	107.9954	196.5861	(98a)
Space heating requirement - total per year (kWh/year)												729.0325	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	179.3234	120.4101	71.2233	21.6910	3.7837	0.0000	0.0000	0.0000	0.0000	28.0194	107.9954	196.5861	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												729.0325	
Space heating per m2											(98c) / (4) =	8.4087	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	179.3234	120.4101	71.2233	21.6910	3.7837	0.0000	0.0000	0.0000	0.0000	28.0194	107.9954	196.5861	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	201.4870	135.2923	80.0262	24.3719	4.2513	0.0000	0.0000	0.0000	0.0000	31.4825	121.3432	220.8832	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0327	87.9221	87.7159	87.4747	87.3348	87.3000	87.3000	87.3000	87.3000	87.5184	87.8839	88.0768	(217)
Fuel for water heating, kWh/month													
	263.7622	232.7467	245.9124	212.3110	203.0507	179.6911	174.9625	183.8181	187.9361	213.0314	230.4200	260.1759	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.1487	9.1665	10.1487	9.8213	10.1487	9.8213	10.1487	10.1487	9.8213	10.1487	9.8213	10.1487	(231)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	819.1376	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2587.8179	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	119.4924	(231)
Electricity for lighting (calculated in Appendix L)	216.3282	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3742.7762	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	819.1376	3.6400	29.8166	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2587.8179	3.6400	94.1966	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	119.4924	16.4900	19.7043	(249)
Energy for lighting	216.3282	16.4900	35.6725	(250)
Additional standing charges			92.0000	(251)
Total energy cost			271.3900	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7418	(257)
SAP value		87.9748	
SAP rating (Section 12)		88	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	819.1376	0.2100	172.0189	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2587.8179	0.2100	543.4418	(264)
Space and water heating			715.4607	(265)
Pumps, fans and electric keep-hot	119.4924	0.1387	16.5751	(267)
Energy for lighting	216.3282	0.1443	31.2229	(268)
Total CO2, kg/year			763.2586	(272)
CO2 emissions per m2			8.8000	(273)
EI value			92.2341	
EI rating			92	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		1.4928 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5778 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day)		126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2796	12.8855	14.2401	13.7256	14.1482	13.6565	14.0893	14.1078	13.6737	14.1700	13.7658	14.2723	(61)
Total heat required for water heating calculated for each month	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
										Total per year (kWh/year) = Sum(64)m =		2267.8420	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	76.0275	66.9783	70.5469	60.6190	57.7963	51.0327	49.6244	52.1934	53.4246	60.8228	66.1962	75.0165	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	102.1874	99.6702	94.8210	84.1931	77.6833	70.8788	66.6995	70.1525	74.2008	81.7511	91.9392	100.8286	(72)
Total internal gains	587.9847	585.6501	566.6328	531.2821	496.1193	461.4093	442.7453	446.0155	464.2321	499.5052	538.3462	572.1411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	23.7835	0.7600	0.7000	0.7700	65.5876	(80)
West	1.7600	23.7835	0.7600	0.7000	0.7700	15.4324	(80)

Solar gains	81.0200	140.8292	228.1692	335.8028	395.8111	434.4066	405.9044	355.9037	279.8628	176.2264	99.5150	67.0100	(83)
Total gains	669.0047	726.4794	794.8020	867.0849	891.9304	895.8159	848.6497	801.9193	744.0949	675.7315	637.8612	639.1511	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area	0.9577	0.9302	0.8536	0.7150	0.5425	0.3594	0.2553	0.2840	0.4899	0.7608	0.9224	0.9664	(86)
MIT	20.5202	20.6416	20.8237	20.9465	20.9910	20.9994	20.9999	20.9999	20.9962	20.9362	20.7132	20.4696	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house	0.9502	0.9188	0.8331	0.6848	0.5068	0.3219	0.2156	0.2420	0.4460	0.7257	0.9078	0.9603	(89)
MIT 2	19.8430	19.9912	20.2067	20.3419	20.3860	20.3930	20.3933	20.3933	20.3907	20.3342	20.0808	19.7805	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0549	20.1947	20.3997	20.5311	20.5753	20.5827	20.5831	20.5831	20.5801	20.5225	20.2786	19.9961	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.9049	20.0447	20.2497	20.3811	20.4253	20.4327	20.4331	20.4331	20.4301	20.3725	20.1286	19.8461	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9431	0.9114	0.8279	0.6842	0.5087	0.3244	0.2182	0.2448	0.4487	0.7245	0.9006	0.9537	(94)
Useful gains	630.9669	662.1137	658.0379	593.2438	453.7076	290.5828	185.1875	196.2874	333.8451	489.5344	574.4775	609.5412	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	850.3884	824.8188	736.1989	615.7006	457.0224	290.7457	185.1973	196.3082	335.0525	515.2130	701.6882	852.6778	(97)
Space heating kWh	163.2496	109.3378	58.1517	16.1689	2.4662	0.0000	0.0000	0.0000	0.0000	19.1049	91.5917	180.8937	(98a)
Space heating requirement - total per year (kWh/year)												640.9646	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	163.2496	109.3378	58.1517	16.1689	2.4662	0.0000	0.0000	0.0000	0.0000	19.1049	91.5917	180.8937	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												640.9646	
Space heating per m2										(98c) / (4) =		7.3929	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	163.2496	109.3378	58.1517	16.1689	2.4662	0.0000	0.0000	0.0000	0.0000	19.1049	91.5917	180.8937	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	183.4266	122.8515	65.3390	18.1673	2.7710	0.0000	0.0000	0.0000	0.0000	21.4662	102.9121	203.2513	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
Efficiency of water heater												87.3000	(216)
(217)m	87.9939	87.8846	87.6555	87.4338	87.3229	87.3000	87.3000	87.3000	87.3000	87.4553	87.8224	88.0419	(217)
Fuel for water heating, kWh/month	263.8787	232.8461	246.0817	212.4106	203.0786	179.6911	174.9625	183.8181	187.9361	213.1852	230.5811	260.2792	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.1487	9.1665	10.1487	9.8213	10.1487	9.8213	10.1487	10.1487	9.8213	10.1487	9.8213	10.1487	(231)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													

Space heating fuel - main system 1	720.1849	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2588.7488	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	119.4924	(231)
Electricity for lighting (calculated in Appendix L)	216.3282	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3644.7544	(238)

10a. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	720.1849	6.5500	47.1721	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2588.7488	6.5500	169.5630	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	119.4924	28.4300	33.9717	(249)
Energy for lighting	216.3282	28.4300	61.5021	(250)
Additional standing charges			104.0000	(251)
Total energy cost			416.2090	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	720.1849	0.2100	151.2388	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2588.7488	0.2100	543.6373	(264)
Space and water heating			694.8761	(265)
Pumps, fans and electric keep-hot	119.4924	0.1387	16.5751	(267)
Energy for lighting	216.3282	0.1443	31.2229	(268)
Total CO2, kg/year			742.6740	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	720.1849	1.1300	813.8089	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2588.7488	1.1300	2925.2862	(278)
Space and water heating			3739.0951	(279)
Pumps, fans and electric keep-hot	119.4924	1.5128	180.7681	(281)
Energy for lighting	216.3282	1.5338	331.8115	(282)
Total Primary energy kWh/year			4251.6747	(286)

SAP 10 EPC IMPROVEMENTS

Rev C - Be Lean

Current energy efficiency rating: B 88
Current environmental impact rating: A 92

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 92

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£95	£95	£0
Mains gas	£321	£321	£0
Space heating	£185	£185	£0

Water heating	£170	£170	£0
Lighting	£62	£62	£0
Total cost of fuels	£416	£416	£0
Total cost of uses	£417	£417	£0
Delivered energy	42 kWh/m²	42 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.7 tonnes	0.0 tonnes
CO2 emissions per m²	9 kg/m²	9 kg/m²	0 kg/m²
Primary energy	49 kWh/m²	49 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		1.4928 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778	(42)
Hot water usage for mixer showers													
	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths													
	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses													
	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m													
	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2796	12.8855	14.2401	13.7256	14.1482	13.6565	14.0893	14.1078	13.6737	14.1700	13.7658	14.2723	(61)
Total heat required for water heating calculated for each month													
	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
										Total per year (kWh/year) = Sum(64)m =		2267.8420	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	76.0275	66.9783	70.5469	60.6190	57.7963	51.0327	49.6244	52.1934	53.4246	60.8228	66.1962	75.0165	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	102.1874	99.6702	94.8210	84.1931	77.6833	70.8788	66.6995	70.1525	74.2008	81.7511	91.9392	100.8286	(72)
Total internal gains													
	587.9847	585.6501	566.6328	531.2821	496.1193	461.4093	442.7453	446.0155	464.2321	499.5052	538.3462	572.1411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	654.8905	716.5322	782.1769	845.6403	881.3771	855.7892	818.2111	768.5351	714.9188	654.8078	621.7699	627.1612	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9645	0.9388	0.8755	0.7478	0.5777	0.4146	0.2987	0.3324	0.5313	0.8037	0.9375	0.9717	(86)
MIT	20.4746	20.6065	20.7857	20.9292	20.9866	20.9985	20.9999	20.9997	20.9937	20.9086	20.6641	20.4254	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9581	0.9286	0.8574	0.7191	0.5424	0.3756	0.2576	0.2886	0.4864	0.7720	0.9254	0.9665	(89)
MIT 2	19.7864	19.9485	20.1627	20.3238	20.3820	20.3924	20.3933	20.3932	20.3889	20.3055	20.0219	19.7252	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	20.0017	20.1543	20.3576	20.5132	20.5711	20.5820	20.5830	20.5829	20.5781	20.4941	20.2228	19.9442	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.8517	20.0043	20.2076	20.3632	20.4211	20.4320	20.4330	20.4329	20.4281	20.3441	20.0728	19.7942	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9514	0.9212	0.8514	0.7176	0.5440	0.3781	0.2603	0.2915	0.4890	0.7693	0.9181	0.9603	(94)
Useful gains	623.0781	660.0648	665.9093	606.8070	479.4899	323.6035	212.9429	224.0158	349.5597	503.7559	570.8160	602.2384	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	864.1042	839.2466	761.6395	636.9333	484.5755	324.0453	212.9754	224.0828	351.6081	541.4165	720.8097	866.4670	(97)
Space heating kWh	179.3234	120.4101	71.2233	21.6910	3.7837	0.0000	0.0000	0.0000	0.0000	28.0194	107.9954	196.5861	(98a)
Space heating requirement - total per year (kWh/year)												729.0325	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	179.3234	120.4101	71.2233	21.6910	3.7837	0.0000	0.0000	0.0000	0.0000	28.0194	107.9954	196.5861	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												729.0325	
Space heating per m2											(98c) / (4) =	8.4087	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	179.3234	120.4101	71.2233	21.6910	3.7837	0.0000	0.0000	0.0000	0.0000	28.0194	107.9954	196.5861	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	201.4870	135.2923	80.0262	24.3719	4.2513	0.0000	0.0000	0.0000	0.0000	31.4825	121.3432	220.8832	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0327	87.9221	87.7159	87.4747	87.3348	87.3000	87.3000	87.3000	87.3000	87.5184	87.8839	88.0768	(217)
Fuel for water heating, kWh/month	263.7622	232.7467	245.9124	212.3110	203.0507	179.6911	174.9625	183.8181	187.9361	213.0314	230.4200	260.1759	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.1487	9.1665	10.1487	9.8213	10.1487	9.8213	10.1487	10.1487	9.8213	10.1487	9.8213	10.1487	(231)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	819.1376	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2587.8179	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	119.4924	(231)
Electricity for lighting (calculated in Appendix L)	216.3282	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3742.7762	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	819.1376	3.6400	29.8166	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2587.8179	3.6400	94.1966	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	119.4924	16.4900	19.7043	(249)

Energy for lighting	216.3282	16.4900	35.6725	(250)
Additional standing charges			92.0000	(251)
Total energy cost			271.3900	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):			0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =		0.7418	(257)
SAP value			87.9748	
SAP rating (Section 12)			88	(258)
SAP band			B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	819.1376	0.2100	172.0189	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2587.8179	0.2100	543.4418	(264)
Space and water heating			715.4607	(265)
Pumps, fans and electric keep-hot	119.4924	0.1387	16.5751	(267)
Energy for lighting	216.3282	0.1443	31.2229	(268)
Total CO2, kg/year			763.2586	(272)
CO2 emissions per m2			8.8000	(273)
EI value			92.2341	
EI rating			92	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)

Wall to Access Corridor	16.5900	16.5900	0.1900	3.1521	150.0000	2488.5000 (29a)
Total net area of external elements Aum(A, m2)		49.7600				(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		19.0220		(33)
Main dwelling						
Party Wall		79.3600	0.0000	0.0000	70.0000	5555.2000 (32)
Party Floor		43.3500			70.0000	3034.5000 (32d)
Party Ceiling		43.3500			30.0000	1300.5000 (32b)
Timber partitions		141.0200			9.0000	1269.1800 (32c)
Internal Floor 1		43.3500			18.0000	780.3000 (32d)
Internal Ceiling 1		43.3500			9.0000	390.1500 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		1.4928 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778 (42)
Hot water usage for mixer showers												
	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths												
	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses												
	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)											Total = Sum(45)m =	2100.8276	
Distribution loss (46)m = 0.15 x (45)m													
	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2796	12.8855	14.2401	13.7256	14.1482	13.6565	14.0893	14.1078	13.6737	14.1700	13.7658	14.2723	(61)
Total heat required for water heating calculated for each month													
	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
											Total per year (kWh/year) = Sum(64)m =	2267.8420	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
	76.0275	66.9783	70.5469	60.6190	57.7963	51.0327	49.6244	52.1934	53.4246	60.8228	66.1962	75.0165	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	102.1874	99.6702	94.8210	84.1931	77.6833	70.8788	66.6995	70.1525	74.2008	81.7511	91.9392	100.8286	(72)
Total internal gains													
	587.9847	585.6501	566.6328	531.2821	496.1193	461.4093	442.7453	446.0155	464.2321	499.5052	538.3462	572.1411	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	23.7835	0.7600	0.7000	0.7700	65.5876	(80)
West	1.7600	23.7835	0.7600	0.7000	0.7700	15.4324	(80)

Solar gains	81.0200	140.8292	228.1692	335.8028	395.8111	434.4066	405.9044	355.9037	279.8628	176.2264	99.5150	67.0100	(83)
Total gains	669.0047	726.4794	794.8020	867.0849	891.9304	895.8159	848.6497	801.9193	744.0949	675.7315	637.8612	639.1511	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area	0.9577	0.9302	0.8536	0.7150	0.5425	0.3594	0.2553	0.2840	0.4899	0.7608	0.9224	0.9664	(86)
MIT	20.5202	20.6416	20.8237	20.9465	20.9910	20.9994	20.9999	20.9999	20.9962	20.9362	20.7132	20.4696	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house	0.9502	0.9188	0.8331	0.6848	0.5068	0.3219	0.2156	0.2420	0.4460	0.7257	0.9078	0.9603	(89)
MIT 2	19.8430	19.9912	20.2067	20.3419	20.3860	20.3930	20.3933	20.3933	20.3907	20.3342	20.0808	19.7805	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	20.0549	20.1947	20.3997	20.5311	20.5753	20.5827	20.5831	20.5831	20.5801	20.5225	20.2786	19.9961	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.9049	20.0447	20.2497	20.3811	20.4253	20.4327	20.4331	20.4331	20.4301	20.3725	20.1286	19.8461	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9431	0.9114	0.8279	0.6842	0.5087	0.3244	0.2182	0.2448	0.4487	0.7245	0.9006	0.9537	(94)
Useful gains	630.9669	662.1137	658.0379	593.2438	453.7076	290.5828	185.1875	196.2874	333.8451	489.5344	574.4775	609.5412	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	850.3884	824.8188	736.1989	615.7006	457.0224	290.7457	185.1973	196.3082	335.0525	515.2130	701.6882	852.6778	(97)
Space heating kWh	163.2496	109.3378	58.1517	16.1689	2.4662	0.0000	0.0000	0.0000	0.0000	19.1049	91.5917	180.8937	(98a)
Space heating requirement - total per year (kWh/year)												640.9646	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	163.2496	109.3378	58.1517	16.1689	2.4662	0.0000	0.0000	0.0000	0.0000	19.1049	91.5917	180.8937	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												640.9646	
Space heating per m2											(98c) / (4) =	7.3929	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 89.0000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	163.2496	109.3378	58.1517	16.1689	2.4662	0.0000	0.0000	0.0000	0.0000	19.1049	91.5917	180.8937	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	183.4266	122.8515	65.3390	18.1673	2.7710	0.0000	0.0000	0.0000	0.0000	21.4662	102.9121	203.2513	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
Efficiency of water heater												87.3000	(216)
(217)m	87.9939	87.8846	87.6555	87.4338	87.3229	87.3000	87.3000	87.3000	87.3000	87.4553	87.8224	88.0419	(217)
Fuel for water heating, kWh/month	263.8787	232.8461	246.0817	212.4106	203.0786	179.6911	174.9625	183.8181	187.9361	213.1852	230.5811	260.2792	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.1487	9.1665	10.1487	9.8213	10.1487	9.8213	10.1487	10.1487	9.8213	10.1487	9.8213	10.1487	(231)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 720.1849 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 87.3000

Water heating fuel used 2588.7488 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)

mechanical ventilation fans (SFP = 0.1292) 33.4924 (230a)

central heating pump 41.0000 (230c)

main heating flue fan 45.0000 (230e)

Total electricity for the above, kWh/year 119.4924 (231)

Electricity for lighting (calculated in Appendix L)	216.3282	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3644.7544	(238)

10a. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	720.1849	6.5500	47.1721	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2588.7488	6.5500	169.5630	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	119.4924	28.4300	33.9717	(249)
Energy for lighting	216.3282	28.4300	61.5021	(250)
Additional standing charges			104.0000	(251)
Total energy cost			416.2090	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	720.1849	0.2100	151.2388	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2588.7488	0.2100	543.6373	(264)
Space and water heating			694.8761	(265)
Pumps, fans and electric keep-hot	119.4924	0.1387	16.5751	(267)
Energy for lighting	216.3282	0.1443	31.2229	(268)
Total CO2, kg/year			742.6740	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	720.1849	1.1300	813.8089	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2588.7488	1.1300	2925.2862	(278)
Space and water heating			3739.0951	(279)
Pumps, fans and electric keep-hot	119.4924	1.5128	180.7681	(281)
Energy for lighting	216.3282	1.5338	331.8115	(282)
Total Primary energy kWh/year			4251.6747	(286)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.43	**TER**	9.27
Environmental	99 A	**% DER < TER**			84.57
CO_2 Emissions (t/year)	0.1	**DFEE**	15.84	**TFEE**	19.14
Compliance Check	See BREL	**% DFEE < TFEE**			17.26
% DPER < TPER	61.17	**DPER**	19.13	**TPER**	49.26

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss

Combi loss

Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS

PV diverter

Solar input

FGHRS

Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
									Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
12Total per year (kWh/year)											2752	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	652.0784	730.2946	789.6905	869.3922	912.9689	904.3786	866.5575	814.6416	757.3995	678.0557	637.1713	628.5612	(84)

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7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area	0.9652	0.9339	0.8716	0.7324	0.5591	0.3925	0.2821	0.3136	0.5027	0.7855	0.9310	0.9714	(86)
MIT	20.4706	20.6231	20.7918	20.9369	20.9888	20.9989	20.9999	20.9998	20.9954	20.9198	20.6824	20.4275	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house	0.9589	0.9231	0.8531	0.7034	0.5245	0.3556	0.2432	0.2723	0.4598	0.7530	0.9180	0.9661	(89)
MIT 2	19.7815	19.9685	20.1697	20.3317	20.3839	20.3927	20.3933	20.3933	20.3901	20.3170	20.0437	19.7278	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9970	20.1732	20.3643	20.5210	20.5731	20.5823	20.5830	20.5830	20.5794	20.5055	20.2435	19.9467	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9970	20.1732	20.3643	20.5210	20.5731	20.5823	20.5830	20.5830	20.5794	20.5055	20.2435	19.9467	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9542	0.9188	0.8522	0.7096	0.5349	0.3671	0.2554	0.2852	0.4730	0.7593	0.9145	0.9616	(94)
Useful gains	622.2063	670.9826	672.9501	616.9622	488.3069	332.0142	221.2813	232.3592	358.2729	514.8198	582.6685	604.4037	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	872.1794	848.6313	770.3487	645.7029	493.0207	332.3965	221.3114	232.4203	360.0175	550.3839	730.2945	874.9365	(97)
Space heating kWh	185.9800	119.3799	72.4646	20.6933	3.5071	0.0000	0.0000	0.0000	0.0000	26.4597	106.2907	201.2764	(98a)
Space heating requirement - total per year (kWh/year)												736.0516	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	185.9800	119.3799	72.4646	20.6933	3.5071	0.0000	0.0000	0.0000	0.0000	26.4597	106.2907	201.2764	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												736.0516	
Space heating per m2											(98c) / (4) =	8.4896	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	185.9800	119.3799	72.4646	20.6933	3.5071	0.0000	0.0000	0.0000	0.0000	26.4597	106.2907	201.2764	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	278.9699	179.0698	108.6969	31.0400	5.2606	0.0000	0.0000	0.0000	0.0000	39.6896	159.4361	301.9146	
Space heating requirement	278.9699	179.0698	108.6969	31.0400	5.2606	0.0000	0.0000	0.0000	0.0000	39.6896	159.4361	301.9146	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1104.0774	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												11.0408	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4523.1782	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1395.0876	0.1581	46.5525	(367)
Electrical energy for heat distribution (space & water)	11.0408	0.0000	7.5614	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			209.1981	(373)
Space and water heating			209.1981	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			123.6233	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.4300	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1395.0876	1.5853	466.7424	(467)
Electrical energy for heat distribution (space & water)	11.0408	0.0000	80.2821	(472)
Overall CO2 factor for heat network			0.4246	(486)
Total CO2 associated with community systems			2221.1370	(473)
Space and water heating			2221.1370	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1658.1937	(483)
Dwelling Primary energy Rate (DPER)			19.1300	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4892			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	13.5400	0.0700	0.9478
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.0900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8787 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.3679 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	63.6543	63.4509	63.2515	62.3151	62.1399	61.3243	61.3243	61.1733	61.6385	62.1399	62.4943	62.8649	(39)
Average = Sum(39)m / 12 =												62.3143	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7342	0.7318	0.7295	0.7187	0.7167	0.7073	0.7073	0.7056	0.7109	0.7167	0.7208	0.7251	(40)
HLP (average)												0.7187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(80)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)
Total gains	634.2986	701.5715	746.4857	809.2850	840.7342	827.5835	792.9978	750.1384	705.1835	645.1554	616.5661	612.8145	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4565	69.6791	69.8987	70.9491	71.1492	72.0954	72.0954	72.2734	71.7280	71.1492	70.7457	70.3287	
alpha	5.6304	5.6453	5.6599	5.7299	5.7433	5.8064	5.8064	5.8182	5.7819	5.7433	5.7164	5.6886	
util living area	0.9772	0.9591	0.9222	0.8197	0.6603	0.4709	0.3398	0.3743	0.5898	0.8524	0.9546	0.9805	(86)
MIT	20.2328	20.3960	20.6036	20.8425	20.9604	20.9952	20.9994	20.9990	20.9837	20.8325	20.5134	20.2101	(87)
Th 2	20.3107	20.3128	20.3148	20.3243	20.3261	20.3344	20.3344	20.3359	20.3312	20.3261	20.3225	20.3187	(88)
util rest of house	0.9727	0.9513	0.9080	0.7918	0.6193	0.4232	0.2886	0.3207	0.5371	0.8225	0.9447	0.9766	(89)
MIT 2	19.4173	19.6225	19.8789	20.1658	20.2918	20.3312	20.3341	20.3354	20.3193	20.1616	19.7789	19.3951	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.6724	19.8645	20.1056	20.3774	20.5009	20.5389	20.5422	20.5430	20.5271	20.3715	20.0086	19.6500	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6724	19.8645	20.1056	20.3774	20.5009	20.5389	20.5422	20.5430	20.5271	20.3715	20.0086	19.6500	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9675	0.9454	0.9032	0.7941	0.6301	0.4380	0.3046	0.3375	0.5528	0.8247	0.9393	0.9718	(94)
Useful gains	613.7056	663.2556	674.2084	642.6879	529.7738	362.4578	241.5837	253.1356	389.8443	532.0560	579.1531	595.5527	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	978.5208	949.5103	860.5766	715.2179	546.8866	364.2008	241.7535	253.4398	396.1594	607.1981	806.7171	971.2628	(97)
Space heating kWh	271.4225	192.3632	138.6579	52.2216	12.7319	0.0000	0.0000	0.0000	0.0000	55.9057	163.8461	279.5283	(98a)
Space heating requirement - total per year (kWh/year)												1166.6772	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	271.4225	192.3632	138.6579	52.2216	12.7319	0.0000	0.0000	0.0000	0.0000	55.9057	163.8461	279.5283	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1166.6772	
Space heating per m2											(98c) / (4) =	13.4565	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	271.4225	192.3632	138.6579	52.2216	12.7319	0.0000	0.0000	0.0000	0.0000	55.9057	163.8461	279.5283	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	294.0655	208.4108	150.2252	56.5781	13.7941	0.0000	0.0000	0.0000	0.0000	60.5695	177.5147	302.8476	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.3964	83.9003	83.0590	81.5571	80.3170	79.8000	79.8000	79.8000	79.8000	81.6372	83.5327	84.4864	(217)
Fuel for water heating, kWh/month	276.8852	246.2073	264.2776	237.1858	233.7569	212.3443	209.9929	218.2535	220.5242	239.9258	248.7341	273.6737	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1264.0056	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2881.7612	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3599.0721	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1264.0056	0.2100	265.4412	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2881.7612	0.2100	605.1699	(264)
Space and water heating			870.6110	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			803.7093	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.2700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1264.0056	1.1300	1428.3263	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2881.7612	1.1300	3256.3902	(278)
Space and water heating			4684.7165	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4270.9436	(286)
Target Primary Energy Rate (TPER)			49.2600	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.43	**TER**	9.27
Environmental	99 A	**% DER < TER**			84.57
CO_2 Emissions (t/year)	0.1	**DFEE**	15.84	**TFEE**	19.14
Compliance Check	See BREL	**% DFEE < TFEE**			17.26
% DPER < TPER	61.17	**DPER**	19.13	**TPER**	49.26

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		3 * 10 =	30.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1412	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.2912	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2257	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2878	0.2821	0.2765	0.2483	0.2426	0.2144	0.2144	0.2088	0.2257	0.2426	0.2539	0.2652	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5414	0.5398	0.5382	0.5308	0.5294	0.5230	0.5230	0.5218	0.5255	0.5294	0.5322	0.5352	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15916.3300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	183.5794	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9510	37.8383	37.7278	37.2089	37.1118	36.6599	36.6599	36.5762	36.8339	37.1118	37.3082	37.5135	(38)
Heat transfer coeff	58.4658	58.3531	58.2426	57.7237	57.6266	57.1747	57.1747	57.0910	57.3488	57.6266	57.8230	58.0284	(39)
Average = Sum(39)m / 12 =												57.7233	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6743	0.6730	0.6718	0.6658	0.6647	0.6595	0.6595	0.6585	0.6615	0.6647	0.6669	0.6693	(40)
HLP (average)												0.6658	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =					614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	545.1343	624.6069	686.9038	773.6007	821.2924	817.0482	782.1979	728.3014	668.6668	584.4747	536.9133	522.5689	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.6203	75.7664	75.9101	76.5925	76.7215	77.3280	77.3280	77.4413	77.0932	76.7215	76.4609	76.1904	
alpha	6.0414	6.0511	6.0607	6.1062	6.1148	6.1552	6.1552	6.1628	6.1395	6.1148	6.0974	6.0794	
util living area	0.9867	0.9700	0.9305	0.8118	0.6350	0.4461	0.3214	0.3602	0.5819	0.8700	0.9699	0.9894	(86)

MIT	20.2292	20.4133	20.6387	20.8759	20.9747	20.9975	20.9997	20.9994	20.9884	20.8399	20.5016	20.1941	(87)
Th 2	20.3635	20.3647	20.3658	20.3712	20.3721	20.3768	20.3768	20.3776	20.3750	20.3721	20.3701	20.3680	(88)
util rest of house	0.9840	0.9641	0.9177	0.7846	0.5967	0.4033	0.2760	0.3116	0.5326	0.8430	0.9630	0.9872	(89)
MIT 2	19.6555	19.8367	20.0541	20.2740	20.3551	20.3755	20.3767	20.3774	20.3684	20.2480	19.9294	19.6246	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.8349	20.0171	20.2370	20.4623	20.5489	20.5700	20.5716	20.5720	20.5623	20.4332	20.1083	19.8027	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8349	20.0171	20.2370	20.4623	20.5489	20.5700	20.5716	20.5720	20.5623	20.4332	20.1083	19.8027	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9812	0.9604	0.9149	0.7888	0.6077	0.4166	0.2902	0.3268	0.5476	0.8458	0.9597	0.9847	(94)
Useful gains	534.8770	599.8596	628.4294	610.1828	499.0816	340.4100	226.9938	238.0202	366.1294	494.3458	515.2661	514.5863	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	908.2631	882.1289	800.0787	667.4170	509.9331	341.3344	227.0735	238.1838	370.6058	566.6520	752.1823	905.4017	(97)
Space heating kWh	277.7993	189.6850	127.7071	41.2086	8.0736	0.0000	0.0000	0.0000	0.0000	53.7958	170.5796	290.7667	(98a)
Space heating requirement - total per year (kWh/year)												1159.6156	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	277.7993	189.6850	127.7071	41.2086	8.0736	0.0000	0.0000	0.0000	0.0000	53.7958	170.5796	290.7667	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1159.6156	
Space heating per m2											(98c) / (4) =	13.3750	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	537.4421	423.0928	433.8916	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9818	0.9932	0.9888	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	527.6770	420.2290	429.0462	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	890.8770	853.1757	792.9430	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	261.5040	322.1124	270.7392	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	65.3760	80.5281	67.6848	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												213.5889	(107)
Energy for space heating												13.3750	(99)
Energy for space cooling												2.4635	(108)
Total												15.8386	(109)
Fabric Energy Efficiency (DFEE)												15.8	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4892			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	13.5400	0.0700	0.9478
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.0900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8787 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.3679 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff													
	63.6543	63.4509	63.2515	62.3151	62.1399	61.3243	61.3243	61.1733	61.6385	62.1399	62.4943	62.8649	(39)
Average = Sum(39)m / 12 =												62.3143	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7342	0.7318	0.7295	0.7187	0.7167	0.7073	0.7073	0.7056	0.7109	0.7167	0.7208	0.7251	(40)
HLP (average)												0.7187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses													
	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												64.3029	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)													
	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.3496	(64a)
Heat gains from water heating, kWh/month													
	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains													
	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(80)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)
Total gains	533.6898	602.2192	650.0344	719.8289	755.3931	749.5884	717.9735	673.1335	625.7862	557.9097	522.6435	513.1575	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4565	69.6791	69.8987	70.9491	71.1492	72.0954	72.0954	72.2734	71.7280	71.1492	70.7457	70.3287	
alpha	5.6304	5.6453	5.6599	5.7299	5.7433	5.8064	5.8064	5.8182	5.7819	5.7433	5.7164	5.6886	
util living area													
	0.9896	0.9786	0.9538	0.8704	0.7188	0.5177	0.3750	0.4165	0.6545	0.9066	0.9774	0.9915	(86)
MIT	20.0741	20.2513	20.4850	20.7785	20.9393	20.9923	20.9990	20.9982	20.9726	20.7557	20.3784	20.0503	(87)
Th 2	20.3107	20.3128	20.3148	20.3243	20.3261	20.3344	20.3344	20.3359	20.3312	20.3261	20.3225	20.3187	(88)
util rest of house													
	0.9874	0.9741	0.9442	0.8467	0.6777	0.4660	0.3187	0.3571	0.5991	0.8835	0.9719	0.9896	(89)
MIT 2	19.4587	19.6349	19.8641	20.1462	20.2842	20.3303	20.3340	20.3352	20.3152	20.1323	19.7695	19.4416	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.6512	19.8277	20.0584	20.3440	20.4891	20.5374	20.5420	20.5426	20.5209	20.3273	19.9600	19.6320	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6512	19.8277	20.0584	20.3440	20.4891	20.5374	20.5420	20.5426	20.5209	20.3273	19.9600	19.6320	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9847	0.9703	0.9401	0.8474	0.6880	0.4819	0.3363	0.3757	0.6152	0.8836	0.9684	0.9872	(94)
Useful gains	525.5027	584.3230	611.1006	609.9856	519.7004	361.2573	241.4534	252.8791	385.0027	492.9554	506.1062	506.6090	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	977.1671	947.1780	857.5870	713.1345	546.1555	364.1068	241.7420	253.4171	395.7713	604.4537	803.6748	970.1324	(97)
Space heating kWh													
	336.0384	243.8386	183.3859	74.2672	19.6826	0.0000	0.0000	0.0000	0.0000	82.9548	214.2494	344.8614	(98a)
Space heating requirement - total per year (kWh/year)												1499.2782	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	336.0384	243.8386	183.3859	74.2672	19.6826	0.0000	0.0000	0.0000	0.0000	82.9548	214.2494	344.8614	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1499.2782	
Space heating per m2											(98c) / (4) =	17.2927	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	576.4484	453.7998	464.9168	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9561	0.9813	0.9722	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	551.1187	445.3221	451.9778	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	812.0280	778.1082	728.4611	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	187.8547	247.5929	205.7036	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	46.9637	61.8982	51.4259	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												160.2878	(107)
Energy for space heating												17.2927	(99)
Energy for space cooling												1.8488	(108)
Total												19.1415	(109)
Fabric Energy Efficiency (TFEE)												19.1	(109)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.43	**TER**	9.27
Environmental	99 A	**% DER < TER**			84.57
CO_2 Emissions (t/year)	0.1	**DFEE**	15.84	**TFEE**	19.14
Compliance Check	See BREL	**% DFEE < TFEE**			17.26
% DPER < TPER	61.17	**DPER**	19.13	**TPER**	49.26

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss

Combi loss

Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS

PV diverter

Solar input

FGHRS

Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
									Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
12Total per year (kWh/year)											2752	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	652.0784	730.2946	789.6905	869.3922	912.9689	904.3786	866.5575	814.6416	757.3995	678.0557	637.1713	628.5612	(84)

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7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area	0.9652	0.9339	0.8716	0.7324	0.5591	0.3925	0.2821	0.3136	0.5027	0.7855	0.9310	0.9714	(86)
MIT	20.4706	20.6231	20.7918	20.9369	20.9888	20.9989	20.9999	20.9998	20.9954	20.9198	20.6824	20.4275	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house	0.9589	0.9231	0.8531	0.7034	0.5245	0.3556	0.2432	0.2723	0.4598	0.7530	0.9180	0.9661	(89)
MIT 2	19.7815	19.9685	20.1697	20.3317	20.3839	20.3927	20.3933	20.3933	20.3901	20.3170	20.0437	19.7278	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9970	20.1732	20.3643	20.5210	20.5731	20.5823	20.5830	20.5830	20.5794	20.5055	20.2435	19.9467	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9970	20.1732	20.3643	20.5210	20.5731	20.5823	20.5830	20.5830	20.5794	20.5055	20.2435	19.9467	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9542	0.9188	0.8522	0.7096	0.5349	0.3671	0.2554	0.2852	0.4730	0.7593	0.9145	0.9616	(94)
Useful gains	622.2063	670.9826	672.9501	616.9622	488.3069	332.0142	221.2813	232.3592	358.2729	514.8198	582.6685	604.4037	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	872.1794	848.6313	770.3487	645.7029	493.0207	332.3965	221.3114	232.4203	360.0175	550.3839	730.2945	874.9365	(97)
Space heating kWh	185.9800	119.3799	72.4646	20.6933	3.5071	0.0000	0.0000	0.0000	0.0000	26.4597	106.2907	201.2764	(98a)
Space heating requirement - total per year (kWh/year)												736.0516	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	185.9800	119.3799	72.4646	20.6933	3.5071	0.0000	0.0000	0.0000	0.0000	26.4597	106.2907	201.2764	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												736.0516	
Space heating per m2											(98c) / (4) =	8.4896	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	185.9800	119.3799	72.4646	20.6933	3.5071	0.0000	0.0000	0.0000	0.0000	26.4597	106.2907	201.2764	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	278.9699	179.0698	108.6969	31.0400	5.2606	0.0000	0.0000	0.0000	0.0000	39.6896	159.4361	301.9146	
Space heating requirement	278.9699	179.0698	108.6969	31.0400	5.2606	0.0000	0.0000	0.0000	0.0000	39.6896	159.4361	301.9146	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1104.0774	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												11.0408	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4523.1782	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1395.0876	0.1581	46.5525	(367)
Electrical energy for heat distribution (space & water)	11.0408	0.0000	7.5614	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			209.1981	(373)
Space and water heating			209.1981	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			123.6233	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.4300	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1395.0876	1.5853	466.7424	(467)
Electrical energy for heat distribution (space & water)	11.0408	0.0000	80.2821	(472)
Overall CO2 factor for heat network			0.4246	(486)
Total CO2 associated with community systems			2221.1370	(473)
Space and water heating			2221.1370	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1658.1937	(483)
Dwelling Primary energy Rate (DPER)			19.1300	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4892			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	13.5400	0.0700	0.9478
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.0900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8787 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.3679 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	63.6543	63.4509	63.2515	62.3151	62.1399	61.3243	61.3243	61.1733	61.6385	62.1399	62.4943	62.8649	(39)
Average = Sum(39)m / 12 =												62.3143	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7342	0.7318	0.7295	0.7187	0.7167	0.7073	0.7073	0.7056	0.7109	0.7167	0.7208	0.7251	(40)
HLP (average)												0.7187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(80)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)
Total gains	634.2986	701.5715	746.4857	809.2850	840.7342	827.5835	792.9978	750.1384	705.1835	645.1554	616.5661	612.8145	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4565	69.6791	69.8987	70.9491	71.1492	72.0954	72.0954	72.2734	71.7280	71.1492	70.7457	70.3287	
alpha	5.6304	5.6453	5.6599	5.7299	5.7433	5.8064	5.8064	5.8182	5.7819	5.7433	5.7164	5.6886	
util living area	0.9772	0.9591	0.9222	0.8197	0.6603	0.4709	0.3398	0.3743	0.5898	0.8524	0.9546	0.9805	(86)
MIT	20.2328	20.3960	20.6036	20.8425	20.9604	20.9952	20.9994	20.9990	20.9837	20.8325	20.5134	20.2101	(87)
Th 2	20.3107	20.3128	20.3148	20.3243	20.3261	20.3344	20.3344	20.3359	20.3312	20.3261	20.3225	20.3187	(88)
util rest of house	0.9727	0.9513	0.9080	0.7918	0.6193	0.4232	0.2886	0.3207	0.5371	0.8225	0.9447	0.9766	(89)
MIT 2	19.4173	19.6225	19.8789	20.1658	20.2918	20.3312	20.3341	20.3354	20.3193	20.1616	19.7789	19.3951	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.6724	19.8645	20.1056	20.3774	20.5009	20.5389	20.5422	20.5430	20.5271	20.3715	20.0086	19.6500	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6724	19.8645	20.1056	20.3774	20.5009	20.5389	20.5422	20.5430	20.5271	20.3715	20.0086	19.6500	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9675	0.9454	0.9032	0.7941	0.6301	0.4380	0.3046	0.3375	0.5528	0.8247	0.9393	0.9718	(94)
Useful gains	613.7056	663.2556	674.2084	642.6879	529.7738	362.4578	241.5837	253.1356	389.8443	532.0560	579.1531	595.5527	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	978.5208	949.5103	860.5766	715.2179	546.8866	364.2008	241.7535	253.4398	396.1594	607.1981	806.7171	971.2628	(97)
Space heating kWh	271.4225	192.3632	138.6579	52.2216	12.7319	0.0000	0.0000	0.0000	0.0000	55.9057	163.8461	279.5283	(98a)
Space heating requirement - total per year (kWh/year)												1166.6772	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	271.4225	192.3632	138.6579	52.2216	12.7319	0.0000	0.0000	0.0000	0.0000	55.9057	163.8461	279.5283	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1166.6772	
Space heating per m2											(98c) / (4) =	13.4565	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	271.4225	192.3632	138.6579	52.2216	12.7319	0.0000	0.0000	0.0000	0.0000	55.9057	163.8461	279.5283	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	294.0655	208.4108	150.2252	56.5781	13.7941	0.0000	0.0000	0.0000	0.0000	60.5695	177.5147	302.8476	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.3964	83.9003	83.0590	81.5571	80.3170	79.8000	79.8000	79.8000	79.8000	81.6372	83.5327	84.4864	(217)
Fuel for water heating, kWh/month	276.8852	246.2073	264.2776	237.1858	233.7569	212.3443	209.9929	218.2535	220.5242	239.9258	248.7341	273.6737	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1264.0056	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2881.7612	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3599.0721	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1264.0056	0.2100	265.4412	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2881.7612	0.2100	605.1699	(264)
Space and water heating			870.6110	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			803.7093	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.2700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1264.0056	1.1300	1428.3263	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2881.7612	1.1300	3256.3902	(278)
Space and water heating			4684.7165	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4270.9436	(286)
Target Primary Energy Rate (TPER)			49.2600	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.43	**TER**	9.27
Environmental	99 A	**% DER < TER**			84.57
CO_2 Emissions (t/year)	0.1	**DFEE**	15.84	**TFEE**	19.14
Compliance Check	See BREL	**% DFEE < TFEE**			17.26
% DPER < TPER	61.17	**DPER**	19.13	**TPER**	49.26

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	706.5297	768.1759	833.8294	897.3119	933.0604	910.4848	872.9142	823.2320	769.6084	706.4837	673.4276	678.8029	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9504	0.9194	0.8478	0.7146	0.5478	0.3899	0.2800	0.3103	0.4950	0.7634	0.9147	0.9594	(86)
MIT	20.5453	20.6661	20.8249	20.9449	20.9900	20.9990	20.9999	20.9998	20.9958	20.9317	20.7227	20.4996	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9421	0.9071	0.8277	0.6855	0.5137	0.3532	0.2414	0.2695	0.4526	0.7301	0.8996	0.9524	(89)
MIT 2	19.8732	20.0200	20.2072	20.3398	20.3849	20.3927	20.3933	20.3933	20.3903	20.3289	20.0911	19.8170	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0835	20.2221	20.4004	20.5291	20.5742	20.5823	20.5831	20.5830	20.5797	20.5175	20.2887	20.0305	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0835	20.2221	20.4004	20.5291	20.5742	20.5823	20.5831	20.5830	20.5797	20.5175	20.2887	20.0305	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9373	0.9032	0.8279	0.6921	0.5239	0.3647	0.2535	0.2823	0.4657	0.7372	0.8967	0.9475	(94)
Useful gains	662.2410	693.8477	690.3523	621.0549	488.8709	332.0304	221.2827	232.3633	358.4350	520.8163	603.8839	643.1916	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	876.9824	851.3467	772.3535	646.1499	493.0804	332.3982	221.3116	232.4208	360.0346	551.0482	732.8068	879.5958	(97)
Space heating kWh													
	159.7676	105.8393	61.0089	18.0685	3.1318	0.0000	0.0000	0.0000	0.0000	22.4926	92.8245	175.8847	(98a)
Space heating requirement - total per year (kWh/year)												639.0180	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	159.7676	105.8393	61.0089	18.0685	3.1318	0.0000	0.0000	0.0000	0.0000	22.4926	92.8245	175.8847	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												639.0180	
Space heating per m2											(98c) / (4) =	7.3704	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	159.7676	105.8393	61.0089	18.0685	3.1318	0.0000	0.0000	0.0000	0.0000	22.4926	92.8245	175.8847	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	239.6514	158.7590	91.5134	27.1027	4.6977	0.0000	0.0000	0.0000	0.0000	33.7389	139.2368	263.8271	
Space heating requirement													
	239.6514	158.7590	91.5134	27.1027	4.6977	0.0000	0.0000	0.0000	0.0000	33.7389	139.2368	263.8271	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												958.5270	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												9.5853	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4377.6277	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	958.5270	4.4400	42.5586	(340a)
Space heating total			42.5586	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			251.1496	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.6865 (357)
SAP value		88.8716
SAP rating (Section 12)		89 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1356.2741	0.1581	40.4211	(367)
Electrical energy for heat distribution (space & water)	9.5853	0.0000	7.3315	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			202.8368	(373)
Space and water heating			202.8368	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			117.2620	(383)
CO2 emissions per m2			1.3500	(384)
EI value			98.8069	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)

Average = Sum(39)m / 12 = 55.5633

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss / Combi loss

Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS / PV diverter / Solar input / FGHRS

Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
									Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	23.7835	0.7600	0.7000	0.7700	65.5876	(80)
West	1.7600	23.7835	0.7600	0.7000	0.7700	15.4324	(80)

Solar gains	81.0200	140.8292	228.1692	335.8028	395.8111	434.4066	405.9044	355.9037	279.8628	176.2264	99.5150	67.0100	(83)
Total gains	720.6439	778.1231	846.4545	918.7565	943.6137	950.5115	903.3528	856.6161	798.7845	727.4075	689.5188	690.7928	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9419	0.9093	0.8241	0.6822	0.5142	0.3388	0.2399	0.2659	0.4573	0.7198	0.8966	0.9526	(86)
MIT	20.5878	20.6979	20.8575	20.9586	20.9933	20.9996	21.0000	20.9999	20.9974	20.9531	20.7662	20.5412	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9323	0.8956	0.8018	0.6520	0.4799	0.3035	0.2026	0.2266	0.4159	0.6840	0.8790	0.9445	(89)
MIT 2	19.9253	20.0582	20.2443	20.3540	20.3879	20.3931	20.3933	20.3933	20.3916	20.3506	20.1424	19.8685	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.1325	20.2583	20.4361	20.5431	20.5773	20.5828	20.5831	20.5831	20.5811	20.5390	20.3375	20.0789	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1325	20.2583	20.4361	20.5431	20.5773	20.5828	20.5831	20.5831	20.5811	20.5390	20.3375	20.0789	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9277	0.8923	0.8034	0.6596	0.4904	0.3145	0.2142	0.2389	0.4288	0.6928	0.8773	0.9397	(94)
Useful gains	668.5372	694.3477	680.0767	606.0205	462.7143	298.9472	193.5231	204.6251	342.4828	503.9794	604.9046	649.1319	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	863.0398	836.6906	746.5566	624.7035	465.4699	299.0871	193.5323	204.6438	343.4411	524.4633	713.2949	865.6165	(97)
Space heating kWh													
	144.7099	95.6544	49.4611	13.4518	2.0502	0.0000	0.0000	0.0000	0.0000	15.2400	78.0410	161.0646	(98a)
Space heating requirement - total per year (kWh/year)												559.6730	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	144.7099	95.6544	49.4611	13.4518	2.0502	0.0000	0.0000	0.0000	0.0000	15.2400	78.0410	161.0646	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												559.6730	
Space heating per m2											(98c) / (4) =	6.4553	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	144.7099	95.6544	49.4611	13.4518	2.0502	0.0000	0.0000	0.0000	0.0000	15.2400	78.0410	161.0646	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	217.0649	143.4817	74.1916	20.1776	3.0753	0.0000	0.0000	0.0000	0.0000	22.8600	117.0615	241.5969	
Space heating requirement													
	217.0649	143.4817	74.1916	20.1776	3.0753	0.0000	0.0000	0.0000	0.0000	22.8600	117.0615	241.5969	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)

Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year		
Space heating fuel - community heating	839.5095	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4127.5010	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	8.3951	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4162.0842	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	839.5095	6.5500	54.9879	(340a)
Space heating total			54.9879	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			318.2929	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1324.5361	0.1586	35.5058	(367)
Electrical energy for heat distribution (space & water)	8.3951	0.0000	7.1471	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			197.7373	(373)
Space and water heating			197.7373	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			99.9043	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1324.5361	1.5871	355.2976	(467)
Electrical energy for heat distribution (space & water)	8.3951	0.0000	76.1029	(472)
Overall CO2 factor for heat network			0.4239	(486)
Total CO2 associated with community systems			2105.5131	(473)
Space and water heating			2105.5131	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1461.6779	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - East

Current energy efficiency rating: B 89
Current environmental impact rating: A 99

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 89
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£71	£71	£0
Community scheme	£429	£429	£0
Space heating	£169	£169	£0
Water heating	£270	£270	£0
Lighting	£62	£62	£0
Generated (PV)	-£182	-£182	£0
Total cost of fuels	£318	£318	£0
Total cost of uses	£319	£319	£0
Delivered energy	48 kWh/m²	48 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	17 kWh/m²	17 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		1.4928 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5778 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day)	126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	706.5297	768.1759	833.8294	897.3119	933.0604	910.4848	872.9142	823.2320	769.6084	706.4837	673.4276	678.8029	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area	0.9504	0.9194	0.8478	0.7146	0.5478	0.3899	0.2800	0.3103	0.4950	0.7634	0.9147	0.9594	(86)
MIT	20.5453	20.6661	20.8249	20.9449	20.9900	20.9990	20.9999	20.9998	20.9958	20.9317	20.7227	20.4996	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house	0.9421	0.9071	0.8277	0.6855	0.5137	0.3532	0.2414	0.2695	0.4526	0.7301	0.8996	0.9524	(89)
MIT 2	19.8732	20.0200	20.2072	20.3398	20.3849	20.3927	20.3933	20.3933	20.3903	20.3289	20.0911	19.8170	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	20.0835	20.2221	20.4004	20.5291	20.5742	20.5823	20.5831	20.5830	20.5797	20.5175	20.2887	20.0305	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0835	20.2221	20.4004	20.5291	20.5742	20.5823	20.5831	20.5830	20.5797	20.5175	20.2887	20.0305	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9373	0.9032	0.8279	0.6921	0.5239	0.3647	0.2535	0.2823	0.4657	0.7372	0.8967	0.9475	(94)
Useful gains	662.2410	693.8477	690.3523	621.0549	488.8709	332.0304	221.2827	232.3633	358.4350	520.8163	603.8839	643.1916	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	876.9824	851.3467	772.3535	646.1499	493.0804	332.3982	221.3116	232.4208	360.0346	551.0482	732.8068	879.5958	(97)
Space heating kWh	159.7676	105.8393	61.0089	18.0685	3.1318	0.0000	0.0000	0.0000	0.0000	22.4926	92.8245	175.8847	(98a)
Space heating requirement - total per year (kWh/year)												639.0180	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	159.7676	105.8393	61.0089	18.0685	3.1318	0.0000	0.0000	0.0000	0.0000	22.4926	92.8245	175.8847	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												639.0180	
Space heating per m2										(98c) / (4) =		7.3704	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	159.7676	105.8393	61.0089	18.0685	3.1318	0.0000	0.0000	0.0000	0.0000	22.4926	92.8245	175.8847	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	239.6514	158.7590	91.5134	27.1027	4.6977	0.0000	0.0000	0.0000	0.0000	33.7389	139.2368	263.8271	
Space heating requirement													
	239.6514	158.7590	91.5134	27.1027	4.6977	0.0000	0.0000	0.0000	0.0000	33.7389	139.2368	263.8271	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												958.5270	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)

Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	9.5853	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4377.6277	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	958.5270	4.4400	42.5586	(340a)
Space heating total			42.5586	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			251.1496	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.6865	(357)
SAP value	88.8716	
SAP rating (Section 12)	89	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1356.2741	0.1581	40.4211	(367)
Electrical energy for heat distribution (space & water)	9.5853	0.0000	7.3315	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			202.8368	(373)
Space and water heating			202.8368	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			117.2620	(383)
CO2 emissions per m2			1.3500	(384)
EI value			98.8069	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 86.7000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		1.4928 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5778	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	23.7835	0.7600	0.7000	0.7700	65.5876	(80)
West	1.7600	23.7835	0.7600	0.7000	0.7700	15.4324	(80)

Solar gains	81.0200	140.8292	228.1692	335.8028	395.8111	434.4066	405.9044	355.9037	279.8628	176.2264	99.5150	67.0100	(83)
Total gains	720.6439	778.1231	846.4545	918.7565	943.6137	950.5115	903.3528	856.6161	798.7845	727.4075	689.5188	690.7928	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9419	0.9093	0.8241	0.6822	0.5142	0.3388	0.2399	0.2659	0.4573	0.7198	0.8966	0.9526	(86)
MIT	20.5878	20.6979	20.8575	20.9586	20.9933	20.9996	21.0000	20.9999	20.9974	20.9531	20.7662	20.5412	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9323	0.8956	0.8018	0.6520	0.4799	0.3035	0.2026	0.2266	0.4159	0.6840	0.8790	0.9445	(89)
MIT 2	19.9253	20.0582	20.2443	20.3540	20.3879	20.3931	20.3933	20.3933	20.3916	20.3506	20.1424	19.8685	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.1325	20.2583	20.4361	20.5431	20.5773	20.5828	20.5831	20.5831	20.5811	20.5390	20.3375	20.0789	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1325	20.2583	20.4361	20.5431	20.5773	20.5828	20.5831	20.5831	20.5811	20.5390	20.3375	20.0789	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9277	0.8923	0.8034	0.6596	0.4904	0.3145	0.2142	0.2389	0.4288	0.6928	0.8773	0.9397	(94)
Useful gains	668.5372	694.3477	680.0767	606.0205	462.7143	298.9472	193.5231	204.6251	342.4828	503.9794	604.9046	649.1319	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	863.0398	836.6906	746.5566	624.7035	465.4699	299.0871	193.5323	204.6438	343.4411	524.4633	713.2949	865.6165	(97)
Space heating kWh													
	144.7099	95.6544	49.4611	13.4518	2.0502	0.0000	0.0000	0.0000	0.0000	15.2400	78.0410	161.0646	(98a)
Space heating requirement - total per year (kWh/year)												559.6730	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	144.7099	95.6544	49.4611	13.4518	2.0502	0.0000	0.0000	0.0000	0.0000	15.2400	78.0410	161.0646	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												559.6730	
Space heating per m2											(98c) / (4) =	6.4553	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement

	144.7099	95.6544	49.4611	13.4518	2.0502	0.0000	0.0000	0.0000	0.0000	15.2400	78.0410	161.0646 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	217.0649	143.4817	74.1916	20.1776	3.0753	0.0000	0.0000	0.0000	0.0000	22.8600	117.0615	241.5969
Space heating requirement												
	217.0649	143.4817	74.1916	20.1776	3.0753	0.0000	0.0000	0.0000	0.0000	22.8600	117.0615	241.5969 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388
Water heating fuel												
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446 (331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year

Space heating fuel - community heating	839.5095 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	8.3951 (313)
Space cooling fuel	0.0000 (321)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)

mechanical ventilation fans (SFP = 0.1292)	33.4924 (330a)
Total electricity for the above, kWh/year	33.4924 (331)
Electricity for lighting (calculated in Appendix L)	216.3282 (332)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4162.0842 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	839.5095	6.5500	54.9879	(340a)
Space heating total			54.9879	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			318.2929	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1324.5361	0.1586	35.5058	(367)
Electrical energy for heat distribution (space & water)	8.3951	0.0000	7.1471	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			197.7373	(373)
Space and water heating			197.7373	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			99.9043	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)

Space and Water heating from Heat pump	1324.5361	1.5871	355.2976 (467)
Electrical energy for heat distribution (space & water)	8.3951	0.0000	76.1029 (472)
Overall CO2 factor for heat network			0.4239 (486)
Total CO2 associated with community systems			2105.5131 (473)
Space and water heating			2105.5131 (476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673 (478)
Energy for lighting	216.3282	1.5338	331.8115 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405
PV Unit electricity exported	-520.7528	0.4449	-231.6735
Total			-1026.3140 (480)
Total Primary energy kWh/year			1461.6779 (483)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.27	**TER**	8.71
Environmental	99 A	**% DER < TER**			85.42
CO_2 Emissions (t/year)	0.09	**DFEE**	12.58	**TFEE**	16.06
Compliance Check	See BREL	**% DFEE < TFEE**			21.68
% DPER < TPER	62.04	**DPER**	17.57	**TPER**	46.27

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674 (64)
12Total per year (kWh/year)												2752 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.4800	46.7521	0.7600	0.7000	0.7700	128.9280	(78)
South	1.7600	46.7521	0.7600	0.7000	0.7700	30.3360	(78)

Solar gains	159.2640	260.8334	332.2555	375.5208	391.3159	376.5883	367.9497	357.3302	347.0801	281.3333	188.7822	137.6188 (83)
Total gains	744.4365	860.2459	906.4019	930.5548	919.0271	886.5871	859.0415	849.4522	853.7929	804.0864	742.5297	711.1599 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area	0.9384	0.8794	0.8074	0.6940	0.5556	0.4003	0.2845	0.3008	0.4474	0.6910	0.8795	0.9503	(86)
MIT	20.5933	20.7551	20.8691	20.9530	20.9892	20.9988	20.9999	20.9998	20.9976	20.9606	20.7885	20.5431	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house	0.9285	0.8634	0.7852	0.6648	0.5212	0.3627	0.2453	0.2612	0.4087	0.6569	0.8608	0.9420	(89)
MIT 2	19.9315	20.1246	20.2562	20.3480	20.3842	20.3926	20.3933	20.3933	20.3917	20.3571	20.1671	19.8704	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.1385	20.3218	20.4479	20.5372	20.5735	20.5822	20.5830	20.5830	20.5812	20.5459	20.3614	20.0808	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1385	20.3218	20.4479	20.5372	20.5735	20.5822	20.5830	20.5830	20.5812	20.5459	20.3614	20.0808	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9240	0.8614	0.7873	0.6719	0.5315	0.3744	0.2576	0.2736	0.4207	0.6657	0.8598	0.9372	(94)
Useful gains	687.8224	741.0228	713.5785	625.2311	488.4846	331.9628	221.2794	232.3742	359.2140	535.2583	638.4016	666.5117	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	880.0406	856.8876	774.9933	646.6038	493.0395	332.3911	221.3112	232.4220	360.1169	552.6263	736.8499	882.3918	(97)
Space heating kWh	143.0104	77.8612	45.6926	15.3884	3.3889	0.0000	0.0000	0.0000	0.0000	12.9218	70.8828	160.6148	(98a)
Space heating requirement - total per year (kWh/year)												529.7607	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	143.0104	77.8612	45.6926	15.3884	3.3889	0.0000	0.0000	0.0000	0.0000	12.9218	70.8828	160.6148	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												529.7607	
Space heating per m2											(98c) / (4) =	6.1103	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	143.0104	77.8612	45.6926	15.3884	3.3889	0.0000	0.0000	0.0000	0.0000	12.9218	70.8828	160.6148	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	214.5155	116.7918	68.5389	23.0825	5.0833	0.0000	0.0000	0.0000	0.0000	19.3827	106.3241	240.9223	
Space heating requirement	214.5155	116.7918	68.5389	23.0825	5.0833	0.0000	0.0000	0.0000	0.0000	19.3827	106.3241	240.9223	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												794.6411	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												7.9464	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4213.7419	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1312.5712	0.1587	33.6193	(367)
Electrical energy for heat distribution (space & water)	7.9464	0.0000	7.0764	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			195.7800	(373)
Space and water heating			195.7800	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			110.2051	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.2700	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1312.5712	1.5872	336.3443	(467)
Electrical energy for heat distribution (space & water)	7.9464	0.0000	75.3921	(472)
Overall CO2 factor for heat network			0.4238	(486)
Total CO2 associated with community systems			2085.8490	(473)
Space and water heating			2085.8490	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1522.9057	(483)
Dwelling Primary energy Rate (DPER)			17.5700	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4892			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	13.5400	0.0700	0.9478
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.0900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8787 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.3679 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	63.6543	63.4509	63.2515	62.3151	62.1399	61.3243	61.3243	61.1733	61.6385	62.1399	62.4943	62.8649	(39)
Average = Sum(39)m / 12 =												62.3143	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7342	0.7318	0.7295	0.7187	0.7167	0.7073	0.7073	0.7056	0.7109	0.7167	0.7208	0.7251	(40)
HLP (average)												0.7187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	9.2400	46.7521	0.6300	0.7000	0.7700	132.0215	(78)

Solar gains	132.0215	216.2172	275.4223	311.2870	324.3803	312.1719	305.0110	296.2079	287.7111	233.2105	156.4905	114.0787	(83)
Total gains	710.8586	809.2943	843.2333	859.9856	845.7561	812.8353	786.7674	778.9946	785.0885	749.6283	703.9027	681.2845	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4565	69.6791	69.8987	70.9491	71.1492	72.0954	72.0954	72.2734	71.7280	71.1492	70.7457	70.3287	
alpha	5.6304	5.6453	5.6599	5.7299	5.7433	5.8064	5.8064	5.8182	5.7819	5.7433	5.7164	5.6886	
util living area	0.9631	0.9291	0.8831	0.7902	0.6570	0.4792	0.3425	0.3606	0.5344	0.7819	0.9247	0.9690	(86)
MIT	20.3449	20.5330	20.7011	20.8706	20.9613	20.9948	20.9994	20.9992	20.9900	20.8955	20.6217	20.3130	(87)
Th 2	20.3107	20.3128	20.3148	20.3243	20.3261	20.3344	20.3344	20.3359	20.3312	20.3261	20.3225	20.3187	(88)
util rest of house	0.9562	0.9172	0.8646	0.7607	0.6161	0.4307	0.2909	0.3089	0.4852	0.7470	0.9102	0.9632	(89)
MIT 2	19.5567	19.7890	19.9928	20.1957	20.2926	20.3309	20.3341	20.3355	20.3241	20.2271	19.9086	19.5236	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8033	20.0218	20.2144	20.4068	20.5018	20.5386	20.5422	20.5431	20.5324	20.4362	20.1317	19.7705	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8033	20.0218	20.2144	20.4068	20.5018	20.5386	20.5422	20.5431	20.5324	20.4362	20.1317	19.7705	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9502	0.9116	0.8616	0.7645	0.6270	0.4457	0.3070	0.3250	0.5002	0.7530	0.9056	0.9576	(94)
Useful gains	675.4881	737.7601	726.5403	657.4511	530.2518	362.2721	241.5753	253.1982	392.6676	564.4712	637.4461	652.3657	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	986.8498	959.4890	867.4542	717.0461	546.9427	364.1796	241.7525	253.4471	396.4837	611.2175	814.4060	978.8395	(97)
Space heating kWh	231.6531	149.0018	104.8400	42.9084	12.4180	0.0000	0.0000	0.0000	0.0000	34.7793	127.4111	242.8965	(98a)
Space heating requirement - total per year (kWh/year)												945.9083	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	231.6531	149.0018	104.8400	42.9084	12.4180	0.0000	0.0000	0.0000	0.0000	34.7793	127.4111	242.8965	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												945.9083	
Space heating per m2										(98c) / (4) =		10.9101	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	231.6531	149.0018	104.8400	42.9084	12.4180	0.0000	0.0000	0.0000	0.0000	34.7793	127.4111	242.8965	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	250.9785	161.4321	113.5861	46.4880	13.4540	0.0000	0.0000	0.0000	0.0000	37.6807	138.0402	263.1598	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.0402	83.3395	82.5028	81.2958	80.3049	79.8000	79.8000	79.8000	79.8000	81.0385	82.9975	84.1705	(217)
Fuel for water heating, kWh/month	278.0587	247.8639	266.0591	237.9481	233.7919	212.3443	209.9929	218.2535	220.5242	241.6984	250.3379	274.7009	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1024.8194	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2891.5737	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3369.6984	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1024.8194	0.2100	215.2121	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2891.5737	0.2100	607.2305	(264)
Space and water heating			822.4425	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			755.5409	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.7100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1024.8194	1.1300	1158.0459	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2891.5737	1.1300	3267.4783	(278)
Space and water heating			4425.5242	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4011.7513	(286)
Target Primary Energy Rate (TPER)			46.2700	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.27	**TER**	8.71
Environmental	99 A	**% DER < TER**			85.42
CO_2 Emissions (t/year)	0.09	**DFEE**	12.58	**TFEE**	16.06
Compliance Check	See BREL	**% DFEE < TFEE**			21.68
% DPER < TPER	62.04	**DPER**	17.57	**TPER**	46.27

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2257	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2878	0.2821	0.2765	0.2483	0.2426	0.2144	0.2144	0.2088	0.2257	0.2426	0.2539	0.2652	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5414	0.5398	0.5382	0.5308	0.5294	0.5230	0.5230	0.5218	0.5255	0.5294	0.5322	0.5352	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15916.3300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							183.5794	(35)

Thermal bridges (User defined value 0.030 * total exposed area)												1.4928	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	20.5148	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9510	37.8383	37.7278	37.2089	37.1118	36.6599	36.6599	36.5762	36.8339	37.1118	37.3082	37.5135	(38)
Heat transfer coeff	58.4658	58.3531	58.2426	57.7237	57.6266	57.1747	57.1747	57.0910	57.3488	57.6266	57.8230	58.0284	(39)
Average = Sum(39)m / 12 =												57.7233	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6743	0.6730	0.6718	0.6658	0.6647	0.6595	0.6595	0.6585	0.6615	0.6647	0.6669	0.6693	(40)
HLP (average)												0.6658	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778	(42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses													
	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												64.3029	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)											Total = Sum(45)m =	1067.9337	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)													
	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							614.3496	(64a)
Heat gains from water heating, kWh/month													
	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains													
	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.4800	46.7521	0.7600	0.7000	0.7700	128.9280	(78)
South	1.7600	46.7521	0.7600	0.7000	0.7700	30.3360	(78)

Solar gains	159.2640	260.8334	332.2555	375.5208	391.3159	376.5883	367.9497	357.3302	347.0801	281.3333	188.7822	137.6188	(83)
Total gains	637.4924	754.5582	803.6151	834.7633	827.3506	799.2566	774.6819	763.1120	765.0602	710.5054	642.2718	605.1675	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.6203	75.7664	75.9101	76.5925	76.7215	77.3280	77.3280	77.4413	77.0932	76.7215	76.4609	76.1904	
alpha	6.0414	6.0511	6.0607	6.1062	6.1148	6.1552	6.1552	6.1628	6.1395	6.1148	6.0974	6.0794	
util living area													
	0.9722	0.9336	0.8788	0.7727	0.6310	0.4558	0.3245	0.3438	0.5128	0.7771	0.9357	0.9784	(86)

MIT	20.3731	20.5867	20.7567	20.9058	20.9755	20.9971	20.9997	20.9996	20.9941	20.9168	20.6429	20.3262	(87)
Th 2	20.3635	20.3647	20.3658	20.3712	20.3721	20.3768	20.3768	20.3776	20.3750	20.3721	20.3701	20.3680	(88)
util rest of house	0.9669	0.9226	0.8605	0.7438	0.5928	0.4122	0.2787	0.2975	0.4679	0.7435	0.9232	0.9741	(89)
MIT 2	19.7961	20.0020	20.1616	20.2985	20.3557	20.3753	20.3767	20.3775	20.3717	20.3107	20.0630	19.7543	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.9766	20.1849	20.3477	20.4885	20.5496	20.5698	20.5716	20.5721	20.5664	20.5003	20.2444	19.9332	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9766	20.1849	20.3477	20.4885	20.5496	20.5698	20.5716	20.5721	20.5664	20.5003	20.2444	19.9332	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9632	0.9192	0.8599	0.7494	0.6037	0.4257	0.2930	0.3120	0.4818	0.7506	0.9204	0.9707	(94)
Useful gains	614.0242	693.5613	691.0441	625.5741	499.4866	340.2803	226.9888	238.0626	368.5861	533.3348	591.1431	587.4527	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	916.5465	891.9205	806.5293	668.9303	509.9716	341.3221	227.0730	238.1880	370.8391	570.5215	760.0484	912.9699	(97)
Space heating kWh	225.0766	133.2973	85.9210	31.2164	7.8009	0.0000	0.0000	0.0000	0.0000	27.6669	121.6118	242.1848	(98a)
Space heating requirement - total per year (kWh/year)												874.7757	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	225.0766	133.2973	85.9210	31.2164	7.8009	0.0000	0.0000	0.0000	0.0000	27.6669	121.6118	242.1848	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												874.7757	
Space heating per m2											(98c) / (4) =	10.0897	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	537.4421	423.0928	433.8916	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9796	0.9929	0.9913	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	526.5037	420.0703	430.1373	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	870.0817	844.3908	833.6307	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	247.3762	315.6944	300.1991	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	61.8440	78.9236	75.0498	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												215.8174	(107)
Energy for space heating												10.0897	(99)
Energy for space cooling												2.4892	(108)
Total												12.5789	(109)
Fabric Energy Efficiency (DFEE)												12.6	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4892			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	13.5400	0.0700	0.9478
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.0900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8787 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.3679 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff													
	63.6543	63.4509	63.2515	62.3151	62.1399	61.3243	61.3243	61.1733	61.6385	62.1399	62.4943	62.8649	(39)
Average = Sum(39)m / 12 =												62.3143	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7342	0.7318	0.7295	0.7187	0.7167	0.7073	0.7073	0.7056	0.7109	0.7167	0.7208	0.7251	(40)
HLP (average)												0.7187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses													
	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												64.3029	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)													
	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.3496	(64a)
Heat gains from water heating, kWh/month													
	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains													
	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	9.2400	46.7521	0.6300	0.7000	0.7700	132.0215	(78)

Solar gains	132.0215	216.2172	275.4223	311.2870	324.3803	312.1719	305.0110	296.2079	287.7111	233.2105	156.4905	114.0787	(83)
Total gains	610.2499	709.9420	746.7820	770.5294	760.4149	734.8402	711.7431	701.9897	705.6912	662.3826	609.9801	581.6275	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4565	69.6791	69.8987	70.9491	71.1492	72.0954	72.0954	72.2734	71.7280	71.1492	70.7457	70.3287	
alpha	5.6304	5.6453	5.6599	5.7299	5.7433	5.8064	5.8064	5.8182	5.7819	5.7433	5.7164	5.6886	
util living area													
	0.9808	0.9571	0.9221	0.8420	0.7152	0.5275	0.3783	0.3997	0.5894	0.8410	0.9565	0.9846	(86)
MIT	20.1959	20.4074	20.6039	20.8172	20.9408	20.9915	20.9990	20.9986	20.9837	20.8449	20.5045	20.1612	(87)
Th 2	20.3107	20.3128	20.3148	20.3243	20.3261	20.3344	20.3344	20.3359	20.3312	20.3261	20.3225	20.3187	(88)
util rest of house													
	0.9769	0.9490	0.9079	0.8157	0.6741	0.4751	0.3215	0.3425	0.5368	0.8100	0.9469	0.9814	(89)
MIT 2	19.5784	19.7858	19.9754	20.1794	20.2853	20.3299	20.3340	20.3354	20.3220	20.2081	19.8904	19.5510	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.7716	19.9803	20.1720	20.3789	20.4904	20.5369	20.5420	20.5428	20.5290	20.4073	20.0825	19.7418	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7716	19.9803	20.1720	20.3789	20.4904	20.5369	20.5420	20.5428	20.5290	20.4073	20.0825	19.7418	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9732	0.9445	0.9046	0.8180	0.6844	0.4912	0.3392	0.3604	0.5526	0.8140	0.9430	0.9782	(94)
Useful gains	593.8835	670.5462	675.5494	630.2870	520.4503	360.9354	241.4381	252.9976	389.9682	539.1903	575.2211	568.9195	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	984.8335	956.8568	864.7775	715.3099	546.2324	364.0745	241.7404	253.4295	396.2724	609.4263	811.3345	977.0361	(97)
Space heating kWh													
	290.8668	192.4008	140.7857	61.2165	19.1819	0.0000	0.0000	0.0000	0.0000	52.2556	170.0016	303.6388	(98a)
Space heating requirement - total per year (kWh/year)												1230.3477	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	290.8668	192.4008	140.7857	61.2165	19.1819	0.0000	0.0000	0.0000	0.0000	52.2556	170.0016	303.6388	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1230.3477	
Space heating per m2											(98c) / (4) =	14.1909	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	576.4484	453.7998	464.9168	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9521	0.9805	0.9772	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	548.8133	444.9494	454.3351	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	794.7898	770.8260	762.1891	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	177.1031	242.4521	229.0434	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	44.2758	60.6130	57.2608	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												162.1497	(107)
Energy for space heating												14.1909	(99)
Energy for space cooling												1.8702	(108)
Total												16.0611	(109)
Fabric Energy Efficiency (TFEE)												16.1	(109)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.27	**TER**	8.71
Environmental	99 A	**% DER < TER**			85.42
CO_2 Emissions (t/year)	0.09	**DFEE**	12.58	**TFEE**	16.06
Compliance Check	See BREL	**% DFEE < TFEE**			21.68
% DPER < TPER	62.04	**DPER**	17.57	**TPER**	46.27

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674 (64)
12Total per year (kWh/year)												2752 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.4800	46.7521	0.7600	0.7000	0.7700	128.9280	(78)
South	1.7600	46.7521	0.7600	0.7000	0.7700	30.3360	(78)

Solar gains	159.2640	260.8334	332.2555	375.5208	391.3159	376.5883	367.9497	357.3302	347.0801	281.3333	188.7822	137.6188 (83)
Total gains	744.4365	860.2459	906.4019	930.5548	919.0271	886.5871	859.0415	849.4522	853.7929	804.0864	742.5297	711.1599 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area	0.9384	0.8794	0.8074	0.6940	0.5556	0.4003	0.2845	0.3008	0.4474	0.6910	0.8795	0.9503	(86)
MIT	20.5933	20.7551	20.8691	20.9530	20.9892	20.9988	20.9999	20.9998	20.9976	20.9606	20.7885	20.5431	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house	0.9285	0.8634	0.7852	0.6648	0.5212	0.3627	0.2453	0.2612	0.4087	0.6569	0.8608	0.9420	(89)
MIT 2	19.9315	20.1246	20.2562	20.3480	20.3842	20.3926	20.3933	20.3933	20.3917	20.3571	20.1671	19.8704	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.1385	20.3218	20.4479	20.5372	20.5735	20.5822	20.5830	20.5830	20.5812	20.5459	20.3614	20.0808	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1385	20.3218	20.4479	20.5372	20.5735	20.5822	20.5830	20.5830	20.5812	20.5459	20.3614	20.0808	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9240	0.8614	0.7873	0.6719	0.5315	0.3744	0.2576	0.2736	0.4207	0.6657	0.8598	0.9372	(94)
Useful gains	687.8224	741.0228	713.5785	625.2311	488.4846	331.9628	221.2794	232.3742	359.2140	535.2583	638.4016	666.5117	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	880.0406	856.8876	774.9933	646.6038	493.0395	332.3911	221.3112	232.4220	360.1169	552.6263	736.8499	882.3918	(97)
Space heating kWh	143.0104	77.8612	45.6926	15.3884	3.3889	0.0000	0.0000	0.0000	0.0000	12.9218	70.8828	160.6148	(98a)
Space heating requirement - total per year (kWh/year)												529.7607	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	143.0104	77.8612	45.6926	15.3884	3.3889	0.0000	0.0000	0.0000	0.0000	12.9218	70.8828	160.6148	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												529.7607	
Space heating per m2											(98c) / (4) =	6.1103	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	143.0104	77.8612	45.6926	15.3884	3.3889	0.0000	0.0000	0.0000	0.0000	12.9218	70.8828	160.6148	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	214.5155	116.7918	68.5389	23.0825	5.0833	0.0000	0.0000	0.0000	0.0000	19.3827	106.3241	240.9223	
Space heating requirement	214.5155	116.7918	68.5389	23.0825	5.0833	0.0000	0.0000	0.0000	0.0000	19.3827	106.3241	240.9223	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												794.6411	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												7.9464	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4213.7419	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1312.5712	0.1587	33.6193	(367)
Electrical energy for heat distribution (space & water)	7.9464	0.0000	7.0764	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			195.7800	(373)
Space and water heating			195.7800	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			110.2051	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.2700	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1312.5712	1.5872	336.3443	(467)
Electrical energy for heat distribution (space & water)	7.9464	0.0000	75.3921	(472)
Overall CO2 factor for heat network			0.4238	(486)
Total CO2 associated with community systems			2085.8490	(473)
Space and water heating			2085.8490	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1522.9057	(483)
Dwelling Primary energy Rate (DPER)			17.5700	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4892			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	13.5400	0.0700	0.9478
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.0900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8787 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.3679 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	63.6543	63.4509	63.2515	62.3151	62.1399	61.3243	61.3243	61.1733	61.6385	62.1399	62.4943	62.8649	(39)
Average = Sum(39)m / 12 =												62.3143	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7342	0.7318	0.7295	0.7187	0.7167	0.7073	0.7073	0.7056	0.7109	0.7167	0.7208	0.7251	(40)
HLP (average)												0.7187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	9.2400	46.7521	0.6300	0.7000	0.7700	132.0215	(78)

Solar gains	132.0215	216.2172	275.4223	311.2870	324.3803	312.1719	305.0110	296.2079	287.7111	233.2105	156.4905	114.0787	(83)
Total gains	710.8586	809.2943	843.2333	859.9856	845.7561	812.8353	786.7674	778.9946	785.0885	749.6283	703.9027	681.2845	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4565	69.6791	69.8987	70.9491	71.1492	72.0954	72.0954	72.2734	71.7280	71.1492	70.7457	70.3287	
alpha	5.6304	5.6453	5.6599	5.7299	5.7433	5.8064	5.8064	5.8182	5.7819	5.7433	5.7164	5.6886	
util living area	0.9631	0.9291	0.8831	0.7902	0.6570	0.4792	0.3425	0.3606	0.5344	0.7819	0.9247	0.9690	(86)
MIT	20.3449	20.5330	20.7011	20.8706	20.9613	20.9948	20.9994	20.9992	20.9900	20.8955	20.6217	20.3130	(87)
Th 2	20.3107	20.3128	20.3148	20.3243	20.3261	20.3344	20.3344	20.3359	20.3312	20.3261	20.3225	20.3187	(88)
util rest of house	0.9562	0.9172	0.8646	0.7607	0.6161	0.4307	0.2909	0.3089	0.4852	0.7470	0.9102	0.9632	(89)
MIT 2	19.5567	19.7890	19.9928	20.1957	20.2926	20.3309	20.3341	20.3355	20.3241	20.2271	19.9086	19.5236	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8033	20.0218	20.2144	20.4068	20.5018	20.5386	20.5422	20.5431	20.5324	20.4362	20.1317	19.7705	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8033	20.0218	20.2144	20.4068	20.5018	20.5386	20.5422	20.5431	20.5324	20.4362	20.1317	19.7705	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9502	0.9116	0.8616	0.7645	0.6270	0.4457	0.3070	0.3250	0.5002	0.7530	0.9056	0.9576	(94)
Useful gains	675.4881	737.7601	726.5403	657.4511	530.2518	362.2721	241.5753	253.1982	392.6676	564.4712	637.4461	652.3657	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	986.8498	959.4890	867.4542	717.0461	546.9427	364.1796	241.7525	253.4471	396.4837	611.2175	814.4060	978.8395	(97)
Space heating kWh	231.6531	149.0018	104.8400	42.9084	12.4180	0.0000	0.0000	0.0000	0.0000	34.7793	127.4111	242.8965	(98a)
Space heating requirement - total per year (kWh/year)												945.9083	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	231.6531	149.0018	104.8400	42.9084	12.4180	0.0000	0.0000	0.0000	0.0000	34.7793	127.4111	242.8965	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												945.9083	
Space heating per m2										(98c) / (4) =		10.9101	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	231.6531	149.0018	104.8400	42.9084	12.4180	0.0000	0.0000	0.0000	0.0000	34.7793	127.4111	242.8965	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	250.9785	161.4321	113.5861	46.4880	13.4540	0.0000	0.0000	0.0000	0.0000	37.6807	138.0402	263.1598	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.0402	83.3395	82.5028	81.2958	80.3049	79.8000	79.8000	79.8000	79.8000	81.0385	82.9975	84.1705	(217)
Fuel for water heating, kWh/month	278.0587	247.8639	266.0591	237.9481	233.7919	212.3443	209.9929	218.2535	220.5242	241.6984	250.3379	274.7009	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1024.8194	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2891.5737	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3369.6984	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1024.8194	0.2100	215.2121	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2891.5737	0.2100	607.2305	(264)
Space and water heating			822.4425	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			755.5409	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.7100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1024.8194	1.1300	1158.0459	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2891.5737	1.1300	3267.4783	(278)
Space and water heating			4425.5242	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4011.7513	(286)
Target Primary Energy Rate (TPER)			46.2700	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.27	**TER**	8.71
Environmental	99 A	**% DER < TER**			85.42
CO_2 Emissions (t/year)	0.09	**DFEE**	12.58	**TFEE**	16.06
Compliance Check	See BREL	**% DFEE < TFEE**			21.68
% DPER < TPER	62.04	**DPER**	17.57	**TPER**	46.27

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
									Total per year (kWh/year) = Sum(64)m =			2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.4800	46.7521	0.7600	0.7000	0.7700	128.9280	(78)
South	1.7600	46.7521	0.7600	0.7000	0.7700	30.3360	(78)

Solar gains	159.2640	260.8334	332.2555	375.5208	391.3159	376.5883	367.9497	357.3302	347.0801	281.3333	188.7822	137.6188	(83)
Total gains	798.8879	898.1273	950.5408	958.4745	939.1186	892.6932	865.3981	858.0426	866.0018	832.5145	778.7860	761.4015	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9186	0.8614	0.7826	0.6772	0.5444	0.3976	0.2824	0.2978	0.4413	0.6713	0.8595	0.9341	(86)
MIT	20.6559	20.7855	20.8905	20.9589	20.9903	20.9989	20.9999	20.9998	20.9978	20.9663	20.8174	20.6059	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9066	0.8441	0.7595	0.6482	0.5105	0.3602	0.2435	0.2586	0.4030	0.6374	0.8392	0.9238	(89)
MIT 2	20.0068	20.1596	20.2796	20.3538	20.3852	20.3926	20.3933	20.3933	20.3918	20.3626	20.1998	19.9466	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.2098	20.3554	20.4707	20.5431	20.5745	20.5822	20.5830	20.5830	20.5813	20.5514	20.3930	20.1528	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2098	20.3554	20.4707	20.5431	20.5745	20.5822	20.5830	20.5830	20.5813	20.5514	20.3930	20.1528	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9027	0.8430	0.7626	0.6555	0.5207	0.3719	0.2557	0.2708	0.4149	0.6464	0.8392	0.9193	(94)
Useful gains	721.1533	757.1316	724.8616	628.2328	489.0275	331.9812	221.2810	232.3773	359.2910	538.1179	653.5624	699.9894	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	884.0032	858.7545	776.2586	646.9284	493.0969	332.3930	221.3114	232.4223	360.1250	552.9348	738.6031	886.3914	(97)
Space heating kWh													
	121.1603	68.2906	38.2394	13.4609	3.0276	0.0000	0.0000	0.0000	0.0000	11.0238	61.2293	138.6831	(98a)
Space heating requirement - total per year (kWh/year)												455.1150	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	121.1603	68.2906	38.2394	13.4609	3.0276	0.0000	0.0000	0.0000	0.0000	11.0238	61.2293	138.6831	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												455.1150	
Space heating per m2											(98c) / (4) =	5.2493	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	121.1603	68.2906	38.2394	13.4609	3.0276	0.0000	0.0000	0.0000	0.0000	11.0238	61.2293	138.6831	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	181.7405	102.4358	57.3591	20.1913	4.5415	0.0000	0.0000	0.0000	0.0000	16.5356	91.8440	208.0246	
Space heating requirement													
	181.7405	102.4358	57.3591	20.1913	4.5415	0.0000	0.0000	0.0000	0.0000	16.5356	91.8440	208.0246	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												682.6725	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												6.8267	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4101.7732	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	682.6725	4.4400	30.3107	(340a)
Space heating total			30.3107	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			238.9017	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.6530 (357)
SAP value		89.4143
SAP rating (Section 12)		89 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1282.7129	0.1586	28.8804	(367)
Electrical energy for heat distribution (space & water)	6.8267	0.0000	6.8987	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			190.8634	(373)
Space and water heating			190.8634	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			105.2885	(383)
CO2 emissions per m2			1.2100	(384)
EI value			98.9287	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)

Average = Sum(39)m / 12 = 55.5633

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss / Combi loss

Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS / PV diverter / Solar input / FGHRS

Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
									Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.4800	54.0600	0.7600	0.7000	0.7700	149.0811	(78)
South	1.7600	54.0600	0.7600	0.7000	0.7700	35.0779	(78)

Solar gains	184.1590	267.3147	335.0854	384.8681	389.5564	404.1002	386.5845	379.8122	369.8751	303.9017	214.8392	160.2075	(83)
Total gains	823.7829	904.6086	953.3707	967.8218	937.3591	920.2051	884.0330	880.5246	888.7968	855.0828	804.8430	783.9902	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9026	0.8498	0.7621	0.6527	0.5175	0.3499	0.2451	0.2587	0.4117	0.6285	0.8309	0.9207	(86)
MIT	20.7026	20.8065	20.9090	20.9674	20.9931	20.9995	21.0000	20.9999	20.9986	20.9775	20.8557	20.6543	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.8888	0.8315	0.7376	0.6229	0.4830	0.3134	0.2070	0.2204	0.3742	0.5937	0.8081	0.9088	(89)
MIT 2	20.0626	20.1841	20.3002	20.3626	20.3877	20.3931	20.3933	20.3933	20.3924	20.3735	20.2432	20.0051	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.2628	20.3788	20.4906	20.5518	20.5771	20.5828	20.5831	20.5831	20.5820	20.5624	20.4348	20.2082	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2628	20.3788	20.4906	20.5518	20.5771	20.5828	20.5831	20.5831	20.5820	20.5624	20.4348	20.2082	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8856	0.8311	0.7416	0.6308	0.4935	0.3248	0.2189	0.2324	0.3859	0.6035	0.8098	0.9048	(94)
Useful gains	729.5526	751.7951	707.0666	610.5067	462.6029	298.9146	193.5217	204.6283	342.9661	516.0517	651.7287	709.3549	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	870.2772	843.3816	749.5825	625.1866	465.4582	299.0836	193.5322	204.6442	343.4922	525.7649	718.7010	872.7983	(97)
Space heating kWh													
	104.6991	61.5461	31.6318	10.5695	2.1244	0.0000	0.0000	0.0000	0.0000	7.2267	48.2200	121.6019	(98a)
Space heating requirement - total per year (kWh/year)												387.6196	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	104.6991	61.5461	31.6318	10.5695	2.1244	0.0000	0.0000	0.0000	0.0000	7.2267	48.2200	121.6019	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												387.6196	
Space heating per m2											(98c) / (4) =	4.4708	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	104.6991	61.5461	31.6318	10.5695	2.1244	0.0000	0.0000	0.0000	0.0000	7.2267	48.2200	121.6019	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	157.0487	92.3192	47.4477	15.8543	3.1865	0.0000	0.0000	0.0000	0.0000	10.8400	72.3301	182.4029	
Space heating requirement													
	157.0487	92.3192	47.4477	15.8543	3.1865	0.0000	0.0000	0.0000	0.0000	10.8400	72.3301	182.4029	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)

Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year		
Space heating fuel - community heating	581.4293	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4127.5010	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	5.8143	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3904.0040	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	581.4293	6.5500	38.0836	(340a)
Space heating total			38.0836	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			301.3887	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1255.7148	0.1590	24.6520	(367)
Electrical energy for heat distribution (space & water)	5.8143	0.0000	6.7401	(372)
Overall CO2 factor for heat network			0.0396	(386)
Total CO2 associated with community systems			186.4764	(373)
Space and water heating			186.4764	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			88.6435	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1255.7148	1.5885	246.2981	(467)
Electrical energy for heat distribution (space & water)	5.8143	0.0000	72.0154	(472)
Overall CO2 factor for heat network			0.4231	(486)
Total CO2 associated with community systems			1992.4260	(473)
Space and water heating			1992.4260	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1348.5908	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - North

Current energy efficiency rating: B 89
Current environmental impact rating: A 99

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 89
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£71	£71	£0
Community scheme	£412	£412	£0
Space heating	£152	£152	£0
Water heating	£270	£270	£0
Lighting	£62	£62	£0
Generated (PV)	-£182	-£182	£0
Total cost of fuels	£301	£301	£0
Total cost of uses	£302	£302	£0
Delivered energy	45 kWh/m²	45 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	16 kWh/m²	16 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		1.4928 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5778 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day)	126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.4800	46.7521	0.7600	0.7000	0.7700	128.9280	(78)
South	1.7600	46.7521	0.7600	0.7000	0.7700	30.3360	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	159.2640	260.8334	332.2555	375.5208	391.3159	376.5883	367.9497	357.3302	347.0801	281.3333	188.7822	137.6188	(83)
Total gains	798.8879	898.1273	950.5408	958.4745	939.1186	892.6932	865.3981	858.0426	866.0018	832.5145	778.7860	761.4015	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area	0.9186	0.8614	0.7826	0.6772	0.5444	0.3976	0.2824	0.2978	0.4413	0.6713	0.8595	0.9341	(86)
MIT	20.6559	20.7855	20.8905	20.9589	20.9903	20.9989	20.9999	20.9998	20.9978	20.9663	20.8174	20.6059	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house	0.9066	0.8441	0.7595	0.6482	0.5105	0.3602	0.2435	0.2586	0.4030	0.6374	0.8392	0.9238	(89)
MIT 2	20.0068	20.1596	20.2796	20.3538	20.3852	20.3926	20.3933	20.3933	20.3918	20.3626	20.1998	19.9466	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.2098	20.3554	20.4707	20.5431	20.5745	20.5822	20.5830	20.5830	20.5813	20.5514	20.3930	20.1528	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2098	20.3554	20.4707	20.5431	20.5745	20.5822	20.5830	20.5830	20.5813	20.5514	20.3930	20.1528	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9027	0.8430	0.7626	0.6555	0.5207	0.3719	0.2557	0.2708	0.4149	0.6464	0.8392	0.9193	(94)
Useful gains	721.1533	757.1316	724.8616	628.2328	489.0275	331.9812	221.2810	232.3773	359.2910	538.1179	653.5624	699.9894	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	884.0032	858.7545	776.2586	646.9284	493.0969	332.3930	221.3114	232.4223	360.1250	552.9348	738.6031	886.3914	(97)
Space heating kWh	121.1603	68.2906	38.2394	13.4609	3.0276	0.0000	0.0000	0.0000	0.0000	11.0238	61.2293	138.6831	(98a)
Space heating requirement - total per year (kWh/year)												455.1150	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	121.1603	68.2906	38.2394	13.4609	3.0276	0.0000	0.0000	0.0000	0.0000	11.0238	61.2293	138.6831	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												455.1150	
Space heating per m2										(98c) / (4) =		5.2493	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)											0.0000	(301)
Fraction of space heat from community system											1.0000	(302)
Fraction of heat from community Heat pump-Space and Water											1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating											1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating											1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system											1.5000	(306)
Efficiency of secondary/supplementary heating system, %											0.0000	(208)
Space heating:												
Space heating requirement												
	121.1603	68.2906	38.2394	13.4609	3.0276	0.0000	0.0000	0.0000	0.0000	11.0238	61.2293	138.6831	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	181.7405	102.4358	57.3591	20.1913	4.5415	0.0000	0.0000	0.0000	0.0000	16.5356	91.8440	208.0246	
Space heating requirement												
	181.7405	102.4358	57.3591	20.1913	4.5415	0.0000	0.0000	0.0000	0.0000	16.5356	91.8440	208.0246	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)											0.0000	(308)
Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating												
Annual water heating requirement												
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel												
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio											0.0000	(314)	
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year												
Space heating fuel - community heating											682.6725	(307)	
Space heating fuel - secondary											0.0000	(309)	
Water heating fuel - community heating											4127.5010	(310)	

Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	6.8267	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4101.7732	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	682.6725	4.4400	30.3107	(340a)
Space heating total			30.3107	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			238.9017	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.6530	(357)
SAP value	89.4143	
SAP rating (Section 12)	89	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1282.7129	0.1586	28.8804	(367)
Electrical energy for heat distribution (space & water)	6.8267	0.0000	6.8987	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			190.8634	(373)
Space and water heating			190.8634	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			105.2885	(383)
CO2 emissions per m2			1.2100	(384)
EI value			98.9287	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		1.4928 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5778	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.4800	54.0600	0.7600	0.7000	0.7700	149.0811	(78)
South	1.7600	54.0600	0.7600	0.7000	0.7700	35.0779	(78)

Solar gains	184.1590	267.3147	335.0854	384.8681	389.5564	404.1002	386.5845	379.8122	369.8751	303.9017	214.8392	160.2075	(83)
Total gains	823.7829	904.6086	953.3707	967.8218	937.3591	920.2051	884.0330	880.5246	888.7968	855.0828	804.8430	783.9902	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9026	0.8498	0.7621	0.6527	0.5175	0.3499	0.2451	0.2587	0.4117	0.6285	0.8309	0.9207	(86)
MIT	20.7026	20.8065	20.9090	20.9674	20.9931	20.9995	21.0000	20.9999	20.9986	20.9775	20.8557	20.6543	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.8888	0.8315	0.7376	0.6229	0.4830	0.3134	0.2070	0.2204	0.3742	0.5937	0.8081	0.9088	(89)
MIT 2	20.0626	20.1841	20.3002	20.3626	20.3877	20.3931	20.3933	20.3933	20.3924	20.3735	20.2432	20.0051	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.2628	20.3788	20.4906	20.5518	20.5771	20.5828	20.5831	20.5831	20.5820	20.5624	20.4348	20.2082	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2628	20.3788	20.4906	20.5518	20.5771	20.5828	20.5831	20.5831	20.5820	20.5624	20.4348	20.2082	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8856	0.8311	0.7416	0.6308	0.4935	0.3248	0.2189	0.2324	0.3859	0.6035	0.8098	0.9048	(94)
Useful gains	729.5526	751.7951	707.0666	610.5067	462.6029	298.9146	193.5217	204.6283	342.9661	516.0517	651.7287	709.3549	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	870.2772	843.3816	749.5825	625.1866	465.4582	299.0836	193.5322	204.6442	343.4922	525.7649	718.7010	872.7983	(97)
Space heating kWh													
	104.6991	61.5461	31.6318	10.5695	2.1244	0.0000	0.0000	0.0000	0.0000	7.2267	48.2200	121.6019	(98a)
Space heating requirement - total per year (kWh/year)												387.6196	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	104.6991	61.5461	31.6318	10.5695	2.1244	0.0000	0.0000	0.0000	0.0000	7.2267	48.2200	121.6019	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												387.6196	
Space heating per m2											(98c) / (4) =	4.4708	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement													
	104.6991	61.5461	31.6318	10.5695	2.1244	0.0000	0.0000	0.0000	0.0000	7.2267	48.2200	121.6019	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	157.0487	92.3192	47.4477	15.8543	3.1865	0.0000	0.0000	0.0000	0.0000	10.8400	72.3301	182.4029	
Space heating requirement													
	157.0487	92.3192	47.4477	15.8543	3.1865	0.0000	0.0000	0.0000	0.0000	10.8400	72.3301	182.4029	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												581.4293	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												5.8143	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1054.7470	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3904.0040	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	581.4293	6.5500	38.0836	(340a)
Space heating total			38.0836	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			301.3887	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1255.7148	0.1590	24.6520	(367)
Electrical energy for heat distribution (space & water)	5.8143	0.0000	6.7401	(372)
Overall CO2 factor for heat network			0.0396	(386)
Total CO2 associated with community systems			186.4764	(373)
Space and water heating			186.4764	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			88.6435	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)

Space and Water heating from Heat pump	1255.7148	1.5885	246.2981	(467)
Electrical energy for heat distribution (space & water)	5.8143	0.0000	72.0154	(472)
Overall CO2 factor for heat network			0.4231	(486)
Total CO2 associated with community systems			1992.4260	(473)
Space and water heating			1992.4260	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1348.5908	(483)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.32	**TER**	8.90
Environmental	99 A	**% DER < TER**			85.17
CO_2 Emissions (t/year)	0.09	**DFEE**	13.77	**TFEE**	17.18
Compliance Check	See BREL	**% DFEE < TFEE**			19.86
% DPER < TPER	61.77	**DPER**	18.07	**TPER**	47.27

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers
67.4410 66.4275 64.9507 62.1249 60.0396 57.7140 56.3922 57.8579 59.4646 61.9615 64.8480 67.1826 (42a)
Hot water usage for baths
29.1251 28.6925 28.0834 26.9603 26.1193 25.1868 24.6831 25.2880 25.9466 26.9444 28.0906 29.0266 (42b)
Hot water usage for other uses
41.0293 39.5373 38.0453 36.5534 35.0614 33.5694 33.5694 35.0614 36.5534 38.0453 39.5373 41.0293 (42c)
Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
12Total per year (kWh/year)												2752	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.4800	36.7938	0.7600	0.7000	0.7700	101.4662	(79)
Southwest	1.7600	36.7938	0.7600	0.7000	0.7700	23.8744	(79)

Solar gains	125.3406	213.5015	292.1220	361.9533	405.4179	402.4861	388.0396	355.6131	316.3064	235.9646	150.1292	107.2655	(83)
Total gains	710.5132	812.9140	866.2684	916.9873	933.1290	912.4849	879.1314	847.7351	823.0191	758.7177	703.8768	680.8066	(84)

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7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area	0.9492	0.9008	0.8299	0.7023	0.5477	0.3891	0.2780	0.3014	0.4638	0.7238	0.8997	0.9589	(86)
MIT	20.5505	20.7121	20.8462	20.9499	20.9900	20.9990	20.9999	20.9998	20.9970	20.9492	20.7534	20.5023	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house	0.9408	0.8865	0.8087	0.6732	0.5137	0.3525	0.2397	0.2617	0.4238	0.6898	0.8830	0.9518	(89)
MIT 2	19.8796	20.0744	20.2309	20.3448	20.3849	20.3927	20.3933	20.3933	20.3913	20.3461	20.1269	19.8204	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0895	20.2739	20.4233	20.5341	20.5742	20.5823	20.5831	20.5830	20.5808	20.5348	20.3229	20.0337	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0895	20.2739	20.4233	20.5341	20.5742	20.5823	20.5831	20.5830	20.5808	20.5348	20.3229	20.0337	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9360	0.8835	0.8098	0.6801	0.5239	0.3639	0.2517	0.2741	0.4362	0.6980	0.8809	0.9469	(94)
Useful gains	665.0195	718.2343	701.5112	623.6112	488.8727	332.0355	221.2840	232.3736	358.9857	529.5644	620.0338	644.6745	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	877.3151	854.2232	773.6273	646.4280	493.0806	332.3987	221.3117	232.4219	360.0928	552.0080	734.7063	879.7737	(97)
Space heating kWh	157.9479	91.3845	53.6544	16.4281	3.1306	0.0000	0.0000	0.0000	0.0000	16.6980	82.5642	174.9138	(98a)
Space heating requirement - total per year (kWh/year)												596.7217	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	157.9479	91.3845	53.6544	16.4281	3.1306	0.0000	0.0000	0.0000	0.0000	16.6980	82.5642	174.9138	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												596.7217	
Space heating per m2											(98c) / (4) =	6.8826	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	157.9479	91.3845	53.6544	16.4281	3.1306	0.0000	0.0000	0.0000	0.0000	16.6980	82.5642	174.9138	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	236.9219	137.0768	80.4816	24.6422	4.6959	0.0000	0.0000	0.0000	0.0000	25.0470	123.8463	262.3707	
Space heating requirement	236.9219	137.0768	80.4816	24.6422	4.6959	0.0000	0.0000	0.0000	0.0000	25.0470	123.8463	262.3707	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												895.0825	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												8.9508	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4314.1833	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1339.3556	0.1585	37.8351	(367)
Electrical energy for heat distribution (space & water)	8.9508	0.0000	7.2345	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			200.1539	(373)
Space and water heating			200.1539	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			114.5790	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.3200	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1339.3556	1.5867	378.7357	(467)
Electrical energy for heat distribution (space & water)	8.9508	0.0000	76.9818	(472)
Overall CO2 factor for heat network			0.4241	(486)
Total CO2 associated with community systems			2129.8300	(473)
Space and water heating			2129.8300	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1566.8867	(483)
Dwelling Primary energy Rate (DPER)			18.0700	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4892			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	13.5400	0.0700	0.9478
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.0900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8787 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.3679 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	63.6543	63.4509	63.2515	62.3151	62.1399	61.3243	61.3243	61.1733	61.6385	62.1399	62.4943	62.8649	(39)
Average = Sum(39)m / 12 =												62.3143	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7342	0.7318	0.7295	0.7187	0.7167	0.7073	0.7073	0.7056	0.7109	0.7167	0.7208	0.7251	(40)
HLP (average)												0.7187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	9.2400	36.7938	0.6300	0.7000	0.7700	103.9008	(79)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	103.9008	176.9815	242.1538	300.0403	336.0701	333.6398	321.6644	294.7845	262.2013	195.6022	124.4492	88.9174	(83)
Total gains	682.7380	770.0586	809.9648	848.7388	857.4458	834.3032	803.4208	777.5712	759.5787	712.0200	671.8614	656.1232	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4565	69.6791	69.8987	70.9491	71.1492	72.0954	72.0954	72.2734	71.7280	71.1492	70.7457	70.3287	
alpha	5.6304	5.6453	5.6599	5.7299	5.7433	5.8064	5.8064	5.8182	5.7819	5.7433	5.7164	5.6886	
util living area	0.9688	0.9411	0.8973	0.7967	0.6495	0.4673	0.3355	0.3613	0.5511	0.8075	0.9365	0.9737	(86)
MIT	20.3048	20.4857	20.6700	20.8648	20.9635	20.9954	20.9994	20.9992	20.9884	20.8760	20.5841	20.2759	(87)
Th 2	20.3107	20.3128	20.3148	20.3243	20.3261	20.3344	20.3344	20.3359	20.3312	20.3261	20.3225	20.3187	(88)
util rest of house	0.9628	0.9307	0.8801	0.7676	0.6087	0.4199	0.2849	0.3094	0.5008	0.7740	0.9237	0.9685	(89)
MIT 2	19.5070	19.7321	19.9569	20.1896	20.2946	20.3314	20.3341	20.3355	20.3229	20.2072	19.8640	19.4775	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.7566	19.9678	20.1799	20.4008	20.5038	20.5391	20.5422	20.5431	20.5310	20.4164	20.0892	19.7273	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7566	19.9678	20.1799	20.4008	20.5038	20.5391	20.5422	20.5431	20.5310	20.4164	20.0892	19.7273	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9571	0.9248	0.8764	0.7710	0.6196	0.4345	0.3007	0.3256	0.5160	0.7787	0.9187	0.9632	(94)
Useful gains	653.4332	712.1362	709.8748	654.4152	531.3155	362.5362	241.5967	253.1955	391.9330	554.4646	617.2618	631.9774	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	983.8761	956.0668	865.2770	716.6720	547.0674	364.2097	241.7551	253.4468	396.3995	609.9898	811.7524	976.1191	(97)
Space heating kWh	245.8495	163.9214	115.6193	44.8249	11.7194	0.0000	0.0000	0.0000	0.0000	41.3107	140.0332	256.0415	(98a)
Space heating requirement - total per year (kWh/year)												1019.3198	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	245.8495	163.9214	115.6193	44.8249	11.7194	0.0000	0.0000	0.0000	0.0000	41.3107	140.0332	256.0415	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1019.3198	
Space heating per m2											(98c) / (4) =	11.7569	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 92.3000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	245.8495	163.9214	115.6193	44.8249	11.7194	0.0000	0.0000	0.0000	0.0000	41.3107	140.0332	256.0415	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	266.3591	177.5963	125.2647	48.5644	12.6971	0.0000	0.0000	0.0000	0.0000	44.7570	151.7153	277.4014	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.1738	83.5464	82.6914	81.3511	80.2780	79.8000	79.8000	79.8000	79.8000	81.2340	83.1948	84.2890	(217)
Fuel for water heating, kWh/month	277.6174	247.2501	265.4522	237.7864	233.8702	212.3443	209.9929	218.2535	220.5242	241.1167	249.7443	274.3145	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1104.3552	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2888.2667	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3445.9272	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1104.3552	0.2100	231.9146	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2888.2667	0.2100	606.5360	(264)
Space and water heating			838.4506	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			771.5489	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.9000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1104.3552	1.1300	1247.9214	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2888.2667	1.1300	3263.7414	(278)
Space and water heating			4511.6627	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4097.8898	(286)
Target Primary Energy Rate (TPER)			47.2700	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.32	**TER**	8.90
Environmental	99 A	**% DER < TER**			85.17
CO_2 Emissions (t/year)	0.09	**DFEE**	13.77	**TFEE**	17.18
Compliance Check	See BREL	**% DFEE < TFEE**			19.86
% DPER < TPER	61.77	**DPER**	18.07	**TPER**	47.27

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		3 * 10 =	30.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1412	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.2912	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2257	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2878	0.2821	0.2765	0.2483	0.2426	0.2144	0.2144	0.2088	0.2257	0.2426	0.2539	0.2652	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5414	0.5398	0.5382	0.5308	0.5294	0.5230	0.5230	0.5218	0.5255	0.5294	0.5322	0.5352	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15916.3300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							183.5794	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9510	37.8383	37.7278	37.2089	37.1118	36.6599	36.6599	36.5762	36.8339	37.1118	37.3082	37.5135	(38)
Heat transfer coeff	58.4658	58.3531	58.2426	57.7237	57.6266	57.1747	57.1747	57.0910	57.3488	57.6266	57.8230	58.0284	(39)
Average = Sum(39)m / 12 =												57.7233	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6743	0.6730	0.6718	0.6658	0.6647	0.6595	0.6595	0.6585	0.6615	0.6647	0.6669	0.6693	(40)
HLP (average)												0.6658	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =					614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.4800	36.7938	0.7600	0.7000	0.7700	101.4662	(79)
Southwest	1.7600	36.7938	0.7600	0.7000	0.7700	23.8744	(79)

Solar gains	125.3406	213.5015	292.1220	361.9533	405.4179	402.4861	388.0396	355.6131	316.3064	235.9646	150.1292	107.2655	(83)
Total gains	603.5690	707.2263	763.4817	821.1958	841.4525	825.1544	794.7718	761.3949	734.2864	665.1367	603.6188	574.8142	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.6203	75.7664	75.9101	76.5925	76.7215	77.3280	77.3280	77.4413	77.0932	76.7215	76.4609	76.1904	
alpha	6.0414	6.0511	6.0607	6.1062	6.1148	6.1552	6.1552	6.1628	6.1395	6.1148	6.0974	6.0794	
util living area	0.9784	0.9487	0.8978	0.7813	0.6216	0.4418	0.3163	0.3446	0.5332	0.8110	0.9500	0.9831	(86)

MIT	20.3217	20.5278	20.7202	20.8999	20.9773	20.9976	20.9997	20.9996	20.9927	20.8944	20.5944	20.2787	(87)
Th 2	20.3635	20.3647	20.3658	20.3712	20.3721	20.3768	20.3768	20.3776	20.3750	20.3721	20.3701	20.3680	(88)
util rest of house	0.9741	0.9397	0.8813	0.7528	0.5837	0.3994	0.2716	0.2981	0.4869	0.7791	0.9396	0.9797	(89)
MIT 2	19.7461	19.9465	20.1288	20.2937	20.3570	20.3755	20.3767	20.3775	20.3709	20.2929	20.0176	19.7078	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9262	20.1283	20.3138	20.4833	20.5510	20.5701	20.5716	20.5721	20.5654	20.4811	20.1980	19.8864	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9262	20.1283	20.3138	20.4833	20.5510	20.5701	20.5716	20.5721	20.5654	20.4811	20.1980	19.8864	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9707	0.9359	0.8798	0.7581	0.5947	0.4126	0.2856	0.3127	0.5012	0.7849	0.9364	0.9766	(94)
Useful gains	585.8733	661.9037	671.7392	622.5140	500.3725	340.4634	227.0016	238.0608	367.9957	522.0450	565.2296	561.3424	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	913.5968	888.6190	804.5527	668.6308	510.0558	341.3395	227.0742	238.1878	370.7830	569.4130	757.3672	910.2542	(97)
Space heating kWh	243.8263	152.3526	98.8132	33.2041	7.2043	0.0000	0.0000	0.0000	0.0000	35.2418	138.3390	259.5904	(98a)
Space heating requirement - total per year (kWh/year)												968.5719	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	243.8263	152.3526	98.8132	33.2041	7.2043	0.0000	0.0000	0.0000	0.0000	35.2418	138.3390	259.5904	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												968.5719	
Space heating per m2											(98c) / (4) =	11.1715	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	537.4421	423.0928	433.8916	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9827	0.9938	0.9912	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	528.1649	420.4738	430.0905	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	900.3518	867.8724	831.6237	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	267.9746	332.8646	298.7407	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	66.9937	83.2161	74.6852	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												224.8950	(107)
Energy for space heating												11.1715	(99)
Energy for space cooling												2.5939	(108)
Total												13.7655	(109)
Fabric Energy Efficiency (DFEE)												13.8	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4892			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	13.5400	0.0700	0.9478
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.0900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8787 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.3679 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff													
	63.6543	63.4509	63.2515	62.3151	62.1399	61.3243	61.3243	61.1733	61.6385	62.1399	62.4943	62.8649	(39)
Average = Sum(39)m / 12 =												62.3143	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7342	0.7318	0.7295	0.7187	0.7167	0.7073	0.7073	0.7056	0.7109	0.7167	0.7208	0.7251	(40)
HLP (average)												0.7187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses													
	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												64.3029	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)													
	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.3496	(64a)
Heat gains from water heating, kWh/month													
	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains													
	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	9.2400	36.7938	0.6300	0.7000	0.7700	103.9008	(79)

Solar gains	103.9008	176.9815	242.1538	300.0403	336.0701	333.6398	321.6644	294.7845	262.2013	195.6022	124.4492	88.9174	(83)
Total gains	582.1292	670.7063	713.5134	759.2827	772.1047	756.3081	728.3966	700.5663	680.1814	624.7743	577.9388	556.4662	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4565	69.6791	69.8987	70.9491	71.1492	72.0954	72.0954	72.2734	71.7280	71.1492	70.7457	70.3287	
alpha	5.6304	5.6453	5.6599	5.7299	5.7433	5.8064	5.8064	5.8182	5.7819	5.7433	5.7164	5.6886	
util living area													
	0.9845	0.9660	0.9340	0.8484	0.7069	0.5133	0.3697	0.4005	0.6091	0.8657	0.9652	0.9875	(86)
MIT	20.1519	20.3528	20.5654	20.8091	20.9442	20.9926	20.9991	20.9985	20.9808	20.8168	20.4600	20.1209	(87)
Th 2	20.3107	20.3128	20.3148	20.3243	20.3261	20.3344	20.3344	20.3359	20.3312	20.3261	20.3225	20.3187	(88)
util rest of house													
	0.9812	0.9593	0.9213	0.8227	0.6657	0.4620	0.3141	0.3432	0.5555	0.8372	0.9572	0.9848	(89)
MIT 2	19.5353	19.7333	19.9397	20.1726	20.2878	20.3305	20.3340	20.3354	20.3203	20.1847	19.8480	19.5114	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.7281	19.9271	20.1354	20.3717	20.4931	20.5376	20.5421	20.5428	20.5269	20.3824	20.0395	19.7021	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7281	19.9271	20.1354	20.3717	20.4931	20.5376	20.5421	20.5428	20.5269	20.3824	20.0395	19.7021	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9779	0.9549	0.9176	0.8246	0.6762	0.4778	0.3315	0.3611	0.5714	0.8398	0.9533	0.9819	(94)
Useful gains	569.2515	640.4879	654.7519	626.0862	522.1190	361.3927	241.4771	252.9924	388.6888	524.6730	550.9384	546.3764	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	982.0680	953.4817	862.4631	714.8616	546.4032	364.1204	241.7445	253.4289	396.1435	607.8776	808.6432	974.5350	(97)
Space heating kWh													
	307.1355	210.3318	154.5372	63.9183	18.0675	0.0000	0.0000	0.0000	0.0000	61.9043	185.5475	318.5500	(98a)
Space heating requirement - total per year (kWh/year)												1319.9919	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	307.1355	210.3318	154.5372	63.9183	18.0675	0.0000	0.0000	0.0000	0.0000	61.9043	185.5475	318.5500	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1319.9919	
Space heating per m2											(98c) / (4) =	15.2248	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	576.4484	453.7998	464.9168	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9578	0.9826	0.9770	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	552.1001	445.9069	454.2307	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	819.8821	790.2910	760.5254	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	192.8031	256.2217	227.8833	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	48.2008	64.0554	56.9708	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												169.2270	(107)
Energy for space heating												15.2248	(99)
Energy for space cooling												1.9519	(108)
Total												17.1767	(109)
Fabric Energy Efficiency (TFEE)												17.2	(109)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.32	**TER**	8.90
Environmental	99 A	**% DER < TER**			85.17
CO_2 Emissions (t/year)	0.09	**DFEE**	13.77	**TFEE**	17.18
Compliance Check	See BREL	**% DFEE < TFEE**			19.86
% DPER < TPER	61.77	**DPER**	18.07	**TPER**	47.27

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers
67.4410 66.4275 64.9507 62.1249 60.0396 57.7140 56.3922 57.8579 59.4646 61.9615 64.8480 67.1826 (42a)
Hot water usage for baths
29.1251 28.6925 28.0834 26.9603 26.1193 25.1868 24.6831 25.2880 25.9466 26.9444 28.0906 29.0266 (42b)
Hot water usage for other uses
41.0293 39.5373 38.0453 36.5534 35.0614 33.5694 33.5694 35.0614 36.5534 38.0453 39.5373 41.0293 (42c)
Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
12Total per year (kWh/year)												2752	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.4800	36.7938	0.7600	0.7000	0.7700	101.4662	(79)
Southwest	1.7600	36.7938	0.7600	0.7000	0.7700	23.8744	(79)

Solar gains	125.3406	213.5015	292.1220	361.9533	405.4179	402.4861	388.0396	355.6131	316.3064	235.9646	150.1292	107.2655	(83)
Total gains	710.5132	812.9140	866.2684	916.9873	933.1290	912.4849	879.1314	847.7351	823.0191	758.7177	703.8768	680.8066	(84)

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7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area	0.9492	0.9008	0.8299	0.7023	0.5477	0.3891	0.2780	0.3014	0.4638	0.7238	0.8997	0.9589	(86)
MIT	20.5505	20.7121	20.8462	20.9499	20.9900	20.9990	20.9999	20.9998	20.9970	20.9492	20.7534	20.5023	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house	0.9408	0.8865	0.8087	0.6732	0.5137	0.3525	0.2397	0.2617	0.4238	0.6898	0.8830	0.9518	(89)
MIT 2	19.8796	20.0744	20.2309	20.3448	20.3849	20.3927	20.3933	20.3933	20.3913	20.3461	20.1269	19.8204	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0895	20.2739	20.4233	20.5341	20.5742	20.5823	20.5831	20.5830	20.5808	20.5348	20.3229	20.0337	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0895	20.2739	20.4233	20.5341	20.5742	20.5823	20.5831	20.5830	20.5808	20.5348	20.3229	20.0337	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9360	0.8835	0.8098	0.6801	0.5239	0.3639	0.2517	0.2741	0.4362	0.6980	0.8809	0.9469	(94)
Useful gains	665.0195	718.2343	701.5112	623.6112	488.8727	332.0355	221.2840	232.3736	358.9857	529.5644	620.0338	644.6745	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	877.3151	854.2232	773.6273	646.4280	493.0806	332.3987	221.3117	232.4219	360.0928	552.0080	734.7063	879.7737	(97)
Space heating kWh	157.9479	91.3845	53.6544	16.4281	3.1306	0.0000	0.0000	0.0000	0.0000	16.6980	82.5642	174.9138	(98a)
Space heating requirement - total per year (kWh/year)												596.7217	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	157.9479	91.3845	53.6544	16.4281	3.1306	0.0000	0.0000	0.0000	0.0000	16.6980	82.5642	174.9138	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												596.7217	
Space heating per m2											(98c) / (4) =	6.8826	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	157.9479	91.3845	53.6544	16.4281	3.1306	0.0000	0.0000	0.0000	0.0000	16.6980	82.5642	174.9138	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	236.9219	137.0768	80.4816	24.6422	4.6959	0.0000	0.0000	0.0000	0.0000	25.0470	123.8463	262.3707	
Space heating requirement	236.9219	137.0768	80.4816	24.6422	4.6959	0.0000	0.0000	0.0000	0.0000	25.0470	123.8463	262.3707	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												895.0825	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												8.9508	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4314.1833	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1339.3556	0.1585	37.8351	(367)
Electrical energy for heat distribution (space & water)	8.9508	0.0000	7.2345	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			200.1539	(373)
Space and water heating			200.1539	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			114.5790	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.3200	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1339.3556	1.5867	378.7357	(467)
Electrical energy for heat distribution (space & water)	8.9508	0.0000	76.9818	(472)
Overall CO2 factor for heat network			0.4241	(486)
Total CO2 associated with community systems			2129.8300	(473)
Space and water heating			2129.8300	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1566.8867	(483)
Dwelling Primary energy Rate (DPER)			18.0700	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4892			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	13.5400	0.0700	0.9478
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.0900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8787 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.3679 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	63.6543	63.4509	63.2515	62.3151	62.1399	61.3243	61.3243	61.1733	61.6385	62.1399	62.4943	62.8649	(39)
Average = Sum(39)m / 12 =												62.3143	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7342	0.7318	0.7295	0.7187	0.7167	0.7073	0.7073	0.7056	0.7109	0.7167	0.7208	0.7251	(40)
HLP (average)												0.7187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	9.2400	36.7938	0.6300	0.7000	0.7700	103.9008	(79)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	103.9008	176.9815	242.1538	300.0403	336.0701	333.6398	321.6644	294.7845	262.2013	195.6022	124.4492	88.9174	(83)
Total gains	682.7380	770.0586	809.9648	848.7388	857.4458	834.3032	803.4208	777.5712	759.5787	712.0200	671.8614	656.1232	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4565	69.6791	69.8987	70.9491	71.1492	72.0954	72.0954	72.2734	71.7280	71.1492	70.7457	70.3287	
alpha	5.6304	5.6453	5.6599	5.7299	5.7433	5.8064	5.8064	5.8182	5.7819	5.7433	5.7164	5.6886	
util living area	0.9688	0.9411	0.8973	0.7967	0.6495	0.4673	0.3355	0.3613	0.5511	0.8075	0.9365	0.9737	(86)
MIT	20.3048	20.4857	20.6700	20.8648	20.9635	20.9954	20.9994	20.9992	20.9884	20.8760	20.5841	20.2759	(87)
Th 2	20.3107	20.3128	20.3148	20.3243	20.3261	20.3344	20.3344	20.3359	20.3312	20.3261	20.3225	20.3187	(88)
util rest of house	0.9628	0.9307	0.8801	0.7676	0.6087	0.4199	0.2849	0.3094	0.5008	0.7740	0.9237	0.9685	(89)
MIT 2	19.5070	19.7321	19.9569	20.1896	20.2946	20.3314	20.3341	20.3355	20.3229	20.2072	19.8640	19.4775	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.7566	19.9678	20.1799	20.4008	20.5038	20.5391	20.5422	20.5431	20.5310	20.4164	20.0892	19.7273	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7566	19.9678	20.1799	20.4008	20.5038	20.5391	20.5422	20.5431	20.5310	20.4164	20.0892	19.7273	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9571	0.9248	0.8764	0.7710	0.6196	0.4345	0.3007	0.3256	0.5160	0.7787	0.9187	0.9632	(94)
Useful gains	653.4332	712.1362	709.8748	654.4152	531.3155	362.5362	241.5967	253.1955	391.9330	554.4646	617.2618	631.9774	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	983.8761	956.0668	865.2770	716.6720	547.0674	364.2097	241.7551	253.4468	396.3995	609.9898	811.7524	976.1191	(97)
Space heating kWh	245.8495	163.9214	115.6193	44.8249	11.7194	0.0000	0.0000	0.0000	0.0000	41.3107	140.0332	256.0415	(98a)
Space heating requirement - total per year (kWh/year)												1019.3198	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	245.8495	163.9214	115.6193	44.8249	11.7194	0.0000	0.0000	0.0000	0.0000	41.3107	140.0332	256.0415	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1019.3198	
Space heating per m2											(98c) / (4) =	11.7569	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 92.3000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	245.8495	163.9214	115.6193	44.8249	11.7194	0.0000	0.0000	0.0000	0.0000	41.3107	140.0332	256.0415	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	266.3591	177.5963	125.2647	48.5644	12.6971	0.0000	0.0000	0.0000	0.0000	44.7570	151.7153	277.4014	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.1738	83.5464	82.6914	81.3511	80.2780	79.8000	79.8000	79.8000	79.8000	81.2340	83.1948	84.2890	(217)
Fuel for water heating, kWh/month	277.6174	247.2501	265.4522	237.7864	233.8702	212.3443	209.9929	218.2535	220.5242	241.1167	249.7443	274.3145	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1104.3552	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2888.2667	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3445.9272	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1104.3552	0.2100	231.9146	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2888.2667	0.2100	606.5360	(264)
Space and water heating			838.4506	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			771.5489	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.9000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1104.3552	1.1300	1247.9214	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2888.2667	1.1300	3263.7414	(278)
Space and water heating			4511.6627	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4097.8898	(286)
Target Primary Energy Rate (TPER)			47.2700	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.32	**TER**	8.90
Environmental	99 A	**% DER < TER**			85.17
CO_2 Emissions (t/year)	0.09	**DFEE**	13.77	**TFEE**	17.18
Compliance Check	See BREL	**% DFEE < TFEE**			19.86
% DPER < TPER	61.77	**DPER**	18.07	**TPER**	47.27

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.4800	36.7938	0.7600	0.7000	0.7700	101.4662	(79)
Southwest	1.7600	36.7938	0.7600	0.7000	0.7700	23.8744	(79)

Solar gains	125.3406	213.5015	292.1220	361.9533	405.4179	402.4861	388.0396	355.6131	316.3064	235.9646	150.1292	107.2655	(83)
Total gains	764.9645	850.7953	910.4073	944.9070	953.2205	918.5910	885.4880	856.3255	835.2281	787.1458	740.1330	731.0482	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9312	0.8838	0.8052	0.6853	0.5368	0.3865	0.2760	0.2984	0.4572	0.7031	0.8808	0.9442	(86)
MIT	20.6178	20.7470	20.8712	20.9561	20.9911	20.9990	20.9999	20.9998	20.9973	20.9567	20.7864	20.5687	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9206	0.8681	0.7828	0.6562	0.5033	0.3501	0.2380	0.2591	0.4177	0.6690	0.8622	0.9351	(89)
MIT 2	19.9611	20.1151	20.2585	20.3511	20.3858	20.3927	20.3933	20.3933	20.3914	20.3534	20.1647	19.9016	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.1665	20.3128	20.4502	20.5404	20.5752	20.5824	20.5831	20.5830	20.5810	20.5421	20.3592	20.1102	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1665	20.3128	20.4502	20.5404	20.5752	20.5824	20.5831	20.5830	20.5810	20.5421	20.3592	20.1102	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9162	0.8659	0.7850	0.6634	0.5134	0.3615	0.2499	0.2714	0.4299	0.6775	0.8611	0.9304	(94)
Useful gains	700.8643	736.7138	714.6845	626.8273	489.3699	332.0508	221.2854	232.3767	359.0826	533.3094	637.3303	680.1676	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	881.5946	856.3858	775.1178	646.7766	493.1331	332.4004	221.3119	232.4222	360.1030	552.4152	736.7254	884.0258	(97)
Space heating kWh													
	134.4634	80.4196	44.9624	14.3635	2.7998	0.0000	0.0000	0.0000	0.0000	14.2148	71.5645	151.6705	(98a)
Space heating requirement - total per year (kWh/year)												514.4584	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	134.4634	80.4196	44.9624	14.3635	2.7998	0.0000	0.0000	0.0000	0.0000	14.2148	71.5645	151.6705	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												514.4584	
Space heating per m2											(98c) / (4) =	5.9338	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	134.4634	80.4196	44.9624	14.3635	2.7998	0.0000	0.0000	0.0000	0.0000	14.2148	71.5645	151.6705	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	201.6950	120.6294	67.4436	21.5452	4.1997	0.0000	0.0000	0.0000	0.0000	21.3222	107.3468	227.5057	
Space heating requirement													
	201.6950	120.6294	67.4436	21.5452	4.1997	0.0000	0.0000	0.0000	0.0000	21.3222	107.3468	227.5057	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												771.6876	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												7.7169	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4190.7884	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	771.6876	4.4400	34.2629	(340a)
Space heating total			34.2629	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			242.8540	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.6638 (357)
SAP value		89.2392
SAP rating (Section 12)		89 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1306.4503	0.1585	32.6197	(367)
Electrical energy for heat distribution (space & water)	7.7169	0.0000	7.0389	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			194.7429	(373)
Space and water heating			194.7429	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			109.1680	(383)
CO2 emissions per m2			1.2600	(384)
EI value			98.8893	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)

Average = Sum(39)m / 12 = 55.5633

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss / Combi loss

Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS / PV diverter / Solar input / FGHRS

Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
									Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.4800	42.9509	0.7600	0.7000	0.7700	118.4456	(79)
Southwest	1.7600	42.9509	0.7600	0.7000	0.7700	27.8696	(79)

Solar gains	146.3152	221.4792	299.2755	377.4295	409.9363	437.9421	413.7339	384.4230	342.7809	258.3726	172.6085	125.9735	(83)
Total gains	785.9390	858.7730	917.5608	960.3832	957.7390	954.0470	911.1824	885.1354	861.7026	809.5538	762.6124	749.7563	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9181	0.8724	0.7828	0.6571	0.5069	0.3376	0.2378	0.2573	0.4245	0.6592	0.8559	0.9334	(86)
MIT	20.6636	20.7718	20.8942	20.9662	20.9938	20.9996	21.0000	20.9999	20.9983	20.9709	20.8273	20.6153	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9058	0.8556	0.7588	0.6272	0.4730	0.3023	0.2008	0.2193	0.3859	0.6238	0.8347	0.9229	(89)
MIT 2	20.0165	20.1444	20.2843	20.3614	20.3883	20.3931	20.3933	20.3933	20.3922	20.3674	20.2117	19.9584	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.2189	20.3406	20.4751	20.5506	20.5777	20.5828	20.5831	20.5831	20.5818	20.5562	20.4042	20.1638	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2189	20.3406	20.4751	20.5506	20.5777	20.5828	20.5831	20.5831	20.5818	20.5562	20.4042	20.1638	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9020	0.8541	0.7621	0.6351	0.4834	0.3133	0.2124	0.2312	0.3979	0.6334	0.8351	0.9185	(94)
Useful gains	708.8827	733.4368	699.3065	609.8988	462.9502	298.9505	193.5237	204.6288	342.8535	512.7984	636.8542	688.6215	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	867.8386	841.2631	748.7199	625.1213	465.4948	299.0874	193.5324	204.6442	343.4803	525.4167	717.0012	870.3352	(97)
Space heating kWh													
	118.2632	72.4593	36.7635	10.9602	1.8932	0.0000	0.0000	0.0000	0.0000	9.3880	57.7059	135.1949	(98a)
Space heating requirement - total per year (kWh/year)												442.6282	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	118.2632	72.4593	36.7635	10.9602	1.8932	0.0000	0.0000	0.0000	0.0000	9.3880	57.7059	135.1949	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												442.6282	
Space heating per m2											(98c) / (4) =	5.1053	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	118.2632	72.4593	36.7635	10.9602	1.8932	0.0000	0.0000	0.0000	0.0000	9.3880	57.7059	135.1949	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	177.3948	108.6889	55.1453	16.4403	2.8398	0.0000	0.0000	0.0000	0.0000	14.0820	86.5588	202.7924	
Space heating requirement													
	177.3948	108.6889	55.1453	16.4403	2.8398	0.0000	0.0000	0.0000	0.0000	14.0820	86.5588	202.7924	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)

Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year		
Space heating fuel - community heating	663.9422	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4127.5010	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	6.6394	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3986.5169	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	663.9422	6.5500	43.4882	(340a)
Space heating total			43.4882	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			306.7933	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1277.7182	0.1589	28.1358	(367)
Electrical energy for heat distribution (space & water)	6.6394	0.0000	6.8708	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			190.0909	(373)
Space and water heating			190.0909	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			92.2579	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1277.7182	1.5882	281.1971	(467)
Electrical energy for heat distribution (space & water)	6.6394	0.0000	73.3241	(472)
Overall CO2 factor for heat network			0.4234	(486)
Total CO2 associated with community systems			2028.6337	(473)
Space and water heating			2028.6337	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1384.7986	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Northeast

Current energy efficiency rating: B 89
Current environmental impact rating: A 99

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 89
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£71	£71	£0
Community scheme	£418	£418	£0
Space heating	£157	£157	£0
Water heating	£270	£270	£0
Lighting	£62	£62	£0
Generated (PV)	-£182	-£182	£0
Total cost of fuels	£307	£307	£0
Total cost of uses	£307	£307	£0
Delivered energy	46 kWh/m²	46 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	16 kWh/m²	16 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		1.4928 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5778 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day)	126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.4800	36.7938	0.7600	0.7000	0.7700	101.4662	(79)
Southwest	1.7600	36.7938	0.7600	0.7000	0.7700	23.8744	(79)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	125.3406	213.5015	292.1220	361.9533	405.4179	402.4861	388.0396	355.6131	316.3064	235.9646	150.1292	107.2655	(83)
Total gains	764.9645	850.7953	910.4073	944.9070	953.2205	918.5910	885.4880	856.3255	835.2281	787.1458	740.1330	731.0482	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area	0.9312	0.8838	0.8052	0.6853	0.5368	0.3865	0.2760	0.2984	0.4572	0.7031	0.8808	0.9442	(86)
MIT	20.6178	20.7470	20.8712	20.9561	20.9911	20.9990	20.9999	20.9998	20.9973	20.9567	20.7864	20.5687	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house	0.9206	0.8681	0.7828	0.6562	0.5033	0.3501	0.2380	0.2591	0.4177	0.6690	0.8622	0.9351	(89)
MIT 2	19.9611	20.1151	20.2585	20.3511	20.3858	20.3927	20.3933	20.3933	20.3914	20.3534	20.1647	19.9016	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	20.1665	20.3128	20.4502	20.5404	20.5752	20.5824	20.5831	20.5830	20.5810	20.5421	20.3592	20.1102	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1665	20.3128	20.4502	20.5404	20.5752	20.5824	20.5831	20.5830	20.5810	20.5421	20.3592	20.1102	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9162	0.8659	0.7850	0.6634	0.5134	0.3615	0.2499	0.2714	0.4299	0.6775	0.8611	0.9304	(94)
Useful gains	700.8643	736.7138	714.6845	626.8273	489.3699	332.0508	221.2854	232.3767	359.0826	533.3094	637.3303	680.1676	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	881.5946	856.3858	775.1178	646.7766	493.1331	332.4004	221.3119	232.4222	360.1030	552.4152	736.7254	884.0258	(97)
Space heating kWh	134.4634	80.4196	44.9624	14.3635	2.7998	0.0000	0.0000	0.0000	0.0000	14.2148	71.5645	151.6705	(98a)
Space heating requirement - total per year (kWh/year)												514.4584	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	134.4634	80.4196	44.9624	14.3635	2.7998	0.0000	0.0000	0.0000	0.0000	14.2148	71.5645	151.6705	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												514.4584	
Space heating per m2											(98c) / (4) =	5.9338	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	134.4634	80.4196	44.9624	14.3635	2.7998	0.0000	0.0000	0.0000	0.0000	14.2148	71.5645	151.6705	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	201.6950	120.6294	67.4436	21.5452	4.1997	0.0000	0.0000	0.0000	0.0000	21.3222	107.3468	227.5057	
Space heating requirement													
	201.6950	120.6294	67.4436	21.5452	4.1997	0.0000	0.0000	0.0000	0.0000	21.3222	107.3468	227.5057	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												771.6876	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)

Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	7.7169	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4190.7884	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	771.6876	4.4400	34.2629	(340a)
Space heating total			34.2629	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			242.8540	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.6638	(357)
SAP value	89.2392	
SAP rating (Section 12)	89	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1306.4503	0.1585	32.6197	(367)
Electrical energy for heat distribution (space & water)	7.7169	0.0000	7.0389	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			194.7429	(373)
Space and water heating			194.7429	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			109.1680	(383)
CO2 emissions per m2			1.2600	(384)
EI value			98.8893	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 86.7000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		1.4928 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5778	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.4800	42.9509	0.7600	0.7000	0.7700	118.4456	(79)
Southwest	1.7600	42.9509	0.7600	0.7000	0.7700	27.8696	(79)

Solar gains	146.3152	221.4792	299.2755	377.4295	409.9363	437.9421	413.7339	384.4230	342.7809	258.3726	172.6085	125.9735	(83)
Total gains	785.9390	858.7730	917.5608	960.3832	957.7390	954.0470	911.1824	885.1354	861.7026	809.5538	762.6124	749.7563	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9181	0.8724	0.7828	0.6571	0.5069	0.3376	0.2378	0.2573	0.4245	0.6592	0.8559	0.9334	(86)
MIT	20.6636	20.7718	20.8942	20.9662	20.9938	20.9996	21.0000	20.9999	20.9983	20.9709	20.8273	20.6153	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9058	0.8556	0.7588	0.6272	0.4730	0.3023	0.2008	0.2193	0.3859	0.6238	0.8347	0.9229	(89)
MIT 2	20.0165	20.1444	20.2843	20.3614	20.3883	20.3931	20.3933	20.3933	20.3922	20.3674	20.2117	19.9584	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.2189	20.3406	20.4751	20.5506	20.5777	20.5828	20.5831	20.5831	20.5818	20.5562	20.4042	20.1638	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2189	20.3406	20.4751	20.5506	20.5777	20.5828	20.5831	20.5831	20.5818	20.5562	20.4042	20.1638	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9020	0.8541	0.7621	0.6351	0.4834	0.3133	0.2124	0.2312	0.3979	0.6334	0.8351	0.9185	(94)
Useful gains	708.8827	733.4368	699.3065	609.8988	462.9502	298.9505	193.5237	204.6288	342.8535	512.7984	636.8542	688.6215	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	867.8386	841.2631	748.7199	625.1213	465.4948	299.0874	193.5324	204.6442	343.4803	525.4167	717.0012	870.3352	(97)
Space heating kWh													
	118.2632	72.4593	36.7635	10.9602	1.8932	0.0000	0.0000	0.0000	0.0000	9.3880	57.7059	135.1949	(98a)
Space heating requirement - total per year (kWh/year)												442.6282	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	118.2632	72.4593	36.7635	10.9602	1.8932	0.0000	0.0000	0.0000	0.0000	9.3880	57.7059	135.1949	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												442.6282	
Space heating per m2										(98c) / (4) =		5.1053	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement

	118.2632	72.4593	36.7635	10.9602	1.8932	0.0000	0.0000	0.0000	0.0000	9.3880	57.7059	135.1949 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	177.3948	108.6889	55.1453	16.4403	2.8398	0.0000	0.0000	0.0000	0.0000	14.0820	86.5588	202.7924
Space heating requirement												
	177.3948	108.6889	55.1453	16.4403	2.8398	0.0000	0.0000	0.0000	0.0000	14.0820	86.5588	202.7924 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388
Water heating fuel												
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446 (331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year

Space heating fuel - community heating	663.9422 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	6.6394 (313)
Space cooling fuel	0.0000 (321)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)	
mechanical ventilation fans (SFP = 0.1292)	33.4924 (330a)
Total electricity for the above, kWh/year	33.4924 (331)
Electricity for lighting (calculated in Appendix L)	216.3282 (332)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	3986.5169 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	663.9422	6.5500	43.4882	(340a)
Space heating total			43.4882	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			306.7933	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1277.7182	0.1589	28.1358	(367)
Electrical energy for heat distribution (space & water)	6.6394	0.0000	6.8708	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			190.0909	(373)
Space and water heating			190.0909	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			92.2579	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)

Space and Water heating from Heat pump	1277.7182	1.5882	281.1971 (467)
Electrical energy for heat distribution (space & water)	6.6394	0.0000	73.3241 (472)
Overall CO2 factor for heat network			0.4234 (486)
Total CO2 associated with community systems			2028.6337 (473)
Space and water heating			2028.6337 (476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673 (478)
Energy for lighting	216.3282	1.5338	331.8115 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405
PV Unit electricity exported	-520.7528	0.4449	-231.6735
Total			-1026.3140 (480)
Total Primary energy kWh/year			1384.7986 (483)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.32	**TER**	8.90
Environmental	99 A	**% DER < TER**			85.17
CO_2 Emissions (t/year)	0.09	**DFEE**	13.77	**TFEE**	17.18
Compliance Check	See BREL	**% DFEE < TFEE**			19.86
% DPER < TPER	61.77	**DPER**	18.07	**TPER**	47.27

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
12Total per year (kWh/year)												2752	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.4800	36.7938	0.7600	0.7000	0.7700	101.4662	(77)
Southeast	1.7600	36.7938	0.7600	0.7000	0.7700	23.8744	(77)

Solar gains	125.3406	213.5015	292.1220	361.9533	405.4179	402.4861	388.0396	355.6131	316.3064	235.9646	150.1292	107.2655	(83)
Total gains	710.5132	812.9140	866.2684	916.9873	933.1290	912.4849	879.1314	847.7351	823.0191	758.7177	703.8768	680.8066	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area	0.9492	0.9008	0.8299	0.7023	0.5477	0.3891	0.2780	0.3014	0.4638	0.7238	0.8997	0.9589	(86)
MIT	20.5505	20.7121	20.8462	20.9499	20.9900	20.9990	20.9999	20.9998	20.9970	20.9492	20.7534	20.5023	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house	0.9408	0.8865	0.8087	0.6732	0.5137	0.3525	0.2397	0.2617	0.4238	0.6898	0.8830	0.9518	(89)
MIT 2	19.8796	20.0744	20.2309	20.3448	20.3849	20.3927	20.3933	20.3933	20.3913	20.3461	20.1269	19.8204	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0895	20.2739	20.4233	20.5341	20.5742	20.5823	20.5831	20.5830	20.5808	20.5348	20.3229	20.0337	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0895	20.2739	20.4233	20.5341	20.5742	20.5823	20.5831	20.5830	20.5808	20.5348	20.3229	20.0337	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9360	0.8835	0.8098	0.6801	0.5239	0.3639	0.2517	0.2741	0.4362	0.6980	0.8809	0.9469	(94)
Useful gains	665.0195	718.2343	701.5112	623.6112	488.8727	332.0355	221.2840	232.3736	358.9857	529.5644	620.0338	644.6745	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	877.3151	854.2232	773.6273	646.4280	493.0806	332.3987	221.3117	232.4219	360.0928	552.0080	734.7063	879.7737	(97)
Space heating kWh	157.9479	91.3845	53.6544	16.4281	3.1306	0.0000	0.0000	0.0000	0.0000	16.6980	82.5642	174.9138	(98a)
Space heating requirement - total per year (kWh/year)												596.7217	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	157.9479	91.3845	53.6544	16.4281	3.1306	0.0000	0.0000	0.0000	0.0000	16.6980	82.5642	174.9138	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												596.7217	
Space heating per m2											(98c) / (4) =	6.8826	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	157.9479	91.3845	53.6544	16.4281	3.1306	0.0000	0.0000	0.0000	0.0000	16.6980	82.5642	174.9138	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	236.9219	137.0768	80.4816	24.6422	4.6959	0.0000	0.0000	0.0000	0.0000	25.0470	123.8463	262.3707	
Space heating requirement	236.9219	137.0768	80.4816	24.6422	4.6959	0.0000	0.0000	0.0000	0.0000	25.0470	123.8463	262.3707	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												895.0825	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												8.9508	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4314.1833	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1339.3556	0.1585	37.8351	(367)
Electrical energy for heat distribution (space & water)	8.9508	0.0000	7.2345	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			200.1539	(373)
Space and water heating			200.1539	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			114.5790	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.3200	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1339.3556	1.5867	378.7357	(467)
Electrical energy for heat distribution (space & water)	8.9508	0.0000	76.9818	(472)
Overall CO2 factor for heat network			0.4241	(486)
Total CO2 associated with community systems			2129.8300	(473)
Space and water heating			2129.8300	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1566.8867	(483)
Dwelling Primary energy Rate (DPER)			18.0700	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4892			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	13.5400	0.0700	0.9478
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.0900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8787 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.3679 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	63.6543	63.4509	63.2515	62.3151	62.1399	61.3243	61.3243	61.1733	61.6385	62.1399	62.4943	62.8649	(39)
Average = Sum(39)m / 12 =												62.3143	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7342	0.7318	0.7295	0.7187	0.7167	0.7073	0.7073	0.7056	0.7109	0.7167	0.7208	0.7251	(40)
HLP (average)												0.7187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.2400	36.7938	0.6300	0.7000	0.7700	103.9008	(77)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	103.9008	176.9815	242.1538	300.0403	336.0701	333.6398	321.6644	294.7845	262.2013	195.6022	124.4492	88.9174	(83)
Total gains	682.7380	770.0586	809.9648	848.7388	857.4458	834.3032	803.4208	777.5712	759.5787	712.0200	671.8614	656.1232	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4565	69.6791	69.8987	70.9491	71.1492	72.0954	72.0954	72.2734	71.7280	71.1492	70.7457	70.3287	
alpha	5.6304	5.6453	5.6599	5.7299	5.7433	5.8064	5.8064	5.8182	5.7819	5.7433	5.7164	5.6886	
util living area	0.9688	0.9411	0.8973	0.7967	0.6495	0.4673	0.3355	0.3613	0.5511	0.8075	0.9365	0.9737	(86)
MIT	20.3048	20.4857	20.6700	20.8648	20.9635	20.9954	20.9994	20.9992	20.9884	20.8760	20.5841	20.2759	(87)
Th 2	20.3107	20.3128	20.3148	20.3243	20.3261	20.3344	20.3344	20.3359	20.3312	20.3261	20.3225	20.3187	(88)
util rest of house	0.9628	0.9307	0.8801	0.7676	0.6087	0.4199	0.2849	0.3094	0.5008	0.7740	0.9237	0.9685	(89)
MIT 2	19.5070	19.7321	19.9569	20.1896	20.2946	20.3314	20.3341	20.3355	20.3229	20.2072	19.8640	19.4775	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.7566	19.9678	20.1799	20.4008	20.5038	20.5391	20.5422	20.5431	20.5310	20.4164	20.0892	19.7273	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7566	19.9678	20.1799	20.4008	20.5038	20.5391	20.5422	20.5431	20.5310	20.4164	20.0892	19.7273	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9571	0.9248	0.8764	0.7710	0.6196	0.4345	0.3007	0.3256	0.5160	0.7787	0.9187	0.9632	(94)
Useful gains	653.4332	712.1362	709.8748	654.4152	531.3155	362.5362	241.5967	253.1955	391.9330	554.4646	617.2618	631.9774	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	983.8761	956.0668	865.2770	716.6720	547.0674	364.2097	241.7551	253.4468	396.3995	609.9898	811.7524	976.1191	(97)
Space heating kWh	245.8495	163.9214	115.6193	44.8249	11.7194	0.0000	0.0000	0.0000	0.0000	41.3107	140.0332	256.0415	(98a)
Space heating requirement - total per year (kWh/year)												1019.3198	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	245.8495	163.9214	115.6193	44.8249	11.7194	0.0000	0.0000	0.0000	0.0000	41.3107	140.0332	256.0415	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1019.3198	
Space heating per m2											(98c) / (4) =	11.7569	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	245.8495	163.9214	115.6193	44.8249	11.7194	0.0000	0.0000	0.0000	0.0000	41.3107	140.0332	256.0415	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	266.3591	177.5963	125.2647	48.5644	12.6971	0.0000	0.0000	0.0000	0.0000	44.7570	151.7153	277.4014	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.1738	83.5464	82.6914	81.3511	80.2780	79.8000	79.8000	79.8000	79.8000	81.2340	83.1948	84.2890	(217)
Fuel for water heating, kWh/month	277.6174	247.2501	265.4522	237.7864	233.8702	212.3443	209.9929	218.2535	220.5242	241.1167	249.7443	274.3145	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1104.3552	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2888.2667	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3445.9272	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1104.3552	0.2100	231.9146	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2888.2667	0.2100	606.5360	(264)
Space and water heating			838.4506	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			771.5489	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.9000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1104.3552	1.1300	1247.9214	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2888.2667	1.1300	3263.7414	(278)
Space and water heating			4511.6627	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4097.8898	(286)
Target Primary Energy Rate (TPER)			47.2700	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.32	**TER**	8.90
Environmental	99 A	**% DER < TER**			85.17
CO_2 Emissions (t/year)	0.09	**DFEE**	13.77	**TFEE**	17.18
Compliance Check	See BREL	**% DFEE < TFEE**			19.86
% DPER < TPER	61.77	**DPER**	18.07	**TPER**	47.27

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		3 * 10 =	30.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1412	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.2912	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2257	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2878	0.2821	0.2765	0.2483	0.2426	0.2144	0.2144	0.2088	0.2257	0.2426	0.2539	0.2652	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5414	0.5398	0.5382	0.5308	0.5294	0.5230	0.5230	0.5218	0.5255	0.5294	0.5322	0.5352	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15916.3300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							183.5794	(35)

Thermal bridges (User defined value 0.030 * total exposed area)												1.4928	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	20.5148	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9510	37.8383	37.7278	37.2089	37.1118	36.6599	36.6599	36.5762	36.8339	37.1118	37.3082	37.5135	(38)
Heat transfer coeff	58.4658	58.3531	58.2426	57.7237	57.6266	57.1747	57.1747	57.0910	57.3488	57.6266	57.8230	58.0284	(39)
Average = Sum(39)m / 12 =												57.7233	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6743	0.6730	0.6718	0.6658	0.6647	0.6595	0.6595	0.6585	0.6615	0.6647	0.6669	0.6693	(40)
HLP (average)												0.6658	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778	(42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses													
	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												64.3029	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)											Total = Sum(45)m =	1067.9337	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
											Total per year (kWh/year) = Sum(64)m =	907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)													
	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												614.3496	(64a)
Heat gains from water heating, kWh/month													
	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.4800	36.7938	0.7600	0.7000	0.7700	101.4662	(77)
Southeast	1.7600	36.7938	0.7600	0.7000	0.7700	23.8744	(77)

Solar gains	125.3406	213.5015	292.1220	361.9533	405.4179	402.4861	388.0396	355.6131	316.3064	235.9646	150.1292	107.2655	(83)
Total gains	603.5690	707.2263	763.4817	821.1958	841.4525	825.1544	794.7718	761.3949	734.2864	665.1367	603.6188	574.8142	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.6203	75.7664	75.9101	76.5925	76.7215	77.3280	77.3280	77.4413	77.0932	76.7215	76.4609	76.1904	
alpha	6.0414	6.0511	6.0607	6.1062	6.1148	6.1552	6.1552	6.1628	6.1395	6.1148	6.0974	6.0794	
util living area	0.9784	0.9487	0.8978	0.7813	0.6216	0.4418	0.3163	0.3446	0.5332	0.8110	0.9500	0.9831	(86)

MIT	20.3217	20.5278	20.7202	20.8999	20.9773	20.9976	20.9997	20.9996	20.9927	20.8944	20.5944	20.2787	(87)
Th 2	20.3635	20.3647	20.3658	20.3712	20.3721	20.3768	20.3768	20.3776	20.3750	20.3721	20.3701	20.3680	(88)
util rest of house	0.9741	0.9397	0.8813	0.7528	0.5837	0.3994	0.2716	0.2981	0.4869	0.7791	0.9396	0.9797	(89)
MIT 2	19.7461	19.9465	20.1288	20.2937	20.3570	20.3755	20.3767	20.3775	20.3709	20.2929	20.0176	19.7078	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9262	20.1283	20.3138	20.4833	20.5510	20.5701	20.5716	20.5721	20.5654	20.4811	20.1980	19.8864	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9262	20.1283	20.3138	20.4833	20.5510	20.5701	20.5716	20.5721	20.5654	20.4811	20.1980	19.8864	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9707	0.9359	0.8798	0.7581	0.5947	0.4126	0.2856	0.3127	0.5012	0.7849	0.9364	0.9766	(94)
Useful gains	585.8733	661.9037	671.7392	622.5140	500.3725	340.4634	227.0016	238.0608	367.9957	522.0450	565.2296	561.3424	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	913.5968	888.6190	804.5527	668.6308	510.0558	341.3395	227.0742	238.1878	370.7830	569.4130	757.3672	910.2542	(97)
Space heating kWh	243.8263	152.3526	98.8132	33.2041	7.2043	0.0000	0.0000	0.0000	0.0000	35.2418	138.3390	259.5904	(98a)
Space heating requirement - total per year (kWh/year)												968.5719	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	243.8263	152.3526	98.8132	33.2041	7.2043	0.0000	0.0000	0.0000	0.0000	35.2418	138.3390	259.5904	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												968.5719	
Space heating per m2											(98c) / (4) =	11.1715	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	537.4421	423.0928	433.8916	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9827	0.9938	0.9912	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	528.1649	420.4738	430.0905	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	900.3518	867.8724	831.6237	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	267.9746	332.8646	298.7407	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	66.9937	83.2161	74.6852	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												224.8950	(107)
Energy for space heating												11.1715	(99)
Energy for space cooling												2.5939	(108)
Total												13.7655	(109)
Fabric Energy Efficiency (DFEE)												13.8	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4892			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	13.5400	0.0700	0.9478
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.0900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8787 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.3679 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff													
	63.6543	63.4509	63.2515	62.3151	62.1399	61.3243	61.3243	61.1733	61.6385	62.1399	62.4943	62.8649	(39)
Average = Sum(39)m / 12 =												62.3143	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7342	0.7318	0.7295	0.7187	0.7167	0.7073	0.7073	0.7056	0.7109	0.7167	0.7208	0.7251	(40)
HLP (average)												0.7187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses													
	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												64.3029	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)													
	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.3496	(64a)
Heat gains from water heating, kWh/month													
	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains													
	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.2400	36.7938	0.6300	0.7000	0.7700	103.9008	(77)

Solar gains	103.9008	176.9815	242.1538	300.0403	336.0701	333.6398	321.6644	294.7845	262.2013	195.6022	124.4492	88.9174	(83)
Total gains	582.1292	670.7063	713.5134	759.2827	772.1047	756.3081	728.3966	700.5663	680.1814	624.7743	577.9388	556.4662	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4565	69.6791	69.8987	70.9491	71.1492	72.0954	72.0954	72.2734	71.7280	71.1492	70.7457	70.3287	
alpha	5.6304	5.6453	5.6599	5.7299	5.7433	5.8064	5.8064	5.8182	5.7819	5.7433	5.7164	5.6886	
util living area													
	0.9845	0.9660	0.9340	0.8484	0.7069	0.5133	0.3697	0.4005	0.6091	0.8657	0.9652	0.9875	(86)
MIT	20.1519	20.3528	20.5654	20.8091	20.9442	20.9926	20.9991	20.9985	20.9808	20.8168	20.4600	20.1209	(87)
Th 2	20.3107	20.3128	20.3148	20.3243	20.3261	20.3344	20.3344	20.3359	20.3312	20.3261	20.3225	20.3187	(88)
util rest of house													
	0.9812	0.9593	0.9213	0.8227	0.6657	0.4620	0.3141	0.3432	0.5555	0.8372	0.9572	0.9848	(89)
MIT 2	19.5353	19.7333	19.9397	20.1726	20.2878	20.3305	20.3340	20.3354	20.3203	20.1847	19.8480	19.5114	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.7281	19.9271	20.1354	20.3717	20.4931	20.5376	20.5421	20.5428	20.5269	20.3824	20.0395	19.7021	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7281	19.9271	20.1354	20.3717	20.4931	20.5376	20.5421	20.5428	20.5269	20.3824	20.0395	19.7021	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9779	0.9549	0.9176	0.8246	0.6762	0.4778	0.3315	0.3611	0.5714	0.8398	0.9533	0.9819	(94)
Useful gains	569.2515	640.4879	654.7519	626.0862	522.1190	361.3927	241.4771	252.9924	388.6888	524.6730	550.9384	546.3764	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	982.0680	953.4817	862.4631	714.8616	546.4032	364.1204	241.7445	253.4289	396.1435	607.8776	808.6432	974.5350	(97)
Space heating kWh													
	307.1355	210.3318	154.5372	63.9183	18.0675	0.0000	0.0000	0.0000	0.0000	61.9043	185.5475	318.5500	(98a)
Space heating requirement - total per year (kWh/year)												1319.9919	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	307.1355	210.3318	154.5372	63.9183	18.0675	0.0000	0.0000	0.0000	0.0000	61.9043	185.5475	318.5500	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1319.9919	
Space heating per m2											(98c) / (4) =	15.2248	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	576.4484	453.7998	464.9168	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9578	0.9826	0.9770	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	552.1001	445.9069	454.2307	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	819.8821	790.2910	760.5254	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	192.8031	256.2217	227.8833	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	48.2008	64.0554	56.9708	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												169.2270	(107)
Energy for space heating												15.2248	(99)
Energy for space cooling												1.9519	(108)
Total												17.1767	(109)
Fabric Energy Efficiency (TFEE)												17.2	(109)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.32	**TER**	8.90
Environmental	99 A	**% DER < TER**			85.17
CO_2 Emissions (t/year)	0.09	**DFEE**	13.77	**TFEE**	17.18
Compliance Check	See BREL	**% DFEE < TFEE**			19.86
% DPER < TPER	61.77	**DPER**	18.07	**TPER**	47.27

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
12Total per year (kWh/year)												2752	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.4800	36.7938	0.7600	0.7000	0.7700	101.4662	(77)
Southeast	1.7600	36.7938	0.7600	0.7000	0.7700	23.8744	(77)

Solar gains	125.3406	213.5015	292.1220	361.9533	405.4179	402.4861	388.0396	355.6131	316.3064	235.9646	150.1292	107.2655	(83)
Total gains	710.5132	812.9140	866.2684	916.9873	933.1290	912.4849	879.1314	847.7351	823.0191	758.7177	703.8768	680.8066	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area	0.9492	0.9008	0.8299	0.7023	0.5477	0.3891	0.2780	0.3014	0.4638	0.7238	0.8997	0.9589	(86)
MIT	20.5505	20.7121	20.8462	20.9499	20.9900	20.9990	20.9999	20.9998	20.9970	20.9492	20.7534	20.5023	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house	0.9408	0.8865	0.8087	0.6732	0.5137	0.3525	0.2397	0.2617	0.4238	0.6898	0.8830	0.9518	(89)
MIT 2	19.8796	20.0744	20.2309	20.3448	20.3849	20.3927	20.3933	20.3933	20.3913	20.3461	20.1269	19.8204	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0895	20.2739	20.4233	20.5341	20.5742	20.5823	20.5831	20.5830	20.5808	20.5348	20.3229	20.0337	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0895	20.2739	20.4233	20.5341	20.5742	20.5823	20.5831	20.5830	20.5808	20.5348	20.3229	20.0337	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9360	0.8835	0.8098	0.6801	0.5239	0.3639	0.2517	0.2741	0.4362	0.6980	0.8809	0.9469	(94)
Useful gains	665.0195	718.2343	701.5112	623.6112	488.8727	332.0355	221.2840	232.3736	358.9857	529.5644	620.0338	644.6745	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	877.3151	854.2232	773.6273	646.4280	493.0806	332.3987	221.3117	232.4219	360.0928	552.0080	734.7063	879.7737	(97)
Space heating kWh	157.9479	91.3845	53.6544	16.4281	3.1306	0.0000	0.0000	0.0000	0.0000	16.6980	82.5642	174.9138	(98a)
Space heating requirement - total per year (kWh/year)												596.7217	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	157.9479	91.3845	53.6544	16.4281	3.1306	0.0000	0.0000	0.0000	0.0000	16.6980	82.5642	174.9138	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												596.7217	
Space heating per m2											(98c) / (4) =	6.8826	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	157.9479	91.3845	53.6544	16.4281	3.1306	0.0000	0.0000	0.0000	0.0000	16.6980	82.5642	174.9138	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	236.9219	137.0768	80.4816	24.6422	4.6959	0.0000	0.0000	0.0000	0.0000	25.0470	123.8463	262.3707	
Space heating requirement	236.9219	137.0768	80.4816	24.6422	4.6959	0.0000	0.0000	0.0000	0.0000	25.0470	123.8463	262.3707	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												895.0825	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												8.9508	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4314.1833	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1339.3556	0.1585	37.8351	(367)
Electrical energy for heat distribution (space & water)	8.9508	0.0000	7.2345	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			200.1539	(373)
Space and water heating			200.1539	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			114.5790	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.3200	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1339.3556	1.5867	378.7357	(467)
Electrical energy for heat distribution (space & water)	8.9508	0.0000	76.9818	(472)
Overall CO2 factor for heat network			0.4241	(486)
Total CO2 associated with community systems			2129.8300	(473)
Space and water heating			2129.8300	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1566.8867	(483)
Dwelling Primary energy Rate (DPER)			18.0700	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4892			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	13.5400	0.0700	0.9478
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.0900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8787 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.3679 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	63.6543	63.4509	63.2515	62.3151	62.1399	61.3243	61.3243	61.1733	61.6385	62.1399	62.4943	62.8649	(39)
Average = Sum(39)m / 12 =												62.3143	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7342	0.7318	0.7295	0.7187	0.7167	0.7073	0.7073	0.7056	0.7109	0.7167	0.7208	0.7251	(40)
HLP (average)												0.7187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.2400	36.7938	0.6300	0.7000	0.7700	103.9008	(77)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	103.9008	176.9815	242.1538	300.0403	336.0701	333.6398	321.6644	294.7845	262.2013	195.6022	124.4492	88.9174	(83)
Total gains	682.7380	770.0586	809.9648	848.7388	857.4458	834.3032	803.4208	777.5712	759.5787	712.0200	671.8614	656.1232	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4565	69.6791	69.8987	70.9491	71.1492	72.0954	72.0954	72.2734	71.7280	71.1492	70.7457	70.3287	
alpha	5.6304	5.6453	5.6599	5.7299	5.7433	5.8064	5.8064	5.8182	5.7819	5.7433	5.7164	5.6886	
util living area	0.9688	0.9411	0.8973	0.7967	0.6495	0.4673	0.3355	0.3613	0.5511	0.8075	0.9365	0.9737	(86)
MIT	20.3048	20.4857	20.6700	20.8648	20.9635	20.9954	20.9994	20.9992	20.9884	20.8760	20.5841	20.2759	(87)
Th 2	20.3107	20.3128	20.3148	20.3243	20.3261	20.3344	20.3344	20.3359	20.3312	20.3261	20.3225	20.3187	(88)
util rest of house	0.9628	0.9307	0.8801	0.7676	0.6087	0.4199	0.2849	0.3094	0.5008	0.7740	0.9237	0.9685	(89)
MIT 2	19.5070	19.7321	19.9569	20.1896	20.2946	20.3314	20.3341	20.3355	20.3229	20.2072	19.8640	19.4775	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.7566	19.9678	20.1799	20.4008	20.5038	20.5391	20.5422	20.5431	20.5310	20.4164	20.0892	19.7273	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7566	19.9678	20.1799	20.4008	20.5038	20.5391	20.5422	20.5431	20.5310	20.4164	20.0892	19.7273	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9571	0.9248	0.8764	0.7710	0.6196	0.4345	0.3007	0.3256	0.5160	0.7787	0.9187	0.9632	(94)
Useful gains	653.4332	712.1362	709.8748	654.4152	531.3155	362.5362	241.5967	253.1955	391.9330	554.4646	617.2618	631.9774	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	983.8761	956.0668	865.2770	716.6720	547.0674	364.2097	241.7551	253.4468	396.3995	609.9898	811.7524	976.1191	(97)
Space heating kWh	245.8495	163.9214	115.6193	44.8249	11.7194	0.0000	0.0000	0.0000	0.0000	41.3107	140.0332	256.0415	(98a)
Space heating requirement - total per year (kWh/year)												1019.3198	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	245.8495	163.9214	115.6193	44.8249	11.7194	0.0000	0.0000	0.0000	0.0000	41.3107	140.0332	256.0415	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1019.3198	
Space heating per m2											(98c) / (4) =	11.7569	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	245.8495	163.9214	115.6193	44.8249	11.7194	0.0000	0.0000	0.0000	0.0000	41.3107	140.0332	256.0415	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	266.3591	177.5963	125.2647	48.5644	12.6971	0.0000	0.0000	0.0000	0.0000	44.7570	151.7153	277.4014	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.1738	83.5464	82.6914	81.3511	80.2780	79.8000	79.8000	79.8000	79.8000	81.2340	83.1948	84.2890	(217)
Fuel for water heating, kWh/month	277.6174	247.2501	265.4522	237.7864	233.8702	212.3443	209.9929	218.2535	220.5242	241.1167	249.7443	274.3145	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1104.3552	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2888.2667	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3445.9272	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1104.3552	0.2100	231.9146	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2888.2667	0.2100	606.5360	(264)
Space and water heating			838.4506	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			771.5489	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.9000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1104.3552	1.1300	1247.9214	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2888.2667	1.1300	3263.7414	(278)
Space and water heating			4511.6627	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4097.8898	(286)
Target Primary Energy Rate (TPER)			47.2700	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.32	**TER**	8.90
Environmental	99 A	**% DER < TER**			85.17
CO_2 Emissions (t/year)	0.09	**DFEE**	13.77	**TFEE**	17.18
Compliance Check	See BREL	**% DFEE < TFEE**			19.86
% DPER < TPER	61.77	**DPER**	18.07	**TPER**	47.27

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.4800	36.7938	0.7600	0.7000	0.7700	101.4662	(77)
Southeast	1.7600	36.7938	0.7600	0.7000	0.7700	23.8744	(77)

Solar gains	125.3406	213.5015	292.1220	361.9533	405.4179	402.4861	388.0396	355.6131	316.3064	235.9646	150.1292	107.2655	(83)
Total gains	764.9645	850.7953	910.4073	944.9070	953.2205	918.5910	885.4880	856.3255	835.2281	787.1458	740.1330	731.0482	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9312	0.8838	0.8052	0.6853	0.5368	0.3865	0.2760	0.2984	0.4572	0.7031	0.8808	0.9442	(86)
MIT	20.6178	20.7470	20.8712	20.9561	20.9911	20.9990	20.9999	20.9998	20.9973	20.9567	20.7864	20.5687	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9206	0.8681	0.7828	0.6562	0.5033	0.3501	0.2380	0.2591	0.4177	0.6690	0.8622	0.9351	(89)
MIT 2	19.9611	20.1151	20.2585	20.3511	20.3858	20.3927	20.3933	20.3933	20.3914	20.3534	20.1647	19.9016	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.1665	20.3128	20.4502	20.5404	20.5752	20.5824	20.5831	20.5830	20.5810	20.5421	20.3592	20.1102	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1665	20.3128	20.4502	20.5404	20.5752	20.5824	20.5831	20.5830	20.5810	20.5421	20.3592	20.1102	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9162	0.8659	0.7850	0.6634	0.5134	0.3615	0.2499	0.2714	0.4299	0.6775	0.8611	0.9304	(94)
Useful gains	700.8643	736.7138	714.6845	626.8273	489.3699	332.0508	221.2854	232.3767	359.0826	533.3094	637.3303	680.1676	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	881.5946	856.3858	775.1178	646.7766	493.1331	332.4004	221.3119	232.4222	360.1030	552.4152	736.7254	884.0258	(97)
Space heating kWh													
	134.4634	80.4196	44.9624	14.3635	2.7998	0.0000	0.0000	0.0000	0.0000	14.2148	71.5645	151.6705	(98a)
Space heating requirement - total per year (kWh/year)												514.4584	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	134.4634	80.4196	44.9624	14.3635	2.7998	0.0000	0.0000	0.0000	0.0000	14.2148	71.5645	151.6705	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												514.4584	
Space heating per m2											(98c) / (4) =	5.9338	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	134.4634	80.4196	44.9624	14.3635	2.7998	0.0000	0.0000	0.0000	0.0000	14.2148	71.5645	151.6705	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	201.6950	120.6294	67.4436	21.5452	4.1997	0.0000	0.0000	0.0000	0.0000	21.3222	107.3468	227.5057	
Space heating requirement													
	201.6950	120.6294	67.4436	21.5452	4.1997	0.0000	0.0000	0.0000	0.0000	21.3222	107.3468	227.5057	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												771.6876	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												7.7169	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4190.7884	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	771.6876	4.4400	34.2629	(340a)
Space heating total			34.2629	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			242.8540	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.6638 (357)
SAP value		89.2392
SAP rating (Section 12)		89 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1306.4503	0.1585	32.6197	(367)
Electrical energy for heat distribution (space & water)	7.7169	0.0000	7.0389	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			194.7429	(373)
Space and water heating			194.7429	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			109.1680	(383)
CO2 emissions per m2			1.2600	(384)
EI value			98.8893	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)

Average = Sum(39)m / 12 = 55.5633

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss / Combi loss

Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS / PV diverter / Solar input / FGHRS

Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
									Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.4800	42.9509	0.7600	0.7000	0.7700	118.4456	(77)
Southeast	1.7600	42.9509	0.7600	0.7000	0.7700	27.8696	(77)

Solar gains	146.3152	221.4792	299.2755	377.4295	409.9363	437.9421	413.7339	384.4230	342.7809	258.3726	172.6085	125.9735	(83)
Total gains	785.9390	858.7730	917.5608	960.3832	957.7390	954.0470	911.1824	885.1354	861.7026	809.5538	762.6124	749.7563	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9181	0.8724	0.7828	0.6571	0.5069	0.3376	0.2378	0.2573	0.4245	0.6592	0.8559	0.9334	(86)
MIT	20.6636	20.7718	20.8942	20.9662	20.9938	20.9996	21.0000	20.9999	20.9983	20.9709	20.8273	20.6153	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9058	0.8556	0.7588	0.6272	0.4730	0.3023	0.2008	0.2193	0.3859	0.6238	0.8347	0.9229	(89)
MIT 2	20.0165	20.1444	20.2843	20.3614	20.3883	20.3931	20.3933	20.3933	20.3922	20.3674	20.2117	19.9584	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.2189	20.3406	20.4751	20.5506	20.5777	20.5828	20.5831	20.5831	20.5818	20.5562	20.4042	20.1638	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2189	20.3406	20.4751	20.5506	20.5777	20.5828	20.5831	20.5831	20.5818	20.5562	20.4042	20.1638	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9020	0.8541	0.7621	0.6351	0.4834	0.3133	0.2124	0.2312	0.3979	0.6334	0.8351	0.9185	(94)
Useful gains	708.8827	733.4368	699.3065	609.8988	462.9502	298.9505	193.5237	204.6288	342.8535	512.7984	636.8542	688.6215	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	867.8386	841.2631	748.7199	625.1213	465.4948	299.0874	193.5324	204.6442	343.4803	525.4167	717.0012	870.3352	(97)
Space heating kWh													
	118.2632	72.4593	36.7635	10.9602	1.8932	0.0000	0.0000	0.0000	0.0000	9.3880	57.7059	135.1949	(98a)
Space heating requirement - total per year (kWh/year)												442.6282	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	118.2632	72.4593	36.7635	10.9602	1.8932	0.0000	0.0000	0.0000	0.0000	9.3880	57.7059	135.1949	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												442.6282	
Space heating per m2											(98c) / (4) =	5.1053	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	118.2632	72.4593	36.7635	10.9602	1.8932	0.0000	0.0000	0.0000	0.0000	9.3880	57.7059	135.1949	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	177.3948	108.6889	55.1453	16.4403	2.8398	0.0000	0.0000	0.0000	0.0000	14.0820	86.5588	202.7924	
Space heating requirement													
	177.3948	108.6889	55.1453	16.4403	2.8398	0.0000	0.0000	0.0000	0.0000	14.0820	86.5588	202.7924	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)

Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year		
Space heating fuel - community heating	663.9422	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4127.5010	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	6.6394	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3986.5169	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	663.9422	6.5500	43.4882	(340a)
Space heating total			43.4882	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			306.7933	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1277.7182	0.1589	28.1358	(367)
Electrical energy for heat distribution (space & water)	6.6394	0.0000	6.8708	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			190.0909	(373)
Space and water heating			190.0909	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			92.2579	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1277.7182	1.5882	281.1971	(467)
Electrical energy for heat distribution (space & water)	6.6394	0.0000	73.3241	(472)
Overall CO2 factor for heat network			0.4234	(486)
Total CO2 associated with community systems			2028.6337	(473)
Space and water heating			2028.6337	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1384.7986	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Northwest

Current energy efficiency rating: B 89
Current environmental impact rating: A 99

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 89
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£71	£71	£0
Community scheme	£418	£418	£0
Space heating	£157	£157	£0
Water heating	£270	£270	£0
Lighting	£62	£62	£0
Generated (PV)	-£182	-£182	£0
Total cost of fuels	£307	£307	£0
Total cost of uses	£307	£307	£0
Delivered energy	46 kWh/m²	46 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	16 kWh/m²	16 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		1.4928 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5778 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day)	126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.4800	36.7938	0.7600	0.7000	0.7700	101.4662	(77)
Southeast	1.7600	36.7938	0.7600	0.7000	0.7700	23.8744	(77)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	125.3406	213.5015	292.1220	361.9533	405.4179	402.4861	388.0396	355.6131	316.3064	235.9646	150.1292	107.2655	(83)
Total gains	764.9645	850.7953	910.4073	944.9070	953.2205	918.5910	885.4880	856.3255	835.2281	787.1458	740.1330	731.0482	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area	0.9312	0.8838	0.8052	0.6853	0.5368	0.3865	0.2760	0.2984	0.4572	0.7031	0.8808	0.9442	(86)
MIT	20.6178	20.7470	20.8712	20.9561	20.9911	20.9990	20.9999	20.9998	20.9973	20.9567	20.7864	20.5687	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house	0.9206	0.8681	0.7828	0.6562	0.5033	0.3501	0.2380	0.2591	0.4177	0.6690	0.8622	0.9351	(89)
MIT 2	19.9611	20.1151	20.2585	20.3511	20.3858	20.3927	20.3933	20.3933	20.3914	20.3534	20.1647	19.9016	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	20.1665	20.3128	20.4502	20.5404	20.5752	20.5824	20.5831	20.5830	20.5810	20.5421	20.3592	20.1102	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1665	20.3128	20.4502	20.5404	20.5752	20.5824	20.5831	20.5830	20.5810	20.5421	20.3592	20.1102	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9162	0.8659	0.7850	0.6634	0.5134	0.3615	0.2499	0.2714	0.4299	0.6775	0.8611	0.9304	(94)
Useful gains	700.8643	736.7138	714.6845	626.8273	489.3699	332.0508	221.2854	232.3767	359.0826	533.3094	637.3303	680.1676	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	881.5946	856.3858	775.1178	646.7766	493.1331	332.4004	221.3119	232.4222	360.1030	552.4152	736.7254	884.0258	(97)
Space heating kWh	134.4634	80.4196	44.9624	14.3635	2.7998	0.0000	0.0000	0.0000	0.0000	14.2148	71.5645	151.6705	(98a)
Space heating requirement - total per year (kWh/year)												514.4584	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	134.4634	80.4196	44.9624	14.3635	2.7998	0.0000	0.0000	0.0000	0.0000	14.2148	71.5645	151.6705	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												514.4584	
Space heating per m2										(98c) / (4) =		5.9338	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	134.4634	80.4196	44.9624	14.3635	2.7998	0.0000	0.0000	0.0000	0.0000	14.2148	71.5645	151.6705	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	201.6950	120.6294	67.4436	21.5452	4.1997	0.0000	0.0000	0.0000	0.0000	21.3222	107.3468	227.5057	
Space heating requirement	201.6950	120.6294	67.4436	21.5452	4.1997	0.0000	0.0000	0.0000	0.0000	21.3222	107.3468	227.5057	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												771.6876	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)

Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	7.7169	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4190.7884	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	771.6876	4.4400	34.2629	(340a)
Space heating total			34.2629	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			242.8540	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.6638	(357)
SAP value	89.2392	
SAP rating (Section 12)	89	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1306.4503	0.1585	32.6197	(367)
Electrical energy for heat distribution (space & water)	7.7169	0.0000	7.0389	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			194.7429	(373)
Space and water heating			194.7429	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			109.1680	(383)
CO2 emissions per m2			1.2600	(384)
EI value			98.8893	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 86.7000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		1.4928 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5778	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.4800	42.9509	0.7600	0.7000	0.7700	118.4456	(77)
Southeast	1.7600	42.9509	0.7600	0.7000	0.7700	27.8696	(77)

Solar gains	146.3152	221.4792	299.2755	377.4295	409.9363	437.9421	413.7339	384.4230	342.7809	258.3726	172.6085	125.9735	(83)
Total gains	785.9390	858.7730	917.5608	960.3832	957.7390	954.0470	911.1824	885.1354	861.7026	809.5538	762.6124	749.7563	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9181	0.8724	0.7828	0.6571	0.5069	0.3376	0.2378	0.2573	0.4245	0.6592	0.8559	0.9334	(86)
MIT	20.6636	20.7718	20.8942	20.9662	20.9938	20.9996	21.0000	20.9999	20.9983	20.9709	20.8273	20.6153	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9058	0.8556	0.7588	0.6272	0.4730	0.3023	0.2008	0.2193	0.3859	0.6238	0.8347	0.9229	(89)
MIT 2	20.0165	20.1444	20.2843	20.3614	20.3883	20.3931	20.3933	20.3933	20.3922	20.3674	20.2117	19.9584	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.2189	20.3406	20.4751	20.5506	20.5777	20.5828	20.5831	20.5831	20.5818	20.5562	20.4042	20.1638	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2189	20.3406	20.4751	20.5506	20.5777	20.5828	20.5831	20.5831	20.5818	20.5562	20.4042	20.1638	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9020	0.8541	0.7621	0.6351	0.4834	0.3133	0.2124	0.2312	0.3979	0.6334	0.8351	0.9185	(94)
Useful gains	708.8827	733.4368	699.3065	609.8988	462.9502	298.9505	193.5237	204.6288	342.8535	512.7984	636.8542	688.6215	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	867.8386	841.2631	748.7199	625.1213	465.4948	299.0874	193.5324	204.6442	343.4803	525.4167	717.0012	870.3352	(97)
Space heating kWh													
	118.2632	72.4593	36.7635	10.9602	1.8932	0.0000	0.0000	0.0000	0.0000	9.3880	57.7059	135.1949	(98a)
Space heating requirement - total per year (kWh/year)												442.6282	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	118.2632	72.4593	36.7635	10.9602	1.8932	0.0000	0.0000	0.0000	0.0000	9.3880	57.7059	135.1949	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												442.6282	
Space heating per m2											(98c) / (4) =	5.1053	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement

	118.2632	72.4593	36.7635	10.9602	1.8932	0.0000	0.0000	0.0000	0.0000	9.3880	57.7059	135.1949 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	177.3948	108.6889	55.1453	16.4403	2.8398	0.0000	0.0000	0.0000	0.0000	14.0820	86.5588	202.7924
Space heating requirement												
	177.3948	108.6889	55.1453	16.4403	2.8398	0.0000	0.0000	0.0000	0.0000	14.0820	86.5588	202.7924 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388
Water heating fuel												
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446 (331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year

Space heating fuel - community heating	663.9422 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	6.6394 (313)
Space cooling fuel	0.0000 (321)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)	
mechanical ventilation fans (SFP = 0.1292)	33.4924 (330a)
Total electricity for the above, kWh/year	33.4924 (331)
Electricity for lighting (calculated in Appendix L)	216.3282 (332)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	3986.5169 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	663.9422	6.5500	43.4882	(340a)
Space heating total			43.4882	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			306.7933	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1277.7182	0.1589	28.1358	(367)
Electrical energy for heat distribution (space & water)	6.6394	0.0000	6.8708	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			190.0909	(373)
Space and water heating			190.0909	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			92.2579	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)

Space and Water heating from Heat pump	1277.7182	1.5882	281.1971 (467)
Electrical energy for heat distribution (space & water)	6.6394	0.0000	73.3241 (472)
Overall CO2 factor for heat network			0.4234 (486)
Total CO2 associated with community systems			2028.6337 (473)
Space and water heating			2028.6337 (476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673 (478)
Energy for lighting	216.3282	1.5338	331.8115 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405
PV Unit electricity exported	-520.7528	0.4449	-231.6735
Total			-1026.3140 (480)
Total Primary energy kWh/year			1384.7986 (483)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.53	**TER**	9.64
Environmental	99 A	**% DER < TER**			84.13
CO_2 Emissions (t/year)	0.11	**DFEE**	17.22	**TFEE**	20.64
Compliance Check	See BREL	**% DFEE < TFEE**			16.56
% DPER < TPER	60.70	**DPER**	20.15	**TPER**	51.27

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised												0.5000	(23a)
If mechanical ventilation												0.5000	(23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674 (64)
12Total per year (kWh/year)												2752 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)

Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.4800	10.6334	0.7600	0.7000	0.7700	29.3237	(74)
North	1.7600	10.6334	0.7600	0.7000	0.7700	6.8997	(74)

Solar gains	36.2234	69.2247	117.6297	188.9434	254.5240	272.4755	254.3907	201.8266	141.4290	82.4029	44.6862	30.1976 (83)
Total gains	621.3959	668.6372	691.7761	743.9773	782.2352	782.4743	745.4825	693.9486	648.1418	605.1561	598.4337	603.7387 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area	0.9721	0.9542	0.9195	0.8158	0.6433	0.4527	0.3278	0.3679	0.5825	0.8424	0.9466	0.9764	(86)
MIT	20.4258	20.5451	20.6992	20.8840	20.9761	20.9976	20.9997	20.9995	20.9896	20.8793	20.6350	20.3900	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house	0.9669	0.9461	0.9056	0.7893	0.6059	0.4105	0.2827	0.3196	0.5344	0.8133	0.9359	0.9719	(89)
MIT 2	19.7258	19.8739	20.0623	20.2765	20.3726	20.3918	20.3932	20.3931	20.3858	20.2750	19.9870	19.6811	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9448	20.0839	20.2616	20.4665	20.5614	20.5813	20.5830	20.5828	20.5747	20.4640	20.1897	19.9029	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9448	20.0839	20.2616	20.4665	20.5614	20.5813	20.5830	20.5828	20.5747	20.4640	20.1897	19.9029	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9624	0.9414	0.9023	0.7927	0.6164	0.4236	0.2968	0.3347	0.5489	0.8169	0.9318	0.9676	(94)
Useful gains	598.0398	629.4414	624.1975	589.7208	482.1670	331.4730	221.2325	232.2524	355.7882	494.3317	557.6051	584.1614	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	869.2756	843.6666	764.6373	642.6736	492.3675	332.3392	221.3061	232.4087	359.7543	548.0788	727.3077	872.5039	(97)
Space heating kWh	201.7994	143.9593	104.4872	38.1260	7.5892	0.0000	0.0000	0.0000	0.0000	39.9878	122.1859	214.5268	(98a)
Space heating requirement - total per year (kWh/year)												872.6617	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	201.7994	143.9593	104.4872	38.1260	7.5892	0.0000	0.0000	0.0000	0.0000	39.9878	122.1859	214.5268	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												872.6617	
Space heating per m2											(98c) / (4) =	10.0653	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	201.7994	143.9593	104.4872	38.1260	7.5892	0.0000	0.0000	0.0000	0.0000	39.9878	122.1859	214.5268	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	302.6991	215.9389	156.7308	57.1891	11.3838	0.0000	0.0000	0.0000	0.0000	59.9817	183.2788	321.7902	
Space heating requirement	302.6991	215.9389	156.7308	57.1891	11.3838	0.0000	0.0000	0.0000	0.0000	59.9817	183.2788	321.7902	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1308.9926	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												13.0899	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4728.0934	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1449.7316	0.1572	54.8894	(367)
Electrical energy for heat distribution (space & water)	13.0899	0.0000	7.8740	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			217.8477	(373)
Space and water heating			217.8477	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			132.2728	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.5300	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1449.7316	1.5821	552.2688	(467)
Electrical energy for heat distribution (space & water)	13.0899	0.0000	83.4893	(472)
Overall CO2 factor for heat network			0.4249	(486)
Total CO2 associated with community systems			2309.8707	(473)
Space and water heating			2309.8707	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1746.9274	(483)
Dwelling Primary energy Rate (DPER)			20.1500	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4892			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	13.5400	0.0700	0.9478
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.0900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8787 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.3679 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	63.6543	63.4509	63.2515	62.3151	62.1399	61.3243	61.3243	61.1733	61.6385	62.1399	62.4943	62.8649	(39)
Average = Sum(39)m / 12 =												62.3143	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7342	0.7318	0.7295	0.7187	0.7167	0.7073	0.7073	0.7056	0.7109	0.7167	0.7208	0.7251	(40)
HLP (average)												0.7187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.2400	10.6334	0.6300	0.7000	0.7700	30.0273	(74)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	30.0273	57.3836	97.5088	156.6241	210.9870	225.8679	210.8765	167.3036	117.2372	68.3077	37.0425	25.0322	(83)
Total gains	608.8644	650.4608	665.3198	705.3227	732.3628	726.5312	692.6329	650.0903	614.6146	584.7255	584.4547	592.2379	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4565	69.6791	69.8987	70.9491	71.1492	72.0954	72.0954	72.2734	71.7280	71.1492	70.7457	70.3287	
alpha	5.6304	5.6453	5.6599	5.7299	5.7433	5.8064	5.8064	5.8182	5.7819	5.7433	5.7164	5.6886	
util living area	0.9810	0.9701	0.9494	0.8783	0.7356	0.5331	0.3886	0.4310	0.6644	0.8908	0.9635	0.9833	(86)
MIT	20.1938	20.3235	20.5052	20.7662	20.9318	20.9911	20.9988	20.9979	20.9704	20.7820	20.4692	20.1779	(87)
Th 2	20.3107	20.3128	20.3148	20.3243	20.3261	20.3344	20.3344	20.3359	20.3312	20.3261	20.3225	20.3187	(88)
util rest of house	0.9771	0.9641	0.9391	0.8553	0.6947	0.4803	0.3303	0.3696	0.6088	0.8654	0.9552	0.9799	(89)
MIT 2	19.3684	19.5330	19.7610	20.0821	20.2653	20.3283	20.3338	20.3349	20.3090	20.1066	19.7250	19.3547	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.6266	19.7803	19.9938	20.2961	20.4738	20.5356	20.5418	20.5423	20.5159	20.3179	19.9578	19.6122	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6266	19.7803	19.9938	20.2961	20.4738	20.5356	20.5418	20.5423	20.5159	20.3179	19.9578	19.6122	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9723	0.9586	0.9335	0.8543	0.7040	0.4964	0.3485	0.3888	0.6246	0.8651	0.9499	0.9755	(94)
Useful gains	592.0278	623.5045	621.0759	602.5546	515.5689	360.6845	241.3808	252.7503	383.8668	505.8263	555.1795	577.6993	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	975.6016	944.1662	853.5027	710.1468	545.2012	363.9984	241.7297	253.3950	395.4669	603.8678	803.5394	968.8855	(97)
Space heating kWh	285.3789	215.4847	172.9255	77.4663	22.0464	0.0000	0.0000	0.0000	0.0000	72.9429	178.8191	291.0426	(98a)
Space heating requirement - total per year (kWh/year)												1316.1064	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	285.3789	215.4847	172.9255	77.4663	22.0464	0.0000	0.0000	0.0000	0.0000	72.9429	178.8191	291.0426	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1316.1064	
Space heating per m2										(98c) / (4) =		15.1800	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	285.3789	215.4847	172.9255	77.4663	22.0464	0.0000	0.0000	0.0000	0.0000	72.9429	178.8191	291.0426	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	309.1863	233.4612	187.3516	83.9289	23.8856	0.0000	0.0000	0.0000	0.0000	79.0280	193.7369	315.3224	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.5091	84.1547	83.5305	82.1817	80.6591	79.8000	79.8000	79.8000	79.8000	82.0567	83.7250	84.5770	(217)
Fuel for water heating, kWh/month	276.5160	245.4630	262.7857	235.3830	232.7654	212.3443	209.9929	218.2535	220.5242	238.6992	248.1627	273.3806	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1425.9008	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2874.2705	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3753.4766	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1425.9008	0.2100	299.4392	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2874.2705	0.2100	603.5968	(264)
Space and water heating			903.0360	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			836.1343	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.6400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1425.9008	1.1300	1611.2679	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2874.2705	1.1300	3247.9257	(278)
Space and water heating			4859.1936	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4445.4207	(286)
Target Primary Energy Rate (TPER)			51.2700	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.53	**TER**	9.64
Environmental	99 A	**% DER < TER**			84.13
CO_2 Emissions (t/year)	0.11	**DFEE**	17.22	**TFEE**	20.64
Compliance Check	See BREL	**% DFEE < TFEE**			16.56
% DPER < TPER	60.70	**DPER**	20.15	**TPER**	51.27

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2257	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2878	0.2821	0.2765	0.2483	0.2426	0.2144	0.2144	0.2088	0.2257	0.2426	0.2539	0.2652	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5414	0.5398	0.5382	0.5308	0.5294	0.5230	0.5230	0.5218	0.5255	0.5294	0.5322	0.5352	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15916.3300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							183.5794	(35)

Thermal bridges (User defined value 0.030 * total exposed area)												1.4928	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	20.5148	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9510	37.8383	37.7278	37.2089	37.1118	36.6599	36.6599	36.5762	36.8339	37.1118	37.3082	37.5135	(38)
Heat transfer coeff	58.4658	58.3531	58.2426	57.7237	57.6266	57.1747	57.1747	57.0910	57.3488	57.6266	57.8230	58.0284	(39)
Average = Sum(39)m / 12 =												57.7233	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6743	0.6730	0.6718	0.6658	0.6647	0.6595	0.6595	0.6585	0.6615	0.6647	0.6669	0.6693	(40)
HLP (average)												0.6658	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778	(42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses													
	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												64.3029	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)											Total = Sum(45)m =	1067.9337	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
											Total per year (kWh/year) = Sum(64)m =	907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)													
	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	614.3496	(64a)
Heat gains from water heating, kWh/month													
	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains													
	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.4800	10.6334	0.7600	0.7000	0.7700	29.3237	(74)
North	1.7600	10.6334	0.7600	0.7000	0.7700	6.8997	(74)

Solar gains	36.2234	69.2247	117.6297	188.9434	254.5240	272.4755	254.3907	201.8266	141.4290	82.4029	44.6862	30.1976	(83)
Total gains	514.4518	562.9495	588.9893	648.1858	690.5587	695.1438	661.1229	607.6084	559.4090	511.5750	498.1758	497.7463	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.6203	75.7664	75.9101	76.5925	76.7215	77.3280	77.3280	77.4413	77.0932	76.7215	76.4609	76.1904	
alpha	6.0414	6.0511	6.0607	6.1062	6.1148	6.1552	6.1552	6.1628	6.1395	6.1148	6.0974	6.0794	
util living area													
	0.9900	0.9814	0.9630	0.8893	0.7319	0.5215	0.3799	0.4308	0.6804	0.9177	0.9787	0.9917	(86)

MIT	20.1789	20.3195	20.5122	20.7850	20.9463	20.9941	20.9993	20.9985	20.9734	20.7712	20.4431	20.1529	(87)
Th 2	20.3635	20.3647	20.3658	20.3712	20.3721	20.3768	20.3768	20.3776	20.3750	20.3721	20.3701	20.3680	(88)
util rest of house	0.9879	0.9776	0.9552	0.8683	0.6929	0.4726	0.3264	0.3732	0.6273	0.8972	0.9736	0.9899	(89)
MIT 2	19.6060	19.7455	19.9349	20.1961	20.3347	20.3736	20.3765	20.3771	20.3592	20.1886	19.8729	19.5839	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.7852	19.9251	20.1155	20.3803	20.5260	20.5677	20.5713	20.5714	20.5513	20.3708	20.0513	19.7619	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7852	19.9251	20.1155	20.3803	20.5260	20.5677	20.5713	20.5714	20.5513	20.3708	20.0513	19.7619	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9855	0.9744	0.9517	0.8686	0.7028	0.4877	0.3431	0.3912	0.6427	0.8971	0.9705	0.9878	(94)
Useful gains	507.0081	548.5119	560.5194	563.0148	485.3142	339.0128	226.8519	237.7009	359.5337	458.9489	483.4709	491.6815	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	905.3555	876.7586	793.0015	662.6856	508.6133	341.2016	227.0592	238.1522	369.9764	563.0592	748.8819	903.0303	(97)
Space heating kWh	296.3705	220.5818	172.9667	71.7630	17.3345	0.0000	0.0000	0.0000	0.0000	77.4580	191.0960	306.0436	(98a)
Space heating requirement - total per year (kWh/year)												1353.6140	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	296.3705	220.5818	172.9667	71.7630	17.3345	0.0000	0.0000	0.0000	0.0000	77.4580	191.0960	306.0436	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1353.6140	
Space heating per m2											(98c) / (4) =	15.6126	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	537.4421	423.0928	433.8916	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9595	0.9831	0.9712	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	515.6679	415.9315	421.4074	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	748.3914	711.6595	651.8733	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	167.5610	220.0216	171.4666	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	41.8902	55.0054	42.8667	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												139.7623	(107)
Energy for space heating												15.6126	(99)
Energy for space cooling												1.6120	(108)
Total												17.2246	(109)
Fabric Energy Efficiency (DFEE)												17.2	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4892			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	13.5400	0.0700	0.9478
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.0900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8787 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.3679 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff													
	63.6543	63.4509	63.2515	62.3151	62.1399	61.3243	61.3243	61.1733	61.6385	62.1399	62.4943	62.8649	(39)
Average = Sum(39)m / 12 =												62.3143	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7342	0.7318	0.7295	0.7187	0.7167	0.7073	0.7073	0.7056	0.7109	0.7167	0.7208	0.7251	(40)
HLP (average)												0.7187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses													
	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												64.3029	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)													
	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.3496	(64a)
Heat gains from water heating, kWh/month													
	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains													
	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.2400	10.6334	0.6300	0.7000	0.7700	30.0273	(74)

Solar gains	30.0273	57.3836	97.5088	156.6241	210.9870	225.8679	210.8765	167.3036	117.2372	68.3077	37.0425	25.0322	(83)
Total gains	508.2557	551.1084	568.8684	615.8666	647.0217	648.5361	617.6087	573.0854	535.2172	497.4798	490.5321	492.5809	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4565	69.6791	69.8987	70.9491	71.1492	72.0954	72.0954	72.2734	71.7280	71.1492	70.7457	70.3287	
alpha	5.6304	5.6453	5.6599	5.7299	5.7433	5.8064	5.8064	5.8182	5.7819	5.7433	5.7164	5.6886	
util living area													
	0.9917	0.9856	0.9735	0.9228	0.7996	0.5918	0.4349	0.4870	0.7399	0.9382	0.9830	0.9930	(86)
MIT	20.0324	20.1714	20.3702	20.6772	20.8948	20.9849	20.9978	20.9960	20.9490	20.6878	20.3287	20.0162	(87)
Th 2	20.3107	20.3128	20.3148	20.3243	20.3261	20.3344	20.3344	20.3359	20.3312	20.3261	20.3225	20.3187	(88)
util rest of house													
	0.9899	0.9825	0.9674	0.9056	0.7614	0.5350	0.3701	0.4186	0.6844	0.9209	0.9787	0.9914	(89)
MIT 2	19.4174	19.5567	19.7541	20.0563	20.2506	20.3262	20.3336	20.3343	20.3002	20.0718	19.7211	19.4079	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.6098	19.7490	19.9468	20.2506	20.4521	20.5323	20.5414	20.5413	20.5031	20.2645	19.9111	19.5982	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6098	19.7490	19.9468	20.2506	20.4521	20.5323	20.5414	20.5413	20.5031	20.2645	19.9111	19.5982	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9876	0.9793	0.9635	0.9035	0.7689	0.5522	0.3903	0.4399	0.6993	0.9191	0.9755	0.9894	(94)
Useful gains	501.9467	539.7040	548.1065	556.4412	497.5121	358.1148	241.0664	252.1089	374.2857	457.2142	478.5374	487.3399	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	974.5346	942.1813	850.5339	707.3115	543.8555	363.7912	241.7012	253.3371	394.6796	600.5488	800.6241	968.0037	(97)
Space heating kWh													
	351.6054	270.4647	225.0060	108.6267	34.4795	0.0000	0.0000	0.0000	0.0000	106.6409	231.9024	357.6139	(98a)
Space heating requirement - total per year (kWh/year)												1686.3395	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	351.6054	270.4647	225.0060	108.6267	34.4795	0.0000	0.0000	0.0000	0.0000	106.6409	231.9024	357.6139	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1686.3395	
Space heating per m2											(98c) / (4) =	19.4503	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	576.4484	453.7998	464.9168	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9196	0.9617	0.9425	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	530.0859	436.4155	438.1673	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	693.9149	660.7987	611.5218	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	117.9569	166.9411	128.9757	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	29.4892	41.7353	32.2439	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												103.4684	(107)
Energy for space heating												19.4503	(99)
Energy for space cooling												1.1934	(108)
Total												20.6437	(109)
Fabric Energy Efficiency (TFEE)												20.6	(109)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.53	**TER**	9.64
Environmental	99 A	**% DER < TER**			84.13
CO_2 Emissions (t/year)	0.11	**DFEE**	17.22	**TFEE**	20.64
Compliance Check	See BREL	**% DFEE < TFEE**			16.56
% DPER < TPER	60.70	**DPER**	20.15	**TPER**	51.27

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised												0.5000	(23a)
If mechanical ventilation												0.5000	(23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674 (64)
12Total per year (kWh/year)												2752 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)

Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.4800	10.6334	0.7600	0.7000	0.7700	29.3237	(74)
North	1.7600	10.6334	0.7600	0.7000	0.7700	6.8997	(74)

Solar gains	36.2234	69.2247	117.6297	188.9434	254.5240	272.4755	254.3907	201.8266	141.4290	82.4029	44.6862	30.1976 (83)
Total gains	621.3959	668.6372	691.7761	743.9773	782.2352	782.4743	745.4825	693.9486	648.1418	605.1561	598.4337	603.7387 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area	0.9721	0.9542	0.9195	0.8158	0.6433	0.4527	0.3278	0.3679	0.5825	0.8424	0.9466	0.9764	(86)
MIT	20.4258	20.5451	20.6992	20.8840	20.9761	20.9976	20.9997	20.9995	20.9896	20.8793	20.6350	20.3900	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house	0.9669	0.9461	0.9056	0.7893	0.6059	0.4105	0.2827	0.3196	0.5344	0.8133	0.9359	0.9719	(89)
MIT 2	19.7258	19.8739	20.0623	20.2765	20.3726	20.3918	20.3932	20.3931	20.3858	20.2750	19.9870	19.6811	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9448	20.0839	20.2616	20.4665	20.5614	20.5813	20.5830	20.5828	20.5747	20.4640	20.1897	19.9029	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9448	20.0839	20.2616	20.4665	20.5614	20.5813	20.5830	20.5828	20.5747	20.4640	20.1897	19.9029	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9624	0.9414	0.9023	0.7927	0.6164	0.4236	0.2968	0.3347	0.5489	0.8169	0.9318	0.9676	(94)
Useful gains	598.0398	629.4414	624.1975	589.7208	482.1670	331.4730	221.2325	232.2524	355.7882	494.3317	557.6051	584.1614	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	869.2756	843.6666	764.6373	642.6736	492.3675	332.3392	221.3061	232.4087	359.7543	548.0788	727.3077	872.5039	(97)
Space heating kWh	201.7994	143.9593	104.4872	38.1260	7.5892	0.0000	0.0000	0.0000	0.0000	39.9878	122.1859	214.5268	(98a)
Space heating requirement - total per year (kWh/year)												872.6617	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	201.7994	143.9593	104.4872	38.1260	7.5892	0.0000	0.0000	0.0000	0.0000	39.9878	122.1859	214.5268	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												872.6617	
Space heating per m2											(98c) / (4) =	10.0653	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	201.7994	143.9593	104.4872	38.1260	7.5892	0.0000	0.0000	0.0000	0.0000	39.9878	122.1859	214.5268	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	302.6991	215.9389	156.7308	57.1891	11.3838	0.0000	0.0000	0.0000	0.0000	59.9817	183.2788	321.7902	
Space heating requirement	302.6991	215.9389	156.7308	57.1891	11.3838	0.0000	0.0000	0.0000	0.0000	59.9817	183.2788	321.7902	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1308.9926	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												13.0899	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4728.0934	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1449.7316	0.1572	54.8894	(367)
Electrical energy for heat distribution (space & water)	13.0899	0.0000	7.8740	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			217.8477	(373)
Space and water heating			217.8477	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			132.2728	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.5300	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1449.7316	1.5821	552.2688	(467)
Electrical energy for heat distribution (space & water)	13.0899	0.0000	83.4893	(472)
Overall CO2 factor for heat network			0.4249	(486)
Total CO2 associated with community systems			2309.8707	(473)
Space and water heating			2309.8707	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1746.9274	(483)
Dwelling Primary energy Rate (DPER)			20.1500	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4892			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	13.5400	0.0700	0.9478
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.0900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8787 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.3679 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	63.6543	63.4509	63.2515	62.3151	62.1399	61.3243	61.3243	61.1733	61.6385	62.1399	62.4943	62.8649	(39)
Average = Sum(39)m / 12 =												62.3143	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7342	0.7318	0.7295	0.7187	0.7167	0.7073	0.7073	0.7056	0.7109	0.7167	0.7208	0.7251	(40)
HLP (average)												0.7187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.2400	10.6334	0.6300	0.7000	0.7700	30.0273	(74)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	30.0273	57.3836	97.5088	156.6241	210.9870	225.8679	210.8765	167.3036	117.2372	68.3077	37.0425	25.0322	(83)
Total gains	608.8644	650.4608	665.3198	705.3227	732.3628	726.5312	692.6329	650.0903	614.6146	584.7255	584.4547	592.2379	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4565	69.6791	69.8987	70.9491	71.1492	72.0954	72.0954	72.2734	71.7280	71.1492	70.7457	70.3287	
alpha	5.6304	5.6453	5.6599	5.7299	5.7433	5.8064	5.8064	5.8182	5.7819	5.7433	5.7164	5.6886	
util living area	0.9810	0.9701	0.9494	0.8783	0.7356	0.5331	0.3886	0.4310	0.6644	0.8908	0.9635	0.9833	(86)
MIT	20.1938	20.3235	20.5052	20.7662	20.9318	20.9911	20.9988	20.9979	20.9704	20.7820	20.4692	20.1779	(87)
Th 2	20.3107	20.3128	20.3148	20.3243	20.3261	20.3344	20.3344	20.3359	20.3312	20.3261	20.3225	20.3187	(88)
util rest of house	0.9771	0.9641	0.9391	0.8553	0.6947	0.4803	0.3303	0.3696	0.6088	0.8654	0.9552	0.9799	(89)
MIT 2	19.3684	19.5330	19.7610	20.0821	20.2653	20.3283	20.3338	20.3349	20.3090	20.1066	19.7250	19.3547	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.6266	19.7803	19.9938	20.2961	20.4738	20.5356	20.5418	20.5423	20.5159	20.3179	19.9578	19.6122	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6266	19.7803	19.9938	20.2961	20.4738	20.5356	20.5418	20.5423	20.5159	20.3179	19.9578	19.6122	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9723	0.9586	0.9335	0.8543	0.7040	0.4964	0.3485	0.3888	0.6246	0.8651	0.9499	0.9755	(94)
Useful gains	592.0278	623.5045	621.0759	602.5546	515.5689	360.6845	241.3808	252.7503	383.8668	505.8263	555.1795	577.6993	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	975.6016	944.1662	853.5027	710.1468	545.2012	363.9984	241.7297	253.3950	395.4669	603.8678	803.5394	968.8855	(97)
Space heating kWh	285.3789	215.4847	172.9255	77.4663	22.0464	0.0000	0.0000	0.0000	0.0000	72.9429	178.8191	291.0426	(98a)
Space heating requirement - total per year (kWh/year)												1316.1064	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	285.3789	215.4847	172.9255	77.4663	22.0464	0.0000	0.0000	0.0000	0.0000	72.9429	178.8191	291.0426	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1316.1064	
Space heating per m2										(98c) / (4) =		15.1800	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	285.3789	215.4847	172.9255	77.4663	22.0464	0.0000	0.0000	0.0000	0.0000	72.9429	178.8191	291.0426	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	309.1863	233.4612	187.3516	83.9289	23.8856	0.0000	0.0000	0.0000	0.0000	79.0280	193.7369	315.3224	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.5091	84.1547	83.5305	82.1817	80.6591	79.8000	79.8000	79.8000	79.8000	82.0567	83.7250	84.5770	(217)
Fuel for water heating, kWh/month	276.5160	245.4630	262.7857	235.3830	232.7654	212.3443	209.9929	218.2535	220.5242	238.6992	248.1627	273.3806	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1425.9008	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2874.2705	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3753.4766	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1425.9008	0.2100	299.4392	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2874.2705	0.2100	603.5968	(264)
Space and water heating			903.0360	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			836.1343	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.6400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1425.9008	1.1300	1611.2679	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2874.2705	1.1300	3247.9257	(278)
Space and water heating			4859.1936	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4445.4207	(286)
Target Primary Energy Rate (TPER)			51.2700	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.53	**TER**	9.64
Environmental	99 A	**% DER < TER**			84.13
CO_2 Emissions (t/year)	0.11	**DFEE**	17.22	**TFEE**	20.64
Compliance Check	See BREL	**% DFEE < TFEE**			16.56
% DPER < TPER	60.70	**DPER**	20.15	**TPER**	51.27

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
									Total per year (kWh/year) = Sum(64)m =			2751.6674 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000 (64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.4800	10.6334	0.7600	0.7000	0.7700	29.3237	(74)
North	1.7600	10.6334	0.7600	0.7000	0.7700	6.8997	(74)

Solar gains	36.2234	69.2247	117.6297	188.9434	254.5240	272.4755	254.3907	201.8266	141.4290	82.4029	44.6862	30.1976 (83)
Total gains	675.8472	706.5185	735.9149	771.8971	802.3267	788.5804	751.8392	702.5390	660.3507	633.5841	634.6900	653.9803 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9591	0.9422	0.8989	0.7970	0.6291	0.4493	0.3250	0.3634	0.5725	0.8203	0.9321	0.9657	(86)
MIT	20.5041	20.5941	20.7444	20.8987	20.9788	20.9977	20.9998	20.9995	20.9906	20.8970	20.6795	20.4646	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9520	0.9325	0.8828	0.7696	0.5920	0.4073	0.2803	0.3157	0.5250	0.7896	0.9192	0.9595	(89)
MIT 2	19.8227	19.9336	20.1151	20.2920	20.3751	20.3918	20.3932	20.3931	20.3865	20.2936	20.0402	19.7739	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0358	20.1402	20.3120	20.4818	20.5639	20.5813	20.5830	20.5828	20.5754	20.4823	20.2402	19.9899	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0358	20.1402	20.3120	20.4818	20.5639	20.5813	20.5830	20.5828	20.5754	20.4823	20.2402	19.9899	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9472	0.9279	0.8805	0.7738	0.6026	0.4204	0.2943	0.3306	0.5394	0.7944	0.9156	0.9548	(94)
Useful gains	640.1454	655.5920	647.9853	597.2794	483.4835	331.5141	221.2365	232.2645	356.1938	503.2931	581.1371	624.4069	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	874.3333	846.7958	767.4392	643.5229	492.5082	332.3436	221.3065	232.4100	359.7973	549.0934	730.1125	877.3401	(97)
Space heating kWh													
	174.2358	128.4889	88.8737	33.2953	6.7144	0.0000	0.0000	0.0000	0.0000	34.0754	107.2623	188.1823	(98a)
Space heating requirement - total per year (kWh/year)												761.1281	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	174.2358	128.4889	88.8737	33.2953	6.7144	0.0000	0.0000	0.0000	0.0000	34.0754	107.2623	188.1823	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												761.1281	
Space heating per m2											(98c) / (4) =	8.7789	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	174.2358	128.4889	88.8737	33.2953	6.7144	0.0000	0.0000	0.0000	0.0000	34.0754	107.2623	188.1823	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	261.3538	192.7334	133.3105	49.9429	10.0716	0.0000	0.0000	0.0000	0.0000	51.1131	160.8934	282.2734	
Space heating requirement													
	261.3538	192.7334	133.3105	49.9429	10.0716	0.0000	0.0000	0.0000	0.0000	51.1131	160.8934	282.2734	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1141.6921	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												11.4169	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4560.7929	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1141.6921	4.4400	50.6911	(340a)
Space heating total			50.6911	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			259.2822	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7087 (357)
SAP value		88.5113
SAP rating (Section 12)		89 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1405.1182	0.1573	47.8834	(367)
Electrical energy for heat distribution (space & water)	11.4169	0.0000	7.6113	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			210.5790	(373)
Space and water heating			210.5790	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			125.0041	(383)
CO2 emissions per m2			1.4400	(384)
EI value			98.7281	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			3.0000 (17)
Infiltration rate			0.1500 (18)
Number of sides sheltered			3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7750 (20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)

Average = Sum(39)m / 12 = 55.5633

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss / Combi loss

Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS / PV diverter / Solar input / FGHRS

Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
									Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.4800	12.7500	0.7600	0.7000	0.7700	35.1606	(74)
North	1.7600	12.7500	0.7600	0.7000	0.7700	8.2731	(74)

Solar gains	43.4336	74.5092	126.2264	206.2135	267.3389	306.4834	281.0067	227.7396	160.7181	94.0355	52.9325	36.3187	(83)
Total gains	683.0575	711.8031	744.5117	789.1672	815.1415	822.5883	778.4551	728.4520	679.6398	645.2166	642.9363	660.1014	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9537	0.9357	0.8813	0.7673	0.5900	0.3911	0.2783	0.3126	0.5344	0.7857	0.9200	0.9612	(86)
MIT	20.5392	20.6243	20.7841	20.9210	20.9858	20.9991	20.9999	20.9998	20.9938	20.9236	20.7188	20.4994	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9456	0.9249	0.8629	0.7380	0.5521	0.3505	0.2350	0.2664	0.4872	0.7515	0.9051	0.9542	(89)
MIT 2	19.8663	19.9705	20.1619	20.3160	20.3816	20.3928	20.3933	20.3933	20.3890	20.3217	20.0874	19.8172	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0768	20.1750	20.3565	20.5052	20.5706	20.5824	20.5831	20.5830	20.5782	20.5099	20.2849	20.0306	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0768	20.1750	20.3565	20.5052	20.5706	20.5824	20.5831	20.5830	20.5782	20.5099	20.2849	20.0306	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9408	0.9206	0.8617	0.7435	0.5633	0.3632	0.2486	0.2809	0.5017	0.7583	0.9022	0.9495	(94)
Useful gains	642.6472	655.2823	641.5574	586.7827	459.1910	298.7421	193.5082	204.5909	340.9749	489.2910	580.0387	626.7396	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	859.9419	832.0590	742.1309	622.5989	465.0973	299.0653	193.5307	204.6400	343.2816	522.8473	710.3694	862.9307	(97)
Space heating kWh													
	161.6672	118.7939	74.8266	25.7877	4.3943	0.0000	0.0000	0.0000	0.0000	24.9659	93.8381	175.7262	(98a)
Space heating requirement - total per year (kWh/year)												680.0000	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	161.6672	118.7939	74.8266	25.7877	4.3943	0.0000	0.0000	0.0000	0.0000	24.9659	93.8381	175.7262	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												680.0000	
Space heating per m2											(98c) / (4) =	7.8431	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	161.6672	118.7939	74.8266	25.7877	4.3943	0.0000	0.0000	0.0000	0.0000	24.9659	93.8381	175.7262	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	242.5009	178.1909	112.2399	38.6816	6.5914	0.0000	0.0000	0.0000	0.0000	37.4488	140.7571	263.5893	
Space heating requirement													
	242.5009	178.1909	112.2399	38.6816	6.5914	0.0000	0.0000	0.0000	0.0000	37.4488	140.7571	263.5893	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)

Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year	
Space heating fuel - community heating	1019.9999 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	10.2000 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)	
mechanical ventilation fans (SFP = 0.1292)	33.4924 (330a)
Total electricity for the above, kWh/year	33.4924 (331)
Electricity for lighting (calculated in Appendix L)	216.3282 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4342.5746 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1019.9999	6.5500	66.8100	(340a)
Space heating total			66.8100	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			330.1150	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1372.6669	0.1578	42.9133	(367)
Electrical energy for heat distribution (space & water)	10.2000	0.0000	7.4249	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			205.4225	(373)
Space and water heating			205.4225	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			107.5896	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1372.6669	1.5841	430.8642	(467)
Electrical energy for heat distribution (space & water)	10.2000	0.0000	78.9366	(472)
Overall CO2 factor for heat network			0.4243	(486)
Total CO2 associated with community systems			2183.9134	(473)
Space and water heating			2183.9134	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1540.0782	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - South

Current energy efficiency rating: B 89
Current environmental impact rating: A 99

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 89
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£71	£71	£0
Community scheme	£441	£441	£0
Space heating	£180	£180	£0
Water heating	£270	£270	£0
Lighting	£62	£62	£0
Generated (PV)	-£182	-£182	£0
Total cost of fuels	£330	£330	£0
Total cost of uses	£330	£330	£0
Delivered energy	50 kWh/m²	50 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	18 kWh/m²	18 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		1.4928 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5778 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day)	126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.4800	10.6334	0.7600	0.7000	0.7700	29.3237	(74)
North	1.7600	10.6334	0.7600	0.7000	0.7700	6.8997	(74)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	36.2234	69.2247	117.6297	188.9434	254.5240	272.4755	254.3907	201.8266	141.4290	82.4029	44.6862	30.1976	(83)
Total gains	675.8472	706.5185	735.9149	771.8971	802.3267	788.5804	751.8392	702.5390	660.3507	633.5841	634.6900	653.9803	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area	0.9591	0.9422	0.8989	0.7970	0.6291	0.4493	0.3250	0.3634	0.5725	0.8203	0.9321	0.9657	(86)
MIT	20.5041	20.5941	20.7444	20.8987	20.9788	20.9977	20.9998	20.9995	20.9906	20.8970	20.6795	20.4646	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house	0.9520	0.9325	0.8828	0.7696	0.5920	0.4073	0.2803	0.3157	0.5250	0.7896	0.9192	0.9595	(89)
MIT 2	19.8227	19.9336	20.1151	20.2920	20.3751	20.3918	20.3932	20.3931	20.3865	20.2936	20.0402	19.7739	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	20.0358	20.1402	20.3120	20.4818	20.5639	20.5813	20.5830	20.5828	20.5754	20.4823	20.2402	19.9899	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0358	20.1402	20.3120	20.4818	20.5639	20.5813	20.5830	20.5828	20.5754	20.4823	20.2402	19.9899	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9472	0.9279	0.8805	0.7738	0.6026	0.4204	0.2943	0.3306	0.5394	0.7944	0.9156	0.9548	(94)
Useful gains	640.1454	655.5920	647.9853	597.2794	483.4835	331.5141	221.2365	232.2645	356.1938	503.2931	581.1371	624.4069	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	874.3333	846.7958	767.4392	643.5229	492.5082	332.3436	221.3065	232.4100	359.7973	549.0934	730.1125	877.3401	(97)
Space heating kWh	174.2358	128.4889	88.8737	33.2953	6.7144	0.0000	0.0000	0.0000	0.0000	34.0754	107.2623	188.1823	(98a)
Space heating requirement - total per year (kWh/year)												761.1281	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	174.2358	128.4889	88.8737	33.2953	6.7144	0.0000	0.0000	0.0000	0.0000	34.0754	107.2623	188.1823	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												761.1281	
Space heating per m2										(98c) / (4) =		8.7789	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	174.2358	128.4889	88.8737	33.2953	6.7144	0.0000	0.0000	0.0000	0.0000	34.0754	107.2623	188.1823	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	261.3538	192.7334	133.3105	49.9429	10.0716	0.0000	0.0000	0.0000	0.0000	51.1131	160.8934	282.2734	
Space heating requirement													
	261.3538	192.7334	133.3105	49.9429	10.0716	0.0000	0.0000	0.0000	0.0000	51.1131	160.8934	282.2734	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1141.6921	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)

Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	11.4169	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4560.7929	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1141.6921	4.4400	50.6911	(340a)
Space heating total			50.6911	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			259.2822	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.7087	(357)
SAP value	88.5113	
SAP rating (Section 12)	89	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1405.1182	0.1573	47.8834	(367)
Electrical energy for heat distribution (space & water)	11.4169	0.0000	7.6113	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			210.5790	(373)
Space and water heating			210.5790	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			125.0041	(383)
CO2 emissions per m2			1.4400	(384)
EI value			98.7281	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		1.4928 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5778	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.4800	12.7500	0.7600	0.7000	0.7700	35.1606	(74)
North	1.7600	12.7500	0.7600	0.7000	0.7700	8.2731	(74)
Solar gains	43.4336	74.5092	126.2264	206.2135	267.3389	306.4834	281.0067	227.7396	160.7181	94.0355	52.9325	36.3187	(83)
Total gains	683.0575	711.8031	744.5117	789.1672	815.1415	822.5883	778.4551	728.4520	679.6398	645.2166	642.9363	660.1014	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9537	0.9357	0.8813	0.7673	0.5900	0.3911	0.2783	0.3126	0.5344	0.7857	0.9200	0.9612	(86)
MIT	20.5392	20.6243	20.7841	20.9210	20.9858	20.9991	20.9999	20.9998	20.9938	20.9236	20.7188	20.4994	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9456	0.9249	0.8629	0.7380	0.5521	0.3505	0.2350	0.2664	0.4872	0.7515	0.9051	0.9542	(89)
MIT 2	19.8663	19.9705	20.1619	20.3160	20.3816	20.3928	20.3933	20.3933	20.3890	20.3217	20.0874	19.8172	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0768	20.1750	20.3565	20.5052	20.5706	20.5824	20.5831	20.5830	20.5782	20.5099	20.2849	20.0306	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0768	20.1750	20.3565	20.5052	20.5706	20.5824	20.5831	20.5830	20.5782	20.5099	20.2849	20.0306	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9408	0.9206	0.8617	0.7435	0.5633	0.3632	0.2486	0.2809	0.5017	0.7583	0.9022	0.9495	(94)
Useful gains	642.6472	655.2823	641.5574	586.7827	459.1910	298.7421	193.5082	204.5909	340.9749	489.2910	580.0387	626.7396	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	859.9419	832.0590	742.1309	622.5989	465.0973	299.0653	193.5307	204.6400	343.2816	522.8473	710.3694	862.9307	(97)
Space heating kWh													
	161.6672	118.7939	74.8266	25.7877	4.3943	0.0000	0.0000	0.0000	0.0000	24.9659	93.8381	175.7262	(98a)
Space heating requirement - total per year (kWh/year)												680.0000	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	161.6672	118.7939	74.8266	25.7877	4.3943	0.0000	0.0000	0.0000	0.0000	24.9659	93.8381	175.7262	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												680.0000	
Space heating per m2											(98c) / (4) =	7.8431	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement													
	161.6672	118.7939	74.8266	25.7877	4.3943	0.0000	0.0000	0.0000	0.0000	24.9659	93.8381	175.7262	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	242.5009	178.1909	112.2399	38.6816	6.5914	0.0000	0.0000	0.0000	0.0000	37.4488	140.7571	263.5893	
Space heating requirement													
	242.5009	178.1909	112.2399	38.6816	6.5914	0.0000	0.0000	0.0000	0.0000	37.4488	140.7571	263.5893	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1019.9999	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												10.2000	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1054.7470	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4342.5746	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1019.9999	6.5500	66.8100	(340a)
Space heating total			66.8100	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			330.1150	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1372.6669	0.1578	42.9133	(367)
Electrical energy for heat distribution (space & water)	10.2000	0.0000	7.4249	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			205.4225	(373)
Space and water heating			205.4225	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			107.5896	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)

Space and Water heating from Heat pump	1372.6669	1.5841	430.8642	(467)
Electrical energy for heat distribution (space & water)	10.2000	0.0000	78.9366	(472)
Overall CO2 factor for heat network			0.4243	(486)
Total CO2 associated with community systems			2183.9134	(473)
Space and water heating			2183.9134	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1540.0782	(483)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.51	**TER**	9.56
Environmental	99 A	**% DER < TER**			84.21
CO_2 Emissions (t/year)	0.11	**DFEE**	17.11	**TFEE**	20.43
Compliance Check	See BREL	**% DFEE < TFEE**			16.27
% DPER < TPER	60.77	**DPER**	19.94	**TPER**	50.84

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers
67.4410 66.4275 64.9507 62.1249 60.0396 57.7140 56.3922 57.8579 59.4646 61.9615 64.8480 67.1826 (42a)
Hot water usage for baths
29.1251 28.6925 28.0834 26.9603 26.1193 25.1868 24.6831 25.2880 25.9466 26.9444 28.0906 29.0266 (42b)
Hot water usage for other uses
41.0293 39.5373 38.0453 36.5534 35.0614 33.5694 33.5694 35.0614 36.5534 38.0453 39.5373 41.0293 (42c)
Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 (56)
If cylinder contains dedicated solar storage
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 (57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
12Total per year (kWh/year)												2752	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.4800	11.2829	0.7600	0.7000	0.7700	31.1149	(81)
Northwest	1.7600	11.2829	0.7600	0.7000	0.7700	7.3212	(81)

Solar gains	38.4361	78.2378	140.9596	231.4961	311.1762	331.7468	310.3423	247.4085	171.7614	95.6128	48.3625	31.3888	(83)
Total gains	623.6086	677.6503	715.1060	786.5301	838.8873	841.7455	801.4341	739.5305	678.4742	618.3659	602.1101	604.9300	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9717	0.9515	0.9088	0.7871	0.6045	0.4214	0.3049	0.3453	0.5582	0.8322	0.9453	0.9762	(86)
MIT	20.4291	20.5571	20.7238	20.9056	20.9829	20.9984	20.9998	20.9996	20.9918	20.8878	20.6397	20.3918	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9664	0.9430	0.8938	0.7594	0.5681	0.3819	0.2630	0.2999	0.5115	0.8023	0.9343	0.9716	(89)
MIT 2	19.7299	19.8886	20.0912	20.2994	20.3787	20.3923	20.3933	20.3932	20.3874	20.2840	19.9927	19.6834	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9486	20.0977	20.2891	20.4890	20.5677	20.5819	20.5830	20.5829	20.5765	20.4729	20.1951	19.9050	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9486	20.0977	20.2891	20.4890	20.5677	20.5819	20.5830	20.5829	20.5765	20.4729	20.1951	19.9050	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9619	0.9383	0.8910	0.7639	0.5787	0.3942	0.2761	0.3141	0.5258	0.8064	0.9302	0.9673	(94)
Useful gains	599.8193	635.8422	637.1499	600.8607	485.4735	331.7987	221.2612	232.3067	356.7218	498.6632	560.0892	585.1482	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	869.4894	844.4335	766.1660	643.9230	492.7202	332.3737	221.3092	232.4146	359.8533	548.5703	727.6045	872.6225	(97)
Space heating kWh													
	200.6346	140.1733	95.9880	31.0049	5.3916	0.0000	0.0000	0.0000	0.0000	37.1309	120.6110	213.8809	(98a)
Space heating requirement - total per year (kWh/year)												844.8152	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	200.6346	140.1733	95.9880	31.0049	5.3916	0.0000	0.0000	0.0000	0.0000	37.1309	120.6110	213.8809	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												844.8152	
Space heating per m2											(98c) / (4) =	9.7441	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	200.6346	140.1733	95.9880	31.0049	5.3916	0.0000	0.0000	0.0000	0.0000	37.1309	120.6110	213.8809	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	300.9519	210.2600	143.9820	46.5073	8.0874	0.0000	0.0000	0.0000	0.0000	55.6964	180.9165	320.8213	
Space heating requirement													
	300.9519	210.2600	143.9820	46.5073	8.0874	0.0000	0.0000	0.0000	0.0000	55.6964	180.9165	320.8213	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1267.2228	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												12.6722	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4686.3236	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1438.5930	0.1575	53.2350	(367)
Electrical energy for heat distribution (space & water)	12.6722	0.0000	7.8120	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			216.1312	(373)
Space and water heating			216.1312	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			130.5564	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.5100	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1438.5930	1.5832	534.9994	(467)
Electrical energy for heat distribution (space & water)	12.6722	0.0000	82.8417	(472)
Overall CO2 factor for heat network			0.4249	(486)
Total CO2 associated with community systems			2291.9536	(473)
Space and water heating			2291.9536	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1729.0103	(483)
Dwelling Primary energy Rate (DPER)			19.9400	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4892			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	13.5400	0.0700	0.9478
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.0900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8787 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.3679 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	63.6543	63.4509	63.2515	62.3151	62.1399	61.3243	61.3243	61.1733	61.6385	62.1399	62.4943	62.8649	(39)
Average = Sum(39)m / 12 =												62.3143	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7342	0.7318	0.7295	0.7187	0.7167	0.7073	0.7073	0.7056	0.7109	0.7167	0.7208	0.7251	(40)
HLP (average)												0.7187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	9.2400	11.2829	0.6300	0.7000	0.7700	31.8615	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	31.8615	64.8550	116.8481	191.8981	257.9487	275.0006	257.2574	205.0886	142.3812	79.2579	40.0900	26.0197	(83)
Total gains	610.6987	657.9322	684.6591	740.5967	779.3244	775.6640	739.0138	687.8753	639.7586	595.6757	587.5022	593.2254	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4565	69.6791	69.8987	70.9491	71.1492	72.0954	72.0954	72.2734	71.7280	71.1492	70.7457	70.3287	
alpha	5.6304	5.6453	5.6599	5.7299	5.7433	5.8064	5.8064	5.8182	5.7819	5.7433	5.7164	5.6886	
util living area	0.9807	0.9686	0.9435	0.8589	0.7018	0.5012	0.3644	0.4077	0.6424	0.8841	0.9627	0.9832	(86)
MIT	20.1966	20.3344	20.5300	20.7951	20.9462	20.9935	20.9991	20.9984	20.9750	20.7920	20.4735	20.1795	(87)
Th 2	20.3107	20.3128	20.3148	20.3243	20.3261	20.3344	20.3344	20.3359	20.3312	20.3261	20.3225	20.3187	(88)
util rest of house	0.9768	0.9624	0.9322	0.8341	0.6606	0.4508	0.3096	0.3495	0.5874	0.8578	0.9542	0.9797	(89)
MIT 2	19.3719	19.5465	19.7910	20.1143	20.2788	20.3300	20.3340	20.3351	20.3126	20.1177	19.7302	19.3566	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.6299	19.7929	20.0221	20.3272	20.4875	20.5375	20.5420	20.5426	20.5198	20.3286	19.9627	19.6140	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6299	19.7929	20.0221	20.3272	20.4875	20.5375	20.5420	20.5426	20.5198	20.3286	19.9627	19.6140	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9720	0.9568	0.9267	0.8342	0.6708	0.4663	0.3268	0.3677	0.6033	0.8579	0.9490	0.9753	(94)
Useful gains	593.6088	629.4808	634.4978	617.8028	522.7489	361.7081	241.4956	252.9363	385.9467	511.0401	557.5108	578.5637	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	975.8144	944.9698	855.2953	712.0891	546.0574	364.1153	241.7432	253.4166	395.7087	604.5344	803.8486	969.0006	(97)
Space heating kWh	284.3609	212.0086	164.2733	67.8861	17.3415	0.0000	0.0000	0.0000	0.0000	69.5598	177.3632	290.4851	(98a)
Space heating requirement - total per year (kWh/year)												1283.2785	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	284.3609	212.0086	164.2733	67.8861	17.3415	0.0000	0.0000	0.0000	0.0000	69.5598	177.3632	290.4851	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1283.2785	
Space heating per m2											(98c) / (4) =	14.8014	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	284.3609	212.0086	164.2733	67.8861	17.3415	0.0000	0.0000	0.0000	0.0000	69.5598	177.3632	290.4851	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	308.0834	229.6951	177.9776	73.5494	18.7882	0.0000	0.0000	0.0000	0.0000	75.3627	192.1595	314.7184	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.5011	84.1181	83.4189	81.9578	80.4898	79.8000	79.8000	79.8000	79.8000	81.9774	83.7070	84.5727	(217)
Fuel for water heating, kWh/month	276.5423	245.5697	263.1372	236.0262	233.2550	212.3443	209.9929	218.2535	220.5242	238.9302	248.2163	273.3945	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1390.3343	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2876.1862	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3719.8258	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1390.3343	0.2100	291.9702	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2876.1862	0.2100	603.9991	(264)
Space and water heating			895.9693	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			829.0676	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.5600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1390.3343	1.1300	1571.0777	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2876.1862	1.1300	3250.0904	(278)
Space and water heating			4821.1681	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4407.3952	(286)
Target Primary Energy Rate (TPER)			50.8400	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.51	**TER**	9.56
Environmental	99 A	**% DER < TER**			84.21
CO_2 Emissions (t/year)	0.11	**DFEE**	17.11	**TFEE**	20.43
Compliance Check	See BREL	**% DFEE < TFEE**			16.27
% DPER < TPER	60.77	**DPER**	19.94	**TPER**	50.84

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2257	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2878	0.2821	0.2765	0.2483	0.2426	0.2144	0.2144	0.2088	0.2257	0.2426	0.2539	0.2652	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5414	0.5398	0.5382	0.5308	0.5294	0.5230	0.5230	0.5218	0.5255	0.5294	0.5322	0.5352	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15916.3300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							183.5794	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9510	37.8383	37.7278	37.2089	37.1118	36.6599	36.6599	36.5762	36.8339	37.1118	37.3082	37.5135	(38)
Heat transfer coeff	58.4658	58.3531	58.2426	57.7237	57.6266	57.1747	57.1747	57.0910	57.3488	57.6266	57.8230	58.0284	(39)
Average = Sum(39)m / 12 =												57.7233	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6743	0.6730	0.6718	0.6658	0.6647	0.6595	0.6595	0.6585	0.6615	0.6647	0.6669	0.6693	(40)
HLP (average)												0.6658	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =					614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.4800	11.2829	0.7600	0.7000	0.7700	31.1149	(81)
Northwest	1.7600	11.2829	0.7600	0.7000	0.7700	7.3212	(81)

Solar gains	38.4361	78.2378	140.9596	231.4961	311.1762	331.7468	310.3423	247.4085	171.7614	95.6128	48.3625	31.3888	(83)
Total gains	516.6645	571.9626	612.3192	690.7385	747.2108	754.4150	717.0745	653.1903	589.7415	524.7848	501.8521	498.9376	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.6203	75.7664	75.9101	76.5925	76.7215	77.3280	77.3280	77.4413	77.0932	76.7215	76.4609	76.1904	
alpha	6.0414	6.0511	6.0607	6.1062	6.1148	6.1552	6.1552	6.1628	6.1395	6.1148	6.0974	6.0794	
util living area	0.9898	0.9800	0.9563	0.8640	0.6879	0.4821	0.3505	0.4012	0.6508	0.9097	0.9780	0.9916	(86)

MIT	20.1826	20.3336	20.5445	20.8209	20.9614	20.9961	20.9995	20.9990	20.9790	20.7851	20.4488	20.1549	(87)
Th 2	20.3635	20.3647	20.3658	20.3712	20.3721	20.3768	20.3768	20.3776	20.3750	20.3721	20.3701	20.3680	(88)
util rest of house	0.9877	0.9758	0.9474	0.8405	0.6487	0.4363	0.3010	0.3473	0.5984	0.8879	0.9727	0.9898	(89)
MIT 2	19.6096	19.7593	19.9657	20.2274	20.3457	20.3748	20.3766	20.3773	20.3627	20.2009	19.8784	19.5859	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.7888	19.9389	20.1467	20.4130	20.5383	20.5691	20.5715	20.5717	20.5555	20.3836	20.0568	19.7639	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7888	19.9389	20.1467	20.4130	20.5383	20.5691	20.5715	20.5717	20.5555	20.3836	20.0568	19.7639	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9852	0.9725	0.9439	0.8422	0.6593	0.4505	0.3165	0.3642	0.6139	0.8883	0.9695	0.9877	(94)
Useful gains	509.0400	556.2577	577.9388	581.7095	492.6678	339.8611	226.9368	237.8666	362.0154	466.1706	486.5682	492.7896	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	905.5673	877.5680	794.8205	664.5755	509.3210	341.2822	227.0677	238.1686	370.2138	563.7967	749.2033	903.1450	(97)
Space heating kWh	295.0163	215.9205	161.3600	59.6635	12.3900	0.0000	0.0000	0.0000	0.0000	72.6339	189.0973	305.3044	(98a)
Space heating requirement - total per year (kWh/year)												1311.3858	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	295.0163	215.9205	161.3600	59.6635	12.3900	0.0000	0.0000	0.0000	0.0000	72.6339	189.0973	305.3044	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1311.3858	
Space heating per m2											(98c) / (4) =	15.1256	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	537.4421	423.0928	433.8916	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9728	0.9891	0.9801	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	522.7993	418.4636	425.2545	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	817.6695	777.0574	705.1508	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	212.3065	266.7938	208.2428	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	53.0766	66.6985	52.0607	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												171.8358	(107)
Energy for space heating												15.1256	(99)
Energy for space cooling												1.9820	(108)
Total												17.1075	(109)
Fabric Energy Efficiency (DFEE)												17.1	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4892			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	13.5400	0.0700	0.9478
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.0900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8787 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.3679 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff													
	63.6543	63.4509	63.2515	62.3151	62.1399	61.3243	61.3243	61.1733	61.6385	62.1399	62.4943	62.8649	(39)
Average = Sum(39)m / 12 =												62.3143	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7342	0.7318	0.7295	0.7187	0.7167	0.7073	0.7073	0.7056	0.7109	0.7167	0.7208	0.7251	(40)
HLP (average)												0.7187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses													
	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												64.3029	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)													
	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.3496	(64a)
Heat gains from water heating, kWh/month													
	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains													
	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	9.2400	11.2829	0.6300	0.7000	0.7700	31.8615	(81)

Solar gains	31.8615	64.8550	116.8481	191.8981	257.9487	275.0006	257.2574	205.0886	142.3812	79.2579	40.0900	26.0197	(83)
Total gains	510.0899	558.5798	588.2077	651.1405	693.9833	697.6688	663.9896	610.8704	560.3613	508.4300	493.5796	493.5684	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4565	69.6791	69.8987	70.9491	71.1492	72.0954	72.0954	72.2734	71.7280	71.1492	70.7457	70.3287	
alpha	5.6304	5.6453	5.6599	5.7299	5.7433	5.8064	5.8064	5.8182	5.7819	5.7433	5.7164	5.6886	
util living area													
	0.9916	0.9847	0.9694	0.9062	0.7641	0.5537	0.4051	0.4579	0.7151	0.9329	0.9826	0.9929	(86)
MIT	20.0354	20.1833	20.3987	20.7150	20.9171	20.9892	20.9985	20.9971	20.9572	20.7010	20.3335	20.0178	(87)
Th 2	20.3107	20.3128	20.3148	20.3243	20.3261	20.3344	20.3344	20.3359	20.3312	20.3261	20.3225	20.3187	(88)
util rest of house													
	0.9898	0.9814	0.9625	0.8866	0.7240	0.4993	0.3444	0.3931	0.6591	0.9145	0.9781	0.9914	(89)
MIT 2	19.4204	19.5684	19.7816	20.0904	20.2677	20.3286	20.3338	20.3348	20.3055	20.0837	19.7257	19.4095	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.6128	19.7607	19.9746	20.2858	20.4709	20.5353	20.5417	20.5419	20.5093	20.2768	19.9159	19.5998	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6128	19.7607	19.9746	20.2858	20.4709	20.5353	20.5417	20.5419	20.5093	20.2768	19.9159	19.5998	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9874	0.9781	0.9585	0.8854	0.7330	0.5159	0.3634	0.4133	0.6746	0.9130	0.9749	0.9893	(94)
Useful gains	503.6575	546.3551	563.8014	576.5015	508.6927	359.9458	241.2890	252.4882	378.0264	464.2031	481.1979	488.2696	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	974.7257	942.9252	852.2911	709.5049	545.0206	363.9752	241.7247	253.3765	395.0623	601.3152	800.9183	968.1064	(97)
Space heating kWh													
	350.4747	266.4951	214.6364	95.7624	27.0279	0.0000	0.0000	0.0000	0.0000	102.0114	230.1986	356.9985	(98a)
Space heating requirement - total per year (kWh/year)												1643.6051	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	350.4747	266.4951	214.6364	95.7624	27.0279	0.0000	0.0000	0.0000	0.0000	102.0114	230.1986	356.9985	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1643.6051	
Space heating per m2											(98c) / (4) =	18.9574	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	576.4484	453.7998	464.9168	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9402	0.9727	0.9565	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	541.9593	441.4055	444.6774	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	751.3428	715.0101	655.6860	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	150.7561	203.5618	156.9904	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	37.6890	50.8905	39.2476	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												127.8271	(107)
Energy for space heating												18.9574	(99)
Energy for space cooling												1.4744	(108)
Total												20.4317	(109)
Fabric Energy Efficiency (TFEE)												20.4	(109)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.51	**TER**	9.56
Environmental	99 A	**% DER < TER**			84.21
CO_2 Emissions (t/year)	0.11	**DFEE**	17.11	**TFEE**	20.43
Compliance Check	See BREL	**% DFEE < TFEE**			16.27
% DPER < TPER	60.77	**DPER**	19.94	**TPER**	50.84

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers
67.4410 66.4275 64.9507 62.1249 60.0396 57.7140 56.3922 57.8579 59.4646 61.9615 64.8480 67.1826 (42a)
Hot water usage for baths
29.1251 28.6925 28.0834 26.9603 26.1193 25.1868 24.6831 25.2880 25.9466 26.9444 28.0906 29.0266 (42b)
Hot water usage for other uses
41.0293 39.5373 38.0453 36.5534 35.0614 33.5694 33.5694 35.0614 36.5534 38.0453 39.5373 41.0293 (42c)
Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 (56)
If cylinder contains dedicated solar storage
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 (57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
12Total per year (kWh/year)												2752	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.4800	11.2829	0.7600	0.7000	0.7700	31.1149	(81)
Northwest	1.7600	11.2829	0.7600	0.7000	0.7700	7.3212	(81)

Solar gains	38.4361	78.2378	140.9596	231.4961	311.1762	331.7468	310.3423	247.4085	171.7614	95.6128	48.3625	31.3888	(83)
Total gains	623.6086	677.6503	715.1060	786.5301	838.8873	841.7455	801.4341	739.5305	678.4742	618.3659	602.1101	604.9300	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9717	0.9515	0.9088	0.7871	0.6045	0.4214	0.3049	0.3453	0.5582	0.8322	0.9453	0.9762	(86)
MIT	20.4291	20.5571	20.7238	20.9056	20.9829	20.9984	20.9998	20.9996	20.9918	20.8878	20.6397	20.3918	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9664	0.9430	0.8938	0.7594	0.5681	0.3819	0.2630	0.2999	0.5115	0.8023	0.9343	0.9716	(89)
MIT 2	19.7299	19.8886	20.0912	20.2994	20.3787	20.3923	20.3933	20.3932	20.3874	20.2840	19.9927	19.6834	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9486	20.0977	20.2891	20.4890	20.5677	20.5819	20.5830	20.5829	20.5765	20.4729	20.1951	19.9050	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9486	20.0977	20.2891	20.4890	20.5677	20.5819	20.5830	20.5829	20.5765	20.4729	20.1951	19.9050	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9619	0.9383	0.8910	0.7639	0.5787	0.3942	0.2761	0.3141	0.5258	0.8064	0.9302	0.9673	(94)
Useful gains	599.8193	635.8422	637.1499	600.8607	485.4735	331.7987	221.2612	232.3067	356.7218	498.6632	560.0892	585.1482	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	869.4894	844.4335	766.1660	643.9230	492.7202	332.3737	221.3092	232.4146	359.8533	548.5703	727.6045	872.6225	(97)
Space heating kWh													
	200.6346	140.1733	95.9880	31.0049	5.3916	0.0000	0.0000	0.0000	0.0000	37.1309	120.6110	213.8809	(98a)
Space heating requirement - total per year (kWh/year)												844.8152	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	200.6346	140.1733	95.9880	31.0049	5.3916	0.0000	0.0000	0.0000	0.0000	37.1309	120.6110	213.8809	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												844.8152	
Space heating per m2											(98c) / (4) =	9.7441	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	200.6346	140.1733	95.9880	31.0049	5.3916	0.0000	0.0000	0.0000	0.0000	37.1309	120.6110	213.8809	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	300.9519	210.2600	143.9820	46.5073	8.0874	0.0000	0.0000	0.0000	0.0000	55.6964	180.9165	320.8213	
Space heating requirement													
	300.9519	210.2600	143.9820	46.5073	8.0874	0.0000	0.0000	0.0000	0.0000	55.6964	180.9165	320.8213	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1267.2228	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												12.6722	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4686.3236	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1438.5930	0.1575	53.2350	(367)
Electrical energy for heat distribution (space & water)	12.6722	0.0000	7.8120	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			216.1312	(373)
Space and water heating			216.1312	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			130.5564	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.5100	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1438.5930	1.5832	534.9994	(467)
Electrical energy for heat distribution (space & water)	12.6722	0.0000	82.8417	(472)
Overall CO2 factor for heat network			0.4249	(486)
Total CO2 associated with community systems			2291.9536	(473)
Space and water heating			2291.9536	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1729.0103	(483)
Dwelling Primary energy Rate (DPER)			19.9400	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4892			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	13.5400	0.0700	0.9478
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.0900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8787 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.3679 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	63.6543	63.4509	63.2515	62.3151	62.1399	61.3243	61.3243	61.1733	61.6385	62.1399	62.4943	62.8649	(39)
Average = Sum(39)m / 12 =												62.3143	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7342	0.7318	0.7295	0.7187	0.7167	0.7073	0.7073	0.7056	0.7109	0.7167	0.7208	0.7251	(40)
HLP (average)												0.7187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	9.2400	11.2829	0.6300	0.7000	0.7700	31.8615	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	31.8615	64.8550	116.8481	191.8981	257.9487	275.0006	257.2574	205.0886	142.3812	79.2579	40.0900	26.0197	(83)
Total gains	610.6987	657.9322	684.6591	740.5967	779.3244	775.6640	739.0138	687.8753	639.7586	595.6757	587.5022	593.2254	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4565	69.6791	69.8987	70.9491	71.1492	72.0954	72.0954	72.2734	71.7280	71.1492	70.7457	70.3287	
alpha	5.6304	5.6453	5.6599	5.7299	5.7433	5.8064	5.8064	5.8182	5.7819	5.7433	5.7164	5.6886	
util living area	0.9807	0.9686	0.9435	0.8589	0.7018	0.5012	0.3644	0.4077	0.6424	0.8841	0.9627	0.9832	(86)
MIT	20.1966	20.3344	20.5300	20.7951	20.9462	20.9935	20.9991	20.9984	20.9750	20.7920	20.4735	20.1795	(87)
Th 2	20.3107	20.3128	20.3148	20.3243	20.3261	20.3344	20.3344	20.3359	20.3312	20.3261	20.3225	20.3187	(88)
util rest of house	0.9768	0.9624	0.9322	0.8341	0.6606	0.4508	0.3096	0.3495	0.5874	0.8578	0.9542	0.9797	(89)
MIT 2	19.3719	19.5465	19.7910	20.1143	20.2788	20.3300	20.3340	20.3351	20.3126	20.1177	19.7302	19.3566	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.6299	19.7929	20.0221	20.3272	20.4875	20.5375	20.5420	20.5426	20.5198	20.3286	19.9627	19.6140	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6299	19.7929	20.0221	20.3272	20.4875	20.5375	20.5420	20.5426	20.5198	20.3286	19.9627	19.6140	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9720	0.9568	0.9267	0.8342	0.6708	0.4663	0.3268	0.3677	0.6033	0.8579	0.9490	0.9753	(94)
Useful gains	593.6088	629.4808	634.4978	617.8028	522.7489	361.7081	241.4956	252.9363	385.9467	511.0401	557.5108	578.5637	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	975.8144	944.9698	855.2953	712.0891	546.0574	364.1153	241.7432	253.4166	395.7087	604.5344	803.8486	969.0006	(97)
Space heating kWh	284.3609	212.0086	164.2733	67.8861	17.3415	0.0000	0.0000	0.0000	0.0000	69.5598	177.3632	290.4851	(98a)
Space heating requirement - total per year (kWh/year)												1283.2785	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	284.3609	212.0086	164.2733	67.8861	17.3415	0.0000	0.0000	0.0000	0.0000	69.5598	177.3632	290.4851	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1283.2785	
Space heating per m2											(98c) / (4) =	14.8014	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	284.3609	212.0086	164.2733	67.8861	17.3415	0.0000	0.0000	0.0000	0.0000	69.5598	177.3632	290.4851	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	308.0834	229.6951	177.9776	73.5494	18.7882	0.0000	0.0000	0.0000	0.0000	75.3627	192.1595	314.7184	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.5011	84.1181	83.4189	81.9578	80.4898	79.8000	79.8000	79.8000	79.8000	81.9774	83.7070	84.5727	(217)
Fuel for water heating, kWh/month	276.5423	245.5697	263.1372	236.0262	233.2550	212.3443	209.9929	218.2535	220.5242	238.9302	248.2163	273.3945	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1390.3343	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2876.1862	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3719.8258	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1390.3343	0.2100	291.9702	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2876.1862	0.2100	603.9991	(264)
Space and water heating			895.9693	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			829.0676	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.5600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1390.3343	1.1300	1571.0777	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2876.1862	1.1300	3250.0904	(278)
Space and water heating			4821.1681	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4407.3952	(286)
Target Primary Energy Rate (TPER)			50.8400	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.51	**TER**	9.56
Environmental	99 A	**% DER < TER**			84.21
CO_2 Emissions (t/year)	0.11	**DFEE**	17.11	**TFEE**	20.43
Compliance Check	See BREL	**% DFEE < TFEE**			16.27
% DPER < TPER	60.77	**DPER**	19.94	**TPER**	50.84

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
									Total per year (kWh/year) = Sum(64)m =			2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.4800	11.2829	0.7600	0.7000	0.7700	31.1149	(81)
Northwest	1.7600	11.2829	0.7600	0.7000	0.7700	7.3212	(81)

Solar gains	38.4361	78.2378	140.9596	231.4961	311.1762	331.7468	310.3423	247.4085	171.7614	95.6128	48.3625	31.3888	(83)
Total gains	678.0599	715.5316	759.2448	814.4498	858.9788	847.8517	807.7907	748.1209	690.6831	646.7939	638.3664	655.1716	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9585	0.9391	0.8873	0.7684	0.5916	0.4184	0.3025	0.3414	0.5490	0.8100	0.9305	0.9654	(86)
MIT	20.5071	20.6053	20.7660	20.9176	20.9848	20.9985	20.9998	20.9997	20.9925	20.9043	20.6838	20.4663	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9513	0.9290	0.8702	0.7401	0.5557	0.3791	0.2609	0.2965	0.5028	0.7787	0.9175	0.9592	(89)
MIT 2	19.8264	19.9470	20.1401	20.3119	20.3804	20.3923	20.3933	20.3932	20.3879	20.3012	20.0453	19.7760	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0393	20.1529	20.3359	20.5013	20.5695	20.5819	20.5830	20.5829	20.5771	20.4898	20.2450	19.9919	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0393	20.1529	20.3359	20.5013	20.5695	20.5819	20.5830	20.5829	20.5771	20.4898	20.2450	19.9919	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9465	0.9245	0.8684	0.7453	0.5662	0.3914	0.2739	0.3105	0.5169	0.7839	0.9139	0.9544	(94)
Useful gains	641.7794	661.5202	659.3443	607.0320	486.3803	331.8244	221.2637	232.3146	357.0339	507.0161	583.4024	625.3256	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	874.5294	847.5034	768.7674	644.6090	492.8166	332.3764	221.3095	232.4155	359.8864	549.5121	730.3816	877.4504	(97)
Space heating kWh													
	173.1660	124.9807	81.4108	27.0554	4.7886	0.0000	0.0000	0.0000	0.0000	31.6170	105.8250	187.5809	(98a)
Space heating requirement - total per year (kWh/year)												736.4246	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	173.1660	124.9807	81.4108	27.0554	4.7886	0.0000	0.0000	0.0000	0.0000	31.6170	105.8250	187.5809	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												736.4246	
Space heating per m2											(98c) / (4) =	8.4939	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	173.1660	124.9807	81.4108	27.0554	4.7886	0.0000	0.0000	0.0000	0.0000	31.6170	105.8250	187.5809	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	259.7490	187.4711	122.1163	40.5832	7.1829	0.0000	0.0000	0.0000	0.0000	47.4255	158.7376	281.3713	
Space heating requirement													
	259.7490	187.4711	122.1163	40.5832	7.1829	0.0000	0.0000	0.0000	0.0000	47.4255	158.7376	281.3713	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1104.6369	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												11.0464	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4523.7377	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1104.6369	4.4400	49.0459	(340a)
Space heating total			49.0459	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			257.6369	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7042 (357)
SAP value		88.5842
SAP rating (Section 12)		89 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1395.2368	0.1576	46.4140	(367)
Electrical energy for heat distribution (space & water)	11.0464	0.0000	7.5562	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			209.0545	(373)
Space and water heating			209.0545	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			123.4796	(383)
CO2 emissions per m2			1.4200	(384)
EI value			98.7436	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			3.0000 (17)
Infiltration rate			0.1500 (18)
Number of sides sheltered			3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7750 (20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)

Average = Sum(39)m / 12 = 55.5633

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss / Combi loss

Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS / PV diverter / Solar input / FGHRS

Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
									Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.4800	13.7758	0.7600	0.7000	0.7700	37.9894	(81)
Northwest	1.7600	13.7758	0.7600	0.7000	0.7700	8.9387	(81)

Solar gains	46.9281	85.4061	152.2932	252.8092	326.2339	372.2643	342.0586	278.9737	195.9553	110.3656	58.2773	38.4694	(83)
Total gains	686.5519	722.6999	770.5784	835.7629	874.0366	888.3692	839.5070	779.6862	714.8770	661.5468	648.2812	662.2521	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9526	0.9316	0.8671	0.7357	0.5530	0.3624	0.2581	0.2921	0.5092	0.7724	0.9175	0.9606	(86)
MIT	20.5439	20.6372	20.8055	20.9375	20.9900	20.9994	20.9999	20.9999	20.9953	20.9306	20.7245	20.5024	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9444	0.9204	0.8476	0.7057	0.5167	0.3246	0.2180	0.2489	0.4638	0.7376	0.9022	0.9536	(89)
MIT 2	19.8720	19.9860	20.1862	20.3328	20.3852	20.3930	20.3933	20.3933	20.3901	20.3287	20.0941	19.8209	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0822	20.1897	20.3799	20.5220	20.5744	20.5827	20.5831	20.5830	20.5794	20.5170	20.2913	20.0341	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0822	20.1897	20.3799	20.5220	20.5744	20.5827	20.5831	20.5830	20.5794	20.5170	20.2913	20.0341	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9397	0.9162	0.8471	0.7122	0.5276	0.3364	0.2305	0.2624	0.4778	0.7450	0.8994	0.9488	(94)
Useful gains	645.1345	662.1383	652.7922	595.2261	461.1788	298.8717	193.5174	204.6092	341.5864	492.8216	583.0775	628.3483	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	860.2399	832.8752	743.4329	623.5289	465.3078	299.0791	193.5317	204.6421	343.3463	523.2387	710.7285	863.1238	(97)
Space heating kWh													
	160.0385	114.7352	67.4367	20.3780	3.0720	0.0000	0.0000	0.0000	0.0000	22.6303	91.9087	174.6730	(98a)
Space heating requirement - total per year (kWh/year)												654.8724	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	160.0385	114.7352	67.4367	20.3780	3.0720	0.0000	0.0000	0.0000	0.0000	22.6303	91.9087	174.6730	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												654.8724	
Space heating per m2											(98c) / (4) =	7.5533	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	160.0385	114.7352	67.4367	20.3780	3.0720	0.0000	0.0000	0.0000	0.0000	22.6303	91.9087	174.6730	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	240.0577	172.1028	101.1550	30.5670	4.6080	0.0000	0.0000	0.0000	0.0000	33.9455	137.8630	262.0095	
Space heating requirement													
	240.0577	172.1028	101.1550	30.5670	4.6080	0.0000	0.0000	0.0000	0.0000	33.9455	137.8630	262.0095	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)

Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year		
Space heating fuel - community heating	982.3086	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4127.5010	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	9.8231	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4304.8833	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	982.3086	6.5500	64.3412	(340a)
Space heating total			64.3412	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			327.6463	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1362.6159	0.1581	41.4036	(367)
Electrical energy for heat distribution (space & water)	9.8231	0.0000	7.3683	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			203.8562	(373)
Space and water heating			203.8562	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			106.0232	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1362.6159	1.5851	415.2189	(467)
Electrical energy for heat distribution (space & water)	9.8231	0.0000	78.3499	(472)
Overall CO2 factor for heat network			0.4242	(486)
Total CO2 associated with community systems			2167.6814	(473)
Space and water heating			2167.6814	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1523.8462	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Southeast

Current energy efficiency rating: B 89
Current environmental impact rating: A 99

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Energy Environmental
Typical annual savings efficiency impact
Recommended measures
(none)
Total Savings £0 0.00 kg/m²

Potential energy efficiency rating: B 89
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£71	£71	£0
Community scheme	£439	£439	£0
Space heating	£178	£178	£0
Water heating	£270	£270	£0
Lighting	£62	£62	£0
Generated (PV)	-£182	-£182	£0
Total cost of fuels	£328	£328	£0
Total cost of uses	£328	£328	£0
Delivered energy	50 kWh/m²	50 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	18 kWh/m²	18 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		1.4928 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5778 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day)	126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.4800	11.2829	0.7600	0.7000	0.7700	31.1149	(81)
Northwest	1.7600	11.2829	0.7600	0.7000	0.7700	7.3212	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	38.4361	78.2378	140.9596	231.4961	311.1762	331.7468	310.3423	247.4085	171.7614	95.6128	48.3625	31.3888	(83)
Total gains	678.0599	715.5316	759.2448	814.4498	858.9788	847.8517	807.7907	748.1209	690.6831	646.7939	638.3664	655.1716	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area	0.9585	0.9391	0.8873	0.7684	0.5916	0.4184	0.3025	0.3414	0.5490	0.8100	0.9305	0.9654	(86)
MIT	20.5071	20.6053	20.7660	20.9176	20.9848	20.9985	20.9998	20.9997	20.9925	20.9043	20.6838	20.4663	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house	0.9513	0.9290	0.8702	0.7401	0.5557	0.3791	0.2609	0.2965	0.5028	0.7787	0.9175	0.9592	(89)
MIT 2	19.8264	19.9470	20.1401	20.3119	20.3804	20.3923	20.3933	20.3932	20.3879	20.3012	20.0453	19.7760	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0393	20.1529	20.3359	20.5013	20.5695	20.5819	20.5830	20.5829	20.5771	20.4898	20.2450	19.9919	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0393	20.1529	20.3359	20.5013	20.5695	20.5819	20.5830	20.5829	20.5771	20.4898	20.2450	19.9919	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9465	0.9245	0.8684	0.7453	0.5662	0.3914	0.2739	0.3105	0.5169	0.7839	0.9139	0.9544	(94)
Useful gains	641.7794	661.5202	659.3443	607.0320	486.3803	331.8244	221.2637	232.3146	357.0339	507.0161	583.4024	625.3256	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	874.5294	847.5034	768.7674	644.6090	492.8166	332.3764	221.3095	232.4155	359.8864	549.5121	730.3816	877.4504	(97)
Space heating kWh	173.1660	124.9807	81.4108	27.0554	4.7886	0.0000	0.0000	0.0000	0.0000	31.6170	105.8250	187.5809	(98a)
Space heating requirement - total per year (kWh/year)												736.4246	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	173.1660	124.9807	81.4108	27.0554	4.7886	0.0000	0.0000	0.0000	0.0000	31.6170	105.8250	187.5809	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												736.4246	
Space heating per m2											(98c) / (4) =	8.4939	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	173.1660	124.9807	81.4108	27.0554	4.7886	0.0000	0.0000	0.0000	0.0000	31.6170	105.8250	187.5809	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	259.7490	187.4711	122.1163	40.5832	7.1829	0.0000	0.0000	0.0000	0.0000	47.4255	158.7376	281.3713	
Space heating requirement													
	259.7490	187.4711	122.1163	40.5832	7.1829	0.0000	0.0000	0.0000	0.0000	47.4255	158.7376	281.3713	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1104.6369	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)

Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	11.0464	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4523.7377	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1104.6369	4.4400	49.0459	(340a)
Space heating total			49.0459	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			257.6369	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.7042	(357)
SAP value	88.5842	
SAP rating (Section 12)	89	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1395.2368	0.1576	46.4140	(367)
Electrical energy for heat distribution (space & water)	11.0464	0.0000	7.5562	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			209.0545	(373)
Space and water heating			209.0545	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			123.4796	(383)
CO2 emissions per m2			1.4200	(384)
EI value			98.7436	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 86.7000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		1.4928 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5778	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.4800	13.7758	0.7600	0.7000	0.7700	37.9894	(81)
Northwest	1.7600	13.7758	0.7600	0.7000	0.7700	8.9387	(81)

Solar gains	46.9281	85.4061	152.2932	252.8092	326.2339	372.2643	342.0586	278.9737	195.9553	110.3656	58.2773	38.4694	(83)
Total gains	686.5519	722.6999	770.5784	835.7629	874.0366	888.3692	839.5070	779.6862	714.8770	661.5468	648.2812	662.2521	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9526	0.9316	0.8671	0.7357	0.5530	0.3624	0.2581	0.2921	0.5092	0.7724	0.9175	0.9606	(86)
MIT	20.5439	20.6372	20.8055	20.9375	20.9900	20.9994	20.9999	20.9999	20.9953	20.9306	20.7245	20.5024	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9444	0.9204	0.8476	0.7057	0.5167	0.3246	0.2180	0.2489	0.4638	0.7376	0.9022	0.9536	(89)
MIT 2	19.8720	19.9860	20.1862	20.3328	20.3852	20.3930	20.3933	20.3933	20.3901	20.3287	20.0941	19.8209	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0822	20.1897	20.3799	20.5220	20.5744	20.5827	20.5831	20.5830	20.5794	20.5170	20.2913	20.0341	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0822	20.1897	20.3799	20.5220	20.5744	20.5827	20.5831	20.5830	20.5794	20.5170	20.2913	20.0341	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9397	0.9162	0.8471	0.7122	0.5276	0.3364	0.2305	0.2624	0.4778	0.7450	0.8994	0.9488	(94)
Useful gains	645.1345	662.1383	652.7922	595.2261	461.1788	298.8717	193.5174	204.6092	341.5864	492.8216	583.0775	628.3483	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	860.2399	832.8752	743.4329	623.5289	465.3078	299.0791	193.5317	204.6421	343.3463	523.2387	710.7285	863.1238	(97)
Space heating kWh													
	160.0385	114.7352	67.4367	20.3780	3.0720	0.0000	0.0000	0.0000	0.0000	22.6303	91.9087	174.6730	(98a)
Space heating requirement - total per year (kWh/year)												654.8724	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	160.0385	114.7352	67.4367	20.3780	3.0720	0.0000	0.0000	0.0000	0.0000	22.6303	91.9087	174.6730	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												654.8724	
Space heating per m2										(98c) / (4) =		7.5533	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement

	160.0385	114.7352	67.4367	20.3780	3.0720	0.0000	0.0000	0.0000	0.0000	22.6303	91.9087	174.6730 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	240.0577	172.1028	101.1550	30.5670	4.6080	0.0000	0.0000	0.0000	0.0000	33.9455	137.8630	262.0095
Space heating requirement												
	240.0577	172.1028	101.1550	30.5670	4.6080	0.0000	0.0000	0.0000	0.0000	33.9455	137.8630	262.0095 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388
Water heating fuel												
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446 (331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year	
Space heating fuel - community heating	982.3086 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	9.8231 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)	
mechanical ventilation fans (SFP = 0.1292)	33.4924 (330a)
Total electricity for the above, kWh/year	33.4924 (331)
Electricity for lighting (calculated in Appendix L)	216.3282 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4304.8833 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	982.3086	6.5500	64.3412	(340a)
Space heating total			64.3412	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			327.6463	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1362.6159	0.1581	41.4036	(367)
Electrical energy for heat distribution (space & water)	9.8231	0.0000	7.3683	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			203.8562	(373)
Space and water heating			203.8562	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			106.0232	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)

Space and Water heating from Heat pump	1362.6159	1.5851	415.2189	(467)
Electrical energy for heat distribution (space & water)	9.8231	0.0000	78.3499	(472)
Overall CO2 factor for heat network			0.4242	(486)
Total CO2 associated with community systems			2167.6814	(473)
Space and water heating			2167.6814	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1523.8462	(483)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.51	**TER**	9.56
Environmental	99 A	**% DER < TER**			84.21
CO_2 Emissions (t/year)	0.11	**DFEE**	17.11	**TFEE**	20.43
Compliance Check	See BREL	**% DFEE < TFEE**			16.27
% DPER < TPER	60.77	**DPER**	19.94	**TPER**	50.84

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers
67.4410 66.4275 64.9507 62.1249 60.0396 57.7140 56.3922 57.8579 59.4646 61.9615 64.8480 67.1826 (42a)
Hot water usage for baths
29.1251 28.6925 28.0834 26.9603 26.1193 25.1868 24.6831 25.2880 25.9466 26.9444 28.0906 29.0266 (42b)
Hot water usage for other uses
41.0293 39.5373 38.0453 36.5534 35.0614 33.5694 33.5694 35.0614 36.5534 38.0453 39.5373 41.0293 (42c)
Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	

Distribution loss (46)m = 0.15 x (45)m
32.6876 28.7625 30.2196 25.7989 24.4779 21.4821 20.7979 21.9548 22.5592 25.8407 28.3104 32.2324 (46)
Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 (56)
If cylinder contains dedicated solar storage
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 (57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month
273.1943 241.6777 256.7410 225.4866 218.4626 196.7075 193.9297 201.6421 203.8882 227.5485 242.2299 270.1592 (62)

WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h
273.1943 241.6777 256.7410 225.4866 218.4626 196.7075 193.9297 201.6421 203.8882 227.5485 242.2299 270.1592 (64)
Total per year (kWh/year) = Sum(64)m = 2751.6674 (64)
12Total per year (kWh/year) 2752 (64)
Electric shower(s)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month
116.6790 103.6989 111.2083 99.9826 98.4807 90.4135 90.3235 92.8879 92.8011 101.5018 105.5497 115.6698 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.4800	11.2829	0.7600	0.7000	0.7700	31.1149	(75)
Northeast	1.7600	11.2829	0.7600	0.7000	0.7700	7.3212	(75)

Solar gains	38.4361	78.2378	140.9596	231.4961	311.1762	331.7468	310.3423	247.4085	171.7614	95.6128	48.3625	31.3888	(83)
Total gains	623.6086	677.6503	715.1060	786.5301	838.8873	841.7455	801.4341	739.5305	678.4742	618.3659	602.1101	604.9300	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9717	0.9515	0.9088	0.7871	0.6045	0.4214	0.3049	0.3453	0.5582	0.8322	0.9453	0.9762	(86)
MIT	20.4291	20.5571	20.7238	20.9056	20.9829	20.9984	20.9998	20.9996	20.9918	20.8878	20.6397	20.3918	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9664	0.9430	0.8938	0.7594	0.5681	0.3819	0.2630	0.2999	0.5115	0.8023	0.9343	0.9716	(89)
MIT 2	19.7299	19.8886	20.0912	20.2994	20.3787	20.3923	20.3933	20.3932	20.3874	20.2840	19.9927	19.6834	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9486	20.0977	20.2891	20.4890	20.5677	20.5819	20.5830	20.5829	20.5765	20.4729	20.1951	19.9050	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9486	20.0977	20.2891	20.4890	20.5677	20.5819	20.5830	20.5829	20.5765	20.4729	20.1951	19.9050	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9619	0.9383	0.8910	0.7639	0.5787	0.3942	0.2761	0.3141	0.5258	0.8064	0.9302	0.9673	(94)
Useful gains	599.8193	635.8422	637.1499	600.8607	485.4735	331.7987	221.2612	232.3067	356.7218	498.6632	560.0892	585.1482	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	869.4894	844.4335	766.1660	643.9230	492.7202	332.3737	221.3092	232.4146	359.8533	548.5703	727.6045	872.6225	(97)
Space heating kWh													
	200.6346	140.1733	95.9880	31.0049	5.3916	0.0000	0.0000	0.0000	0.0000	37.1309	120.6110	213.8809	(98a)
Space heating requirement - total per year (kWh/year)												844.8152	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	200.6346	140.1733	95.9880	31.0049	5.3916	0.0000	0.0000	0.0000	0.0000	37.1309	120.6110	213.8809	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												844.8152	
Space heating per m2											(98c) / (4) =	9.7441	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	200.6346	140.1733	95.9880	31.0049	5.3916	0.0000	0.0000	0.0000	0.0000	37.1309	120.6110	213.8809	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	300.9519	210.2600	143.9820	46.5073	8.0874	0.0000	0.0000	0.0000	0.0000	55.6964	180.9165	320.8213	
Space heating requirement													
	300.9519	210.2600	143.9820	46.5073	8.0874	0.0000	0.0000	0.0000	0.0000	55.6964	180.9165	320.8213	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1267.2228	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												12.6722	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4686.3236	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1438.5930	0.1575	53.2350	(367)
Electrical energy for heat distribution (space & water)	12.6722	0.0000	7.8120	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			216.1312	(373)
Space and water heating			216.1312	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			130.5564	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.5100	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1438.5930	1.5832	534.9994	(467)
Electrical energy for heat distribution (space & water)	12.6722	0.0000	82.8417	(472)
Overall CO2 factor for heat network			0.4249	(486)
Total CO2 associated with community systems			2291.9536	(473)
Space and water heating			2291.9536	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1729.0103	(483)
Dwelling Primary energy Rate (DPER)			19.9400	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4892			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	13.5400	0.0700	0.9478
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.0900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8787 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.3679 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	63.6543	63.4509	63.2515	62.3151	62.1399	61.3243	61.3243	61.1733	61.6385	62.1399	62.4943	62.8649	(39)
Average = Sum(39)m / 12 =												62.3143	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7342	0.7318	0.7295	0.7187	0.7167	0.7073	0.7073	0.7056	0.7109	0.7167	0.7208	0.7251	(40)
HLP (average)												0.7187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.2400	11.2829	0.6300	0.7000	0.7700	31.8615	(75)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	31.8615	64.8550	116.8481	191.8981	257.9487	275.0006	257.2574	205.0886	142.3812	79.2579	40.0900	26.0197	(83)
Total gains	610.6987	657.9322	684.6591	740.5967	779.3244	775.6640	739.0138	687.8753	639.7586	595.6757	587.5022	593.2254	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4565	69.6791	69.8987	70.9491	71.1492	72.0954	72.0954	72.2734	71.7280	71.1492	70.7457	70.3287	
alpha	5.6304	5.6453	5.6599	5.7299	5.7433	5.8064	5.8064	5.8182	5.7819	5.7433	5.7164	5.6886	
util living area	0.9807	0.9686	0.9435	0.8589	0.7018	0.5012	0.3644	0.4077	0.6424	0.8841	0.9627	0.9832	(86)
MIT	20.1966	20.3344	20.5300	20.7951	20.9462	20.9935	20.9991	20.9984	20.9750	20.7920	20.4735	20.1795	(87)
Th 2	20.3107	20.3128	20.3148	20.3243	20.3261	20.3344	20.3344	20.3359	20.3312	20.3261	20.3225	20.3187	(88)
util rest of house	0.9768	0.9624	0.9322	0.8341	0.6606	0.4508	0.3096	0.3495	0.5874	0.8578	0.9542	0.9797	(89)
MIT 2	19.3719	19.5465	19.7910	20.1143	20.2788	20.3300	20.3340	20.3351	20.3126	20.1177	19.7302	19.3566	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.6299	19.7929	20.0221	20.3272	20.4875	20.5375	20.5420	20.5426	20.5198	20.3286	19.9627	19.6140	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6299	19.7929	20.0221	20.3272	20.4875	20.5375	20.5420	20.5426	20.5198	20.3286	19.9627	19.6140	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9720	0.9568	0.9267	0.8342	0.6708	0.4663	0.3268	0.3677	0.6033	0.8579	0.9490	0.9753	(94)
Useful gains	593.6088	629.4808	634.4978	617.8028	522.7489	361.7081	241.4956	252.9363	385.9467	511.0401	557.5108	578.5637	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	975.8144	944.9698	855.2953	712.0891	546.0574	364.1153	241.7432	253.4166	395.7087	604.5344	803.8486	969.0006	(97)
Space heating kWh	284.3609	212.0086	164.2733	67.8861	17.3415	0.0000	0.0000	0.0000	0.0000	69.5598	177.3632	290.4851	(98a)
Space heating requirement - total per year (kWh/year)												1283.2785	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	284.3609	212.0086	164.2733	67.8861	17.3415	0.0000	0.0000	0.0000	0.0000	69.5598	177.3632	290.4851	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1283.2785	
Space heating per m2											(98c) / (4) =	14.8014	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	284.3609	212.0086	164.2733	67.8861	17.3415	0.0000	0.0000	0.0000	0.0000	69.5598	177.3632	290.4851	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	308.0834	229.6951	177.9776	73.5494	18.7882	0.0000	0.0000	0.0000	0.0000	75.3627	192.1595	314.7184	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.5011	84.1181	83.4189	81.9578	80.4898	79.8000	79.8000	79.8000	79.8000	81.9774	83.7070	84.5727	(217)
Fuel for water heating, kWh/month	276.5423	245.5697	263.1372	236.0262	233.2550	212.3443	209.9929	218.2535	220.5242	238.9302	248.2163	273.3945	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1390.3343	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2876.1862	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3719.8258	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1390.3343	0.2100	291.9702	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2876.1862	0.2100	603.9991	(264)
Space and water heating			895.9693	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			829.0676	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.5600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1390.3343	1.1300	1571.0777	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2876.1862	1.1300	3250.0904	(278)
Space and water heating			4821.1681	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4407.3952	(286)
Target Primary Energy Rate (TPER)			50.8400	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.51	**TER**	9.56
Environmental	99 A	**% DER < TER**			84.21
CO_2 Emissions (t/year)	0.11	**DFEE**	17.11	**TFEE**	20.43
Compliance Check	See BREL	**% DFEE < TFEE**			16.27
% DPER < TPER	60.77	**DPER**	19.94	**TPER**	50.84

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		3 * 10 =	30.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1412	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.2912	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2257	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2878	0.2821	0.2765	0.2483	0.2426	0.2144	0.2144	0.2088	0.2257	0.2426	0.2539	0.2652	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5414	0.5398	0.5382	0.5308	0.5294	0.5230	0.5230	0.5218	0.5255	0.5294	0.5322	0.5352	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15916.3300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							183.5794	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9510	37.8383	37.7278	37.2089	37.1118	36.6599	36.6599	36.5762	36.8339	37.1118	37.3082	37.5135	(38)
Heat transfer coeff	58.4658	58.3531	58.2426	57.7237	57.6266	57.1747	57.1747	57.0910	57.3488	57.6266	57.8230	58.0284	(39)
Average = Sum(39)m / 12 =												57.7233	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6743	0.6730	0.6718	0.6658	0.6647	0.6595	0.6595	0.6585	0.6615	0.6647	0.6669	0.6693	(40)
HLP (average)												0.6658	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)											Total = Sum(45)m =	1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =					614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.4800	11.2829	0.7600	0.7000	0.7700	31.1149	(75)
Northeast	1.7600	11.2829	0.7600	0.7000	0.7700	7.3212	(75)

Solar gains	38.4361	78.2378	140.9596	231.4961	311.1762	331.7468	310.3423	247.4085	171.7614	95.6128	48.3625	31.3888	(83)
Total gains	516.6645	571.9626	612.3192	690.7385	747.2108	754.4150	717.0745	653.1903	589.7415	524.7848	501.8521	498.9376	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.6203	75.7664	75.9101	76.5925	76.7215	77.3280	77.3280	77.4413	77.0932	76.7215	76.4609	76.1904	
alpha	6.0414	6.0511	6.0607	6.1062	6.1148	6.1552	6.1552	6.1628	6.1395	6.1148	6.0974	6.0794	
util living area	0.9898	0.9800	0.9563	0.8640	0.6879	0.4821	0.3505	0.4012	0.6508	0.9097	0.9780	0.9916	(86)

MIT	20.1826	20.3336	20.5445	20.8209	20.9614	20.9961	20.9995	20.9990	20.9790	20.7851	20.4488	20.1549	(87)
Th 2	20.3635	20.3647	20.3658	20.3712	20.3721	20.3768	20.3768	20.3776	20.3750	20.3721	20.3701	20.3680	(88)
util rest of house	0.9877	0.9758	0.9474	0.8405	0.6487	0.4363	0.3010	0.3473	0.5984	0.8879	0.9727	0.9898	(89)
MIT 2	19.6096	19.7593	19.9657	20.2274	20.3457	20.3748	20.3766	20.3773	20.3627	20.2009	19.8784	19.5859	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.7888	19.9389	20.1467	20.4130	20.5383	20.5691	20.5715	20.5717	20.5555	20.3836	20.0568	19.7639	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7888	19.9389	20.1467	20.4130	20.5383	20.5691	20.5715	20.5717	20.5555	20.3836	20.0568	19.7639	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9852	0.9725	0.9439	0.8422	0.6593	0.4505	0.3165	0.3642	0.6139	0.8883	0.9695	0.9877	(94)
Useful gains	509.0400	556.2577	577.9388	581.7095	492.6678	339.8611	226.9368	237.8666	362.0154	466.1706	486.5682	492.7896	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	905.5673	877.5680	794.8205	664.5755	509.3210	341.2822	227.0677	238.1686	370.2138	563.7967	749.2033	903.1450	(97)
Space heating kWh	295.0163	215.9205	161.3600	59.6635	12.3900	0.0000	0.0000	0.0000	0.0000	72.6339	189.0973	305.3044	(98a)
Space heating requirement - total per year (kWh/year)												1311.3858	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	295.0163	215.9205	161.3600	59.6635	12.3900	0.0000	0.0000	0.0000	0.0000	72.6339	189.0973	305.3044	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1311.3858	
Space heating per m2											(98c) / (4) =	15.1256	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	537.4421	423.0928	433.8916	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9728	0.9891	0.9801	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	522.7993	418.4636	425.2545	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	817.6695	777.0574	705.1508	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	212.3065	266.7938	208.2428	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	53.0766	66.6985	52.0607	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												171.8358	(107)
Energy for space heating												15.1256	(99)
Energy for space cooling												1.9820	(108)
Total												17.1075	(109)
Fabric Energy Efficiency (DFEE)												17.1	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4892			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	13.5400	0.0700	0.9478
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.0900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8787 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.3679 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff													
	63.6543	63.4509	63.2515	62.3151	62.1399	61.3243	61.3243	61.1733	61.6385	62.1399	62.4943	62.8649	(39)
Average = Sum(39)m / 12 =												62.3143	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7342	0.7318	0.7295	0.7187	0.7167	0.7073	0.7073	0.7056	0.7109	0.7167	0.7208	0.7251	(40)
HLP (average)												0.7187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses													
	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												64.3029	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)													
	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.3496	(64a)
Heat gains from water heating, kWh/month													
	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains													
	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.2400	11.2829	0.6300	0.7000	0.7700	31.8615	(75)

Solar gains	31.8615	64.8550	116.8481	191.8981	257.9487	275.0006	257.2574	205.0886	142.3812	79.2579	40.0900	26.0197	(83)
Total gains	510.0899	558.5798	588.2077	651.1405	693.9833	697.6688	663.9896	610.8704	560.3613	508.4300	493.5796	493.5684	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4565	69.6791	69.8987	70.9491	71.1492	72.0954	72.0954	72.2734	71.7280	71.1492	70.7457	70.3287	
alpha	5.6304	5.6453	5.6599	5.7299	5.7433	5.8064	5.8064	5.8182	5.7819	5.7433	5.7164	5.6886	
util living area													
	0.9916	0.9847	0.9694	0.9062	0.7641	0.5537	0.4051	0.4579	0.7151	0.9329	0.9826	0.9929	(86)
MIT	20.0354	20.1833	20.3987	20.7150	20.9171	20.9892	20.9985	20.9971	20.9572	20.7010	20.3335	20.0178	(87)
Th 2	20.3107	20.3128	20.3148	20.3243	20.3261	20.3344	20.3344	20.3359	20.3312	20.3261	20.3225	20.3187	(88)
util rest of house													
	0.9898	0.9814	0.9625	0.8866	0.7240	0.4993	0.3444	0.3931	0.6591	0.9145	0.9781	0.9914	(89)
MIT 2	19.4204	19.5684	19.7816	20.0904	20.2677	20.3286	20.3338	20.3348	20.3055	20.0837	19.7257	19.4095	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.6128	19.7607	19.9746	20.2858	20.4709	20.5353	20.5417	20.5419	20.5093	20.2768	19.9159	19.5998	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6128	19.7607	19.9746	20.2858	20.4709	20.5353	20.5417	20.5419	20.5093	20.2768	19.9159	19.5998	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9874	0.9781	0.9585	0.8854	0.7330	0.5159	0.3634	0.4133	0.6746	0.9130	0.9749	0.9893	(94)
Useful gains	503.6575	546.3551	563.8014	576.5015	508.6927	359.9458	241.2890	252.4882	378.0264	464.2031	481.1979	488.2696	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	974.7257	942.9252	852.2911	709.5049	545.0206	363.9752	241.7247	253.3765	395.0623	601.3152	800.9183	968.1064	(97)
Space heating kWh													
	350.4747	266.4951	214.6364	95.7624	27.0279	0.0000	0.0000	0.0000	0.0000	102.0114	230.1986	356.9985	(98a)
Space heating requirement - total per year (kWh/year)												1643.6051	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	350.4747	266.4951	214.6364	95.7624	27.0279	0.0000	0.0000	0.0000	0.0000	102.0114	230.1986	356.9985	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1643.6051	
Space heating per m2											(98c) / (4) =	18.9574	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	576.4484	453.7998	464.9168	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9402	0.9727	0.9565	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	541.9593	441.4055	444.6774	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	751.3428	715.0101	655.6860	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	150.7561	203.5618	156.9904	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	37.6890	50.8905	39.2476	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												127.8271	(107)
Energy for space heating												18.9574	(99)
Energy for space cooling												1.4744	(108)
Total												20.4317	(109)
Fabric Energy Efficiency (TFEE)												20.4	(109)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.51	**TER**	9.56
Environmental	99 A	**% DER < TER**			84.21
CO_2 Emissions (t/year)	0.11	**DFEE**	17.11	**TFEE**	20.43
Compliance Check	See BREL	**% DFEE < TFEE**			16.27
% DPER < TPER	60.77	**DPER**	19.94	**TPER**	50.84

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers
67.4410 66.4275 64.9507 62.1249 60.0396 57.7140 56.3922 57.8579 59.4646 61.9615 64.8480 67.1826 (42a)
Hot water usage for baths
29.1251 28.6925 28.0834 26.9603 26.1193 25.1868 24.6831 25.2880 25.9466 26.9444 28.0906 29.0266 (42b)
Hot water usage for other uses
41.0293 39.5373 38.0453 36.5534 35.0614 33.5694 33.5694 35.0614 36.5534 38.0453 39.5373 41.0293 (42c)
Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	

Distribution loss (46)m = 0.15 x (45)m
32.6876 28.7625 30.2196 25.7989 24.4779 21.4821 20.7979 21.9548 22.5592 25.8407 28.3104 32.2324 (46)
Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 (56)
If cylinder contains dedicated solar storage
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 (57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month
273.1943 241.6777 256.7410 225.4866 218.4626 196.7075 193.9297 201.6421 203.8882 227.5485 242.2299 270.1592 (62)

WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h
273.1943 241.6777 256.7410 225.4866 218.4626 196.7075 193.9297 201.6421 203.8882 227.5485 242.2299 270.1592 (64)
Total per year (kWh/year) = Sum(64)m = 2751.6674 (64)
12Total per year (kWh/year) 2752 (64)
Electric shower(s)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month
116.6790 103.6989 111.2083 99.9826 98.4807 90.4135 90.3235 92.8879 92.8011 101.5018 105.5497 115.6698 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.4800	11.2829	0.7600	0.7000	0.7700	31.1149	(75)
Northeast	1.7600	11.2829	0.7600	0.7000	0.7700	7.3212	(75)

Solar gains	38.4361	78.2378	140.9596	231.4961	311.1762	331.7468	310.3423	247.4085	171.7614	95.6128	48.3625	31.3888	(83)
Total gains	623.6086	677.6503	715.1060	786.5301	838.8873	841.7455	801.4341	739.5305	678.4742	618.3659	602.1101	604.9300	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9717	0.9515	0.9088	0.7871	0.6045	0.4214	0.3049	0.3453	0.5582	0.8322	0.9453	0.9762	(86)
MIT	20.4291	20.5571	20.7238	20.9056	20.9829	20.9984	20.9998	20.9996	20.9918	20.8878	20.6397	20.3918	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9664	0.9430	0.8938	0.7594	0.5681	0.3819	0.2630	0.2999	0.5115	0.8023	0.9343	0.9716	(89)
MIT 2	19.7299	19.8886	20.0912	20.2994	20.3787	20.3923	20.3933	20.3932	20.3874	20.2840	19.9927	19.6834	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9486	20.0977	20.2891	20.4890	20.5677	20.5819	20.5830	20.5829	20.5765	20.4729	20.1951	19.9050	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9486	20.0977	20.2891	20.4890	20.5677	20.5819	20.5830	20.5829	20.5765	20.4729	20.1951	19.9050	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9619	0.9383	0.8910	0.7639	0.5787	0.3942	0.2761	0.3141	0.5258	0.8064	0.9302	0.9673	(94)
Useful gains	599.8193	635.8422	637.1499	600.8607	485.4735	331.7987	221.2612	232.3067	356.7218	498.6632	560.0892	585.1482	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	869.4894	844.4335	766.1660	643.9230	492.7202	332.3737	221.3092	232.4146	359.8533	548.5703	727.6045	872.6225	(97)
Space heating kWh													
	200.6346	140.1733	95.9880	31.0049	5.3916	0.0000	0.0000	0.0000	0.0000	37.1309	120.6110	213.8809	(98a)
Space heating requirement - total per year (kWh/year)												844.8152	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	200.6346	140.1733	95.9880	31.0049	5.3916	0.0000	0.0000	0.0000	0.0000	37.1309	120.6110	213.8809	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												844.8152	
Space heating per m2											(98c) / (4) =	9.7441	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	200.6346	140.1733	95.9880	31.0049	5.3916	0.0000	0.0000	0.0000	0.0000	37.1309	120.6110	213.8809	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	300.9519	210.2600	143.9820	46.5073	8.0874	0.0000	0.0000	0.0000	0.0000	55.6964	180.9165	320.8213	
Space heating requirement													
	300.9519	210.2600	143.9820	46.5073	8.0874	0.0000	0.0000	0.0000	0.0000	55.6964	180.9165	320.8213	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1267.2228	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												12.6722	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4686.3236	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1438.5930	0.1575	53.2350	(367)
Electrical energy for heat distribution (space & water)	12.6722	0.0000	7.8120	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			216.1312	(373)
Space and water heating			216.1312	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			130.5564	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.5100	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1438.5930	1.5832	534.9994	(467)
Electrical energy for heat distribution (space & water)	12.6722	0.0000	82.8417	(472)
Overall CO2 factor for heat network			0.4249	(486)
Total CO2 associated with community systems			2291.9536	(473)
Space and water heating			2291.9536	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1729.0103	(483)
Dwelling Primary energy Rate (DPER)			19.9400	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4892			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	13.5400	0.0700	0.9478
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.0900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8787 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.3679 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	63.6543	63.4509	63.2515	62.3151	62.1399	61.3243	61.3243	61.1733	61.6385	62.1399	62.4943	62.8649	(39)
Average = Sum(39)m / 12 =												62.3143	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7342	0.7318	0.7295	0.7187	0.7167	0.7073	0.7073	0.7056	0.7109	0.7167	0.7208	0.7251	(40)
HLP (average)												0.7187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.2400	11.2829	0.6300	0.7000	0.7700	31.8615	(75)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	31.8615	64.8550	116.8481	191.8981	257.9487	275.0006	257.2574	205.0886	142.3812	79.2579	40.0900	26.0197	(83)
Total gains	610.6987	657.9322	684.6591	740.5967	779.3244	775.6640	739.0138	687.8753	639.7586	595.6757	587.5022	593.2254	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4565	69.6791	69.8987	70.9491	71.1492	72.0954	72.0954	72.2734	71.7280	71.1492	70.7457	70.3287	
alpha	5.6304	5.6453	5.6599	5.7299	5.7433	5.8064	5.8064	5.8182	5.7819	5.7433	5.7164	5.6886	
util living area	0.9807	0.9686	0.9435	0.8589	0.7018	0.5012	0.3644	0.4077	0.6424	0.8841	0.9627	0.9832	(86)
MIT	20.1966	20.3344	20.5300	20.7951	20.9462	20.9935	20.9991	20.9984	20.9750	20.7920	20.4735	20.1795	(87)
Th 2	20.3107	20.3128	20.3148	20.3243	20.3261	20.3344	20.3344	20.3359	20.3312	20.3261	20.3225	20.3187	(88)
util rest of house	0.9768	0.9624	0.9322	0.8341	0.6606	0.4508	0.3096	0.3495	0.5874	0.8578	0.9542	0.9797	(89)
MIT 2	19.3719	19.5465	19.7910	20.1143	20.2788	20.3300	20.3340	20.3351	20.3126	20.1177	19.7302	19.3566	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.6299	19.7929	20.0221	20.3272	20.4875	20.5375	20.5420	20.5426	20.5198	20.3286	19.9627	19.6140	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6299	19.7929	20.0221	20.3272	20.4875	20.5375	20.5420	20.5426	20.5198	20.3286	19.9627	19.6140	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9720	0.9568	0.9267	0.8342	0.6708	0.4663	0.3268	0.3677	0.6033	0.8579	0.9490	0.9753	(94)
Useful gains	593.6088	629.4808	634.4978	617.8028	522.7489	361.7081	241.4956	252.9363	385.9467	511.0401	557.5108	578.5637	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	975.8144	944.9698	855.2953	712.0891	546.0574	364.1153	241.7432	253.4166	395.7087	604.5344	803.8486	969.0006	(97)
Space heating kWh	284.3609	212.0086	164.2733	67.8861	17.3415	0.0000	0.0000	0.0000	0.0000	69.5598	177.3632	290.4851	(98a)
Space heating requirement - total per year (kWh/year)												1283.2785	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	284.3609	212.0086	164.2733	67.8861	17.3415	0.0000	0.0000	0.0000	0.0000	69.5598	177.3632	290.4851	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1283.2785	
Space heating per m2											(98c) / (4) =	14.8014	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	284.3609	212.0086	164.2733	67.8861	17.3415	0.0000	0.0000	0.0000	0.0000	69.5598	177.3632	290.4851	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	308.0834	229.6951	177.9776	73.5494	18.7882	0.0000	0.0000	0.0000	0.0000	75.3627	192.1595	314.7184	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.5011	84.1181	83.4189	81.9578	80.4898	79.8000	79.8000	79.8000	79.8000	81.9774	83.7070	84.5727	(217)
Fuel for water heating, kWh/month	276.5423	245.5697	263.1372	236.0262	233.2550	212.3443	209.9929	218.2535	220.5242	238.9302	248.2163	273.3945	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1390.3343	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2876.1862	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3719.8258	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1390.3343	0.2100	291.9702	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2876.1862	0.2100	603.9991	(264)
Space and water heating			895.9693	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			829.0676	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.5600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1390.3343	1.1300	1571.0777	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2876.1862	1.1300	3250.0904	(278)
Space and water heating			4821.1681	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4407.3952	(286)
Target Primary Energy Rate (TPER)			50.8400	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.51	**TER**	9.56
Environmental	99 A	**% DER < TER**			84.21
CO_2 Emissions (t/year)	0.11	**DFEE**	17.11	**TFEE**	20.43
Compliance Check	See BREL	**% DFEE < TFEE**			16.27
% DPER < TPER	60.77	**DPER**	19.94	**TPER**	50.84

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.4800	11.2829	0.7600	0.7000	0.7700	31.1149	(75)
Northeast	1.7600	11.2829	0.7600	0.7000	0.7700	7.3212	(75)

Solar gains	38.4361	78.2378	140.9596	231.4961	311.1762	331.7468	310.3423	247.4085	171.7614	95.6128	48.3625	31.3888	(83)
Total gains	678.0599	715.5316	759.2448	814.4498	858.9788	847.8517	807.7907	748.1209	690.6831	646.7939	638.3664	655.1716	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9585	0.9391	0.8873	0.7684	0.5916	0.4184	0.3025	0.3414	0.5490	0.8100	0.9305	0.9654	(86)
MIT	20.5071	20.6053	20.7660	20.9176	20.9848	20.9985	20.9998	20.9997	20.9925	20.9043	20.6838	20.4663	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9513	0.9290	0.8702	0.7401	0.5557	0.3791	0.2609	0.2965	0.5028	0.7787	0.9175	0.9592	(89)
MIT 2	19.8264	19.9470	20.1401	20.3119	20.3804	20.3923	20.3933	20.3932	20.3879	20.3012	20.0453	19.7760	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0393	20.1529	20.3359	20.5013	20.5695	20.5819	20.5830	20.5829	20.5771	20.4898	20.2450	19.9919	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0393	20.1529	20.3359	20.5013	20.5695	20.5819	20.5830	20.5829	20.5771	20.4898	20.2450	19.9919	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9465	0.9245	0.8684	0.7453	0.5662	0.3914	0.2739	0.3105	0.5169	0.7839	0.9139	0.9544	(94)
Useful gains	641.7794	661.5202	659.3443	607.0320	486.3803	331.8244	221.2637	232.3146	357.0339	507.0161	583.4024	625.3256	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	874.5294	847.5034	768.7674	644.6090	492.8166	332.3764	221.3095	232.4155	359.8864	549.5121	730.3816	877.4504	(97)
Space heating kWh													
	173.1660	124.9807	81.4108	27.0554	4.7886	0.0000	0.0000	0.0000	0.0000	31.6170	105.8250	187.5809	(98a)
Space heating requirement - total per year (kWh/year)												736.4246	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	173.1660	124.9807	81.4108	27.0554	4.7886	0.0000	0.0000	0.0000	0.0000	31.6170	105.8250	187.5809	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												736.4246	
Space heating per m2											(98c) / (4) =	8.4939	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	173.1660	124.9807	81.4108	27.0554	4.7886	0.0000	0.0000	0.0000	0.0000	31.6170	105.8250	187.5809	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	259.7490	187.4711	122.1163	40.5832	7.1829	0.0000	0.0000	0.0000	0.0000	47.4255	158.7376	281.3713	
Space heating requirement													
	259.7490	187.4711	122.1163	40.5832	7.1829	0.0000	0.0000	0.0000	0.0000	47.4255	158.7376	281.3713	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1104.6369	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												11.0464	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4523.7377	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1104.6369	4.4400	49.0459	(340a)
Space heating total			49.0459	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			257.6369	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7042 (357)
SAP value		88.5842
SAP rating (Section 12)		89 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1395.2368	0.1576	46.4140	(367)
Electrical energy for heat distribution (space & water)	11.0464	0.0000	7.5562	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			209.0545	(373)
Space and water heating			209.0545	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			123.4796	(383)
CO2 emissions per m2			1.4200	(384)
EI value			98.7436	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			3.0000 (17)
Infiltration rate			0.1500 (18)
Number of sides sheltered			3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7750 (20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)

Average = Sum(39)m / 12 = 55.5633

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss / Combi loss

Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS / PV diverter / Solar input / FGHRS

Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
									Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.4800	13.7758	0.7600	0.7000	0.7700	37.9894	(75)
Northeast	1.7600	13.7758	0.7600	0.7000	0.7700	8.9387	(75)

Solar gains	46.9281	85.4061	152.2932	252.8092	326.2339	372.2643	342.0586	278.9737	195.9553	110.3656	58.2773	38.4694	(83)
Total gains	686.5519	722.6999	770.5784	835.7629	874.0366	888.3692	839.5070	779.6862	714.8770	661.5468	648.2812	662.2521	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9526	0.9316	0.8671	0.7357	0.5530	0.3624	0.2581	0.2921	0.5092	0.7724	0.9175	0.9606	(86)
MIT	20.5439	20.6372	20.8055	20.9375	20.9900	20.9994	20.9999	20.9999	20.9953	20.9306	20.7245	20.5024	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9444	0.9204	0.8476	0.7057	0.5167	0.3246	0.2180	0.2489	0.4638	0.7376	0.9022	0.9536	(89)
MIT 2	19.8720	19.9860	20.1862	20.3328	20.3852	20.3930	20.3933	20.3933	20.3901	20.3287	20.0941	19.8209	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0822	20.1897	20.3799	20.5220	20.5744	20.5827	20.5831	20.5830	20.5794	20.5170	20.2913	20.0341	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0822	20.1897	20.3799	20.5220	20.5744	20.5827	20.5831	20.5830	20.5794	20.5170	20.2913	20.0341	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9397	0.9162	0.8471	0.7122	0.5276	0.3364	0.2305	0.2624	0.4778	0.7450	0.8994	0.9488	(94)
Useful gains	645.1345	662.1383	652.7922	595.2261	461.1788	298.8717	193.5174	204.6092	341.5864	492.8216	583.0775	628.3483	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	860.2399	832.8752	743.4329	623.5289	465.3078	299.0791	193.5317	204.6421	343.3463	523.2387	710.7285	863.1238	(97)
Space heating kWh													
	160.0385	114.7352	67.4367	20.3780	3.0720	0.0000	0.0000	0.0000	0.0000	22.6303	91.9087	174.6730	(98a)
Space heating requirement - total per year (kWh/year)												654.8724	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	160.0385	114.7352	67.4367	20.3780	3.0720	0.0000	0.0000	0.0000	0.0000	22.6303	91.9087	174.6730	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												654.8724	
Space heating per m2											(98c) / (4) =	7.5533	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	160.0385	114.7352	67.4367	20.3780	3.0720	0.0000	0.0000	0.0000	0.0000	22.6303	91.9087	174.6730	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	240.0577	172.1028	101.1550	30.5670	4.6080	0.0000	0.0000	0.0000	0.0000	33.9455	137.8630	262.0095	
Space heating requirement													
	240.0577	172.1028	101.1550	30.5670	4.6080	0.0000	0.0000	0.0000	0.0000	33.9455	137.8630	262.0095	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)

Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year		
Space heating fuel - community heating	982.3086	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4127.5010	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	9.8231	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4304.8833	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	982.3086	6.5500	64.3412	(340a)
Space heating total			64.3412	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			327.6463	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1362.6159	0.1581	41.4036	(367)
Electrical energy for heat distribution (space & water)	9.8231	0.0000	7.3683	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			203.8562	(373)
Space and water heating			203.8562	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			106.0232	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1362.6159	1.5851	415.2189	(467)
Electrical energy for heat distribution (space & water)	9.8231	0.0000	78.3499	(472)
Overall CO2 factor for heat network			0.4242	(486)
Total CO2 associated with community systems			2167.6814	(473)
Space and water heating			2167.6814	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1523.8462	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Southwest

Current energy efficiency rating: B 89
Current environmental impact rating: A 99

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 89
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£71	£71	£0
Community scheme	£439	£439	£0
Space heating	£178	£178	£0
Water heating	£270	£270	£0
Lighting	£62	£62	£0
Generated (PV)	-£182	-£182	£0
Total cost of fuels	£328	£328	£0
Total cost of uses	£328	£328	£0
Delivered energy	50 kWh/m²	50 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	18 kWh/m²	18 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		1.4928 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5778 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day)	126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.4800	11.2829	0.7600	0.7000	0.7700	31.1149	(75)
Northeast	1.7600	11.2829	0.7600	0.7000	0.7700	7.3212	(75)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	38.4361	78.2378	140.9596	231.4961	311.1762	331.7468	310.3423	247.4085	171.7614	95.6128	48.3625	31.3888	(83)
Total gains	678.0599	715.5316	759.2448	814.4498	858.9788	847.8517	807.7907	748.1209	690.6831	646.7939	638.3664	655.1716	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9585	0.9391	0.8873	0.7684	0.5916	0.4184	0.3025	0.3414	0.5490	0.8100	0.9305	0.9654	(86)
MIT	20.5071	20.6053	20.7660	20.9176	20.9848	20.9985	20.9998	20.9997	20.9925	20.9043	20.6838	20.4663	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9513	0.9290	0.8702	0.7401	0.5557	0.3791	0.2609	0.2965	0.5028	0.7787	0.9175	0.9592	(89)
MIT 2	19.8264	19.9470	20.1401	20.3119	20.3804	20.3923	20.3933	20.3932	20.3879	20.3012	20.0453	19.7760	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0393	20.1529	20.3359	20.5013	20.5695	20.5819	20.5830	20.5829	20.5771	20.4898	20.2450	19.9919	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0393	20.1529	20.3359	20.5013	20.5695	20.5819	20.5830	20.5829	20.5771	20.4898	20.2450	19.9919	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9465	0.9245	0.8684	0.7453	0.5662	0.3914	0.2739	0.3105	0.5169	0.7839	0.9139	0.9544	(94)
Useful gains	641.7794	661.5202	659.3443	607.0320	486.3803	331.8244	221.2637	232.3146	357.0339	507.0161	583.4024	625.3256	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	874.5294	847.5034	768.7674	644.6090	492.8166	332.3764	221.3095	232.4155	359.8864	549.5121	730.3816	877.4504	(97)
Space heating kWh													
	173.1660	124.9807	81.4108	27.0554	4.7886	0.0000	0.0000	0.0000	0.0000	31.6170	105.8250	187.5809	(98a)
Space heating requirement - total per year (kWh/year)												736.4246	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	173.1660	124.9807	81.4108	27.0554	4.7886	0.0000	0.0000	0.0000	0.0000	31.6170	105.8250	187.5809	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												736.4246	
Space heating per m2											(98c) / (4) =	8.4939	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	173.1660	124.9807	81.4108	27.0554	4.7886	0.0000	0.0000	0.0000	0.0000	31.6170	105.8250	187.5809	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	259.7490	187.4711	122.1163	40.5832	7.1829	0.0000	0.0000	0.0000	0.0000	47.4255	158.7376	281.3713	
Space heating requirement													
	259.7490	187.4711	122.1163	40.5832	7.1829	0.0000	0.0000	0.0000	0.0000	47.4255	158.7376	281.3713	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1104.6369	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)

Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	11.0464	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4523.7377	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1104.6369	4.4400	49.0459	(340a)
Space heating total			49.0459	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			257.6369	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.7042	(357)
SAP value	88.5842	
SAP rating (Section 12)	89	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1395.2368	0.1576	46.4140	(367)
Electrical energy for heat distribution (space & water)	11.0464	0.0000	7.5562	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			209.0545	(373)
Space and water heating			209.0545	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			123.4796	(383)
CO2 emissions per m2			1.4200	(384)
EI value			98.7436	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 86.7000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		1.4928 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5778	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.4800	13.7758	0.7600	0.7000	0.7700	37.9894	(75)
Northeast	1.7600	13.7758	0.7600	0.7000	0.7700	8.9387	(75)

Solar gains	46.9281	85.4061	152.2932	252.8092	326.2339	372.2643	342.0586	278.9737	195.9553	110.3656	58.2773	38.4694	(83)
Total gains	686.5519	722.6999	770.5784	835.7629	874.0366	888.3692	839.5070	779.6862	714.8770	661.5468	648.2812	662.2521	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9526	0.9316	0.8671	0.7357	0.5530	0.3624	0.2581	0.2921	0.5092	0.7724	0.9175	0.9606	(86)
MIT	20.5439	20.6372	20.8055	20.9375	20.9900	20.9994	20.9999	20.9999	20.9953	20.9306	20.7245	20.5024	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9444	0.9204	0.8476	0.7057	0.5167	0.3246	0.2180	0.2489	0.4638	0.7376	0.9022	0.9536	(89)
MIT 2	19.8720	19.9860	20.1862	20.3328	20.3852	20.3930	20.3933	20.3933	20.3901	20.3287	20.0941	19.8209	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0822	20.1897	20.3799	20.5220	20.5744	20.5827	20.5831	20.5830	20.5794	20.5170	20.2913	20.0341	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0822	20.1897	20.3799	20.5220	20.5744	20.5827	20.5831	20.5830	20.5794	20.5170	20.2913	20.0341	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9397	0.9162	0.8471	0.7122	0.5276	0.3364	0.2305	0.2624	0.4778	0.7450	0.8994	0.9488	(94)
Useful gains	645.1345	662.1383	652.7922	595.2261	461.1788	298.8717	193.5174	204.6092	341.5864	492.8216	583.0775	628.3483	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	860.2399	832.8752	743.4329	623.5289	465.3078	299.0791	193.5317	204.6421	343.3463	523.2387	710.7285	863.1238	(97)
Space heating kWh													
	160.0385	114.7352	67.4367	20.3780	3.0720	0.0000	0.0000	0.0000	0.0000	22.6303	91.9087	174.6730	(98a)
Space heating requirement - total per year (kWh/year)												654.8724	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	160.0385	114.7352	67.4367	20.3780	3.0720	0.0000	0.0000	0.0000	0.0000	22.6303	91.9087	174.6730	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												654.8724	
Space heating per m2										(98c) / (4) =		7.5533	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement

	160.0385	114.7352	67.4367	20.3780	3.0720	0.0000	0.0000	0.0000	0.0000	22.6303	91.9087	174.6730 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	240.0577	172.1028	101.1550	30.5670	4.6080	0.0000	0.0000	0.0000	0.0000	33.9455	137.8630	262.0095
Space heating requirement												
	240.0577	172.1028	101.1550	30.5670	4.6080	0.0000	0.0000	0.0000	0.0000	33.9455	137.8630	262.0095 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388
Water heating fuel												
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446 (331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year	
Space heating fuel - community heating	982.3086 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	9.8231 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)	
mechanical ventilation fans (SFP = 0.1292)	33.4924 (330a)
Total electricity for the above, kWh/year	33.4924 (331)
Electricity for lighting (calculated in Appendix L)	216.3282 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4304.8833 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	982.3086	6.5500	64.3412	(340a)
Space heating total			64.3412	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			327.6463	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1362.6159	0.1581	41.4036	(367)
Electrical energy for heat distribution (space & water)	9.8231	0.0000	7.3683	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			203.8562	(373)
Space and water heating			203.8562	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			106.0232	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)

Space and Water heating from Heat pump	1362.6159	1.5851	415.2189	(467)
Electrical energy for heat distribution (space & water)	9.8231	0.0000	78.3499	(472)
Overall CO2 factor for heat network			0.4242	(486)
Total CO2 associated with community systems			2167.6814	(473)
Space and water heating			2167.6814	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1523.8462	(483)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.43	**TER**	9.27
Environmental	99 A	**% DER < TER**			84.57
CO_2 Emissions (t/year)	0.1	**DFEE**	15.84	**TFEE**	19.14
Compliance Check	See BREL	**% DFEE < TFEE**			17.26
% DPER < TPER	61.17	**DPER**	19.13	**TPER**	49.26

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers
67.4410 66.4275 64.9507 62.1249 60.0396 57.7140 56.3922 57.8579 59.4646 61.9615 64.8480 67.1826 (42a)
Hot water usage for baths
29.1251 28.6925 28.0834 26.9603 26.1193 25.1868 24.6831 25.2880 25.9466 26.9444 28.0906 29.0266 (42b)
Hot water usage for other uses
41.0293 39.5373 38.0453 36.5534 35.0614 33.5694 33.5694 35.0614 36.5534 38.0453 39.5373 41.0293 (42c)
Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	

Distribution loss (46)m = 0.15 x (45)m
32.6876 28.7625 30.2196 25.7989 24.4779 21.4821 20.7979 21.9548 22.5592 25.8407 28.3104 32.2324 (46)
Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 (56)
If cylinder contains dedicated solar storage
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 (57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
12Total per year (kWh/year)												2752	(64)

Electric shower(s)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month
116.6790 103.6989 111.2083 99.9826 98.4807 90.4135 90.3235 92.8879 92.8011 101.5018 105.5497 115.6698 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(76)
East	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(76)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	652.0784	730.2946	789.6905	869.3922	912.9689	904.3786	866.5575	814.6416	757.3995	678.0557	637.1713	628.5612	(84)

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7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area	0.9652	0.9339	0.8716	0.7324	0.5591	0.3925	0.2821	0.3136	0.5027	0.7855	0.9310	0.9714	(86)
MIT	20.4706	20.6231	20.7918	20.9369	20.9888	20.9989	20.9999	20.9998	20.9954	20.9198	20.6824	20.4275	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house	0.9589	0.9231	0.8531	0.7034	0.5245	0.3556	0.2432	0.2723	0.4598	0.7530	0.9180	0.9661	(89)
MIT 2	19.7815	19.9685	20.1697	20.3317	20.3839	20.3927	20.3933	20.3933	20.3901	20.3170	20.0437	19.7278	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9970	20.1732	20.3643	20.5210	20.5731	20.5823	20.5830	20.5830	20.5794	20.5055	20.2435	19.9467	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9970	20.1732	20.3643	20.5210	20.5731	20.5823	20.5830	20.5830	20.5794	20.5055	20.2435	19.9467	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9542	0.9188	0.8522	0.7096	0.5349	0.3671	0.2554	0.2852	0.4730	0.7593	0.9145	0.9616	(94)
Useful gains	622.2063	670.9826	672.9501	616.9622	488.3069	332.0142	221.2813	232.3592	358.2729	514.8198	582.6685	604.4037	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	872.1794	848.6313	770.3487	645.7029	493.0207	332.3965	221.3114	232.4203	360.0175	550.3839	730.2945	874.9365	(97)
Space heating kWh	185.9800	119.3799	72.4646	20.6933	3.5071	0.0000	0.0000	0.0000	0.0000	26.4597	106.2907	201.2764	(98a)
Space heating requirement - total per year (kWh/year)												736.0516	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	185.9800	119.3799	72.4646	20.6933	3.5071	0.0000	0.0000	0.0000	0.0000	26.4597	106.2907	201.2764	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												736.0516	
Space heating per m2											(98c) / (4) =	8.4896	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	185.9800	119.3799	72.4646	20.6933	3.5071	0.0000	0.0000	0.0000	0.0000	26.4597	106.2907	201.2764	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	278.9699	179.0698	108.6969	31.0400	5.2606	0.0000	0.0000	0.0000	0.0000	39.6896	159.4361	301.9146	
Space heating requirement	278.9699	179.0698	108.6969	31.0400	5.2606	0.0000	0.0000	0.0000	0.0000	39.6896	159.4361	301.9146	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1104.0774	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												11.0408	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4523.1782	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1395.0876	0.1581	46.5525	(367)
Electrical energy for heat distribution (space & water)	11.0408	0.0000	7.5614	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			209.1981	(373)
Space and water heating			209.1981	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			123.6233	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.4300	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1395.0876	1.5853	466.7424	(467)
Electrical energy for heat distribution (space & water)	11.0408	0.0000	80.2821	(472)
Overall CO2 factor for heat network			0.4246	(486)
Total CO2 associated with community systems			2221.1370	(473)
Space and water heating			2221.1370	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1658.1937	(483)
Dwelling Primary energy Rate (DPER)			19.1300	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4892			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	13.5400	0.0700	0.9478
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.0900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8787 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.3679 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	63.6543	63.4509	63.2515	62.3151	62.1399	61.3243	61.3243	61.1733	61.6385	62.1399	62.4943	62.8649	(39)
Average = Sum(39)m / 12 =												62.3143	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7342	0.7318	0.7295	0.7187	0.7167	0.7073	0.7073	0.7056	0.7109	0.7167	0.7208	0.7251	(40)
HLP (average)												0.7187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(76)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)
Total gains	634.2986	701.5715	746.4857	809.2850	840.7342	827.5835	792.9978	750.1384	705.1835	645.1554	616.5661	612.8145	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4565	69.6791	69.8987	70.9491	71.1492	72.0954	72.0954	72.2734	71.7280	71.1492	70.7457	70.3287	
alpha	5.6304	5.6453	5.6599	5.7299	5.7433	5.8064	5.8064	5.8182	5.7819	5.7433	5.7164	5.6886	
util living area	0.9772	0.9591	0.9222	0.8197	0.6603	0.4709	0.3398	0.3743	0.5898	0.8524	0.9546	0.9805	(86)
MIT	20.2328	20.3960	20.6036	20.8425	20.9604	20.9952	20.9994	20.9990	20.9837	20.8325	20.5134	20.2101	(87)
Th 2	20.3107	20.3128	20.3148	20.3243	20.3261	20.3344	20.3344	20.3359	20.3312	20.3261	20.3225	20.3187	(88)
util rest of house	0.9727	0.9513	0.9080	0.7918	0.6193	0.4232	0.2886	0.3207	0.5371	0.8225	0.9447	0.9766	(89)
MIT 2	19.4173	19.6225	19.8789	20.1658	20.2918	20.3312	20.3341	20.3354	20.3193	20.1616	19.7789	19.3951	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.6724	19.8645	20.1056	20.3774	20.5009	20.5389	20.5422	20.5430	20.5271	20.3715	20.0086	19.6500	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6724	19.8645	20.1056	20.3774	20.5009	20.5389	20.5422	20.5430	20.5271	20.3715	20.0086	19.6500	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9675	0.9454	0.9032	0.7941	0.6301	0.4380	0.3046	0.3375	0.5528	0.8247	0.9393	0.9718	(94)
Useful gains	613.7056	663.2556	674.2084	642.6879	529.7738	362.4578	241.5837	253.1356	389.8443	532.0560	579.1531	595.5527	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	978.5208	949.5103	860.5766	715.2179	546.8866	364.2008	241.7535	253.4398	396.1594	607.1981	806.7171	971.2628	(97)
Space heating kWh	271.4225	192.3632	138.6579	52.2216	12.7319	0.0000	0.0000	0.0000	0.0000	55.9057	163.8461	279.5283	(98a)
Space heating requirement - total per year (kWh/year)												1166.6772	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	271.4225	192.3632	138.6579	52.2216	12.7319	0.0000	0.0000	0.0000	0.0000	55.9057	163.8461	279.5283	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1166.6772	
Space heating per m2											(98c) / (4) =	13.4565	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	271.4225	192.3632	138.6579	52.2216	12.7319	0.0000	0.0000	0.0000	0.0000	55.9057	163.8461	279.5283	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	294.0655	208.4108	150.2252	56.5781	13.7941	0.0000	0.0000	0.0000	0.0000	60.5695	177.5147	302.8476	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.3964	83.9003	83.0590	81.5571	80.3170	79.8000	79.8000	79.8000	79.8000	81.6372	83.5327	84.4864	(217)
Fuel for water heating, kWh/month	276.8852	246.2073	264.2776	237.1858	233.7569	212.3443	209.9929	218.2535	220.5242	239.9258	248.7341	273.6737	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1264.0056	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2881.7612	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3599.0721	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1264.0056	0.2100	265.4412	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2881.7612	0.2100	605.1699	(264)
Space and water heating			870.6110	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			803.7093	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.2700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1264.0056	1.1300	1428.3263	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2881.7612	1.1300	3256.3902	(278)
Space and water heating			4684.7165	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4270.9436	(286)
Target Primary Energy Rate (TPER)			49.2600	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.43	**TER**	9.27
Environmental	99 A	**% DER < TER**			84.57
CO_2 Emissions (t/year)	0.1	**DFEE**	15.84	**TFEE**	19.14
Compliance Check	See BREL	**% DFEE < TFEE**			17.26
% DPER < TPER	61.17	**DPER**	19.13	**TPER**	49.26

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		3 * 10 =	30.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1412	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.2912	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2257	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2878	0.2821	0.2765	0.2483	0.2426	0.2144	0.2144	0.2088	0.2257	0.2426	0.2539	0.2652	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5414	0.5398	0.5382	0.5308	0.5294	0.5230	0.5230	0.5218	0.5255	0.5294	0.5322	0.5352	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15916.3300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							183.5794	(35)

Thermal bridges (User defined value 0.030 * total exposed area)												1.4928	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	20.5148	(37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9510	37.8383	37.7278	37.2089	37.1118	36.6599	36.6599	36.5762	36.8339	37.1118	37.3082	37.5135	(38)
Heat transfer coeff	58.4658	58.3531	58.2426	57.7237	57.6266	57.1747	57.1747	57.0910	57.3488	57.6266	57.8230	58.0284	(39)
Average = Sum(39)m / 12 =												57.7233	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6743	0.6730	0.6718	0.6658	0.6647	0.6595	0.6595	0.6585	0.6615	0.6647	0.6669	0.6693	(40)
HLP (average)												0.6658	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778	(42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses													
	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												64.3029	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)											Total = Sum(45)m =	1067.9337	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
											Total per year (kWh/year) = Sum(64)m =	907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)													
	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												614.3496	(64a)
Heat gains from water heating, kWh/month													
	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains													
	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(76)
East	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(76)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	545.1343	624.6069	686.9038	773.6007	821.2924	817.0482	782.1979	728.3014	668.6668	584.4747	536.9133	522.5689	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.6203	75.7664	75.9101	76.5925	76.7215	77.3280	77.3280	77.4413	77.0932	76.7215	76.4609	76.1904	
alpha	6.0414	6.0511	6.0607	6.1062	6.1148	6.1552	6.1552	6.1628	6.1395	6.1148	6.0974	6.0794	
util living area													
	0.9867	0.9700	0.9305	0.8118	0.6350	0.4461	0.3214	0.3602	0.5819	0.8700	0.9699	0.9894	(86)

MIT	20.2292	20.4133	20.6387	20.8759	20.9747	20.9975	20.9997	20.9994	20.9884	20.8399	20.5016	20.1941	(87)
Th 2	20.3635	20.3647	20.3658	20.3712	20.3721	20.3768	20.3768	20.3776	20.3750	20.3721	20.3701	20.3680	(88)
util rest of house	0.9840	0.9641	0.9177	0.7846	0.5967	0.4033	0.2760	0.3116	0.5326	0.8430	0.9630	0.9872	(89)
MIT 2	19.6555	19.8367	20.0541	20.2740	20.3551	20.3755	20.3767	20.3774	20.3684	20.2480	19.9294	19.6246	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.8349	20.0171	20.2370	20.4623	20.5489	20.5700	20.5716	20.5720	20.5623	20.4332	20.1083	19.8027	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8349	20.0171	20.2370	20.4623	20.5489	20.5700	20.5716	20.5720	20.5623	20.4332	20.1083	19.8027	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9812	0.9604	0.9149	0.7888	0.6077	0.4166	0.2902	0.3268	0.5476	0.8458	0.9597	0.9847	(94)
Useful gains	534.8770	599.8596	628.4294	610.1828	499.0816	340.4100	226.9938	238.0202	366.1294	494.3458	515.2661	514.5863	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	908.2631	882.1289	800.0787	667.4170	509.9331	341.3344	227.0735	238.1838	370.6058	566.6520	752.1823	905.4017	(97)
Space heating kWh	277.7993	189.6850	127.7071	41.2086	8.0736	0.0000	0.0000	0.0000	0.0000	53.7958	170.5796	290.7667	(98a)
Space heating requirement - total per year (kWh/year)												1159.6156	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	277.7993	189.6850	127.7071	41.2086	8.0736	0.0000	0.0000	0.0000	0.0000	53.7958	170.5796	290.7667	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1159.6156	
Space heating per m2											(98c) / (4) =	13.3750	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	537.4421	423.0928	433.8916	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9818	0.9932	0.9888	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	527.6770	420.2290	429.0462	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	890.8770	853.1757	792.9430	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	261.5040	322.1124	270.7392	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	65.3760	80.5281	67.6848	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												213.5889	(107)
Energy for space heating												13.3750	(99)
Energy for space cooling												2.4635	(108)
Total												15.8386	(109)
Fabric Energy Efficiency (DFEE)												15.8	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4892			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	13.5400	0.0700	0.9478
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.0900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8787 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.3679 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff													
	63.6543	63.4509	63.2515	62.3151	62.1399	61.3243	61.3243	61.1733	61.6385	62.1399	62.4943	62.8649	(39)
Average = Sum(39)m / 12 =												62.3143	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7342	0.7318	0.7295	0.7187	0.7167	0.7073	0.7073	0.7056	0.7109	0.7167	0.7208	0.7251	(40)
HLP (average)												0.7187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses													
	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												64.3029	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)													
	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.3496	(64a)
Heat gains from water heating, kWh/month													
	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains													
	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(76)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)
Total gains	533.6898	602.2192	650.0344	719.8289	755.3931	749.5884	717.9735	673.1335	625.7862	557.9097	522.6435	513.1575	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4565	69.6791	69.8987	70.9491	71.1492	72.0954	72.0954	72.2734	71.7280	71.1492	70.7457	70.3287	
alpha	5.6304	5.6453	5.6599	5.7299	5.7433	5.8064	5.8064	5.8182	5.7819	5.7433	5.7164	5.6886	
util living area													
	0.9896	0.9786	0.9538	0.8704	0.7188	0.5177	0.3750	0.4165	0.6545	0.9066	0.9774	0.9915	(86)
MIT	20.0741	20.2513	20.4850	20.7785	20.9393	20.9923	20.9990	20.9982	20.9726	20.7557	20.3784	20.0503	(87)
Th 2	20.3107	20.3128	20.3148	20.3243	20.3261	20.3344	20.3344	20.3359	20.3312	20.3261	20.3225	20.3187	(88)
util rest of house													
	0.9874	0.9741	0.9442	0.8467	0.6777	0.4660	0.3187	0.3571	0.5991	0.8835	0.9719	0.9896	(89)
MIT 2	19.4587	19.6349	19.8641	20.1462	20.2842	20.3303	20.3340	20.3352	20.3152	20.1323	19.7695	19.4416	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.6512	19.8277	20.0584	20.3440	20.4891	20.5374	20.5420	20.5426	20.5209	20.3273	19.9600	19.6320	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6512	19.8277	20.0584	20.3440	20.4891	20.5374	20.5420	20.5426	20.5209	20.3273	19.9600	19.6320	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9847	0.9703	0.9401	0.8474	0.6880	0.4819	0.3363	0.3757	0.6152	0.8836	0.9684	0.9872	(94)
Useful gains	525.5027	584.3230	611.1006	609.9856	519.7004	361.2573	241.4534	252.8791	385.0027	492.9554	506.1062	506.6090	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	977.1671	947.1780	857.5870	713.1345	546.1555	364.1068	241.7420	253.4171	395.7713	604.4537	803.6748	970.1324	(97)
Space heating kWh													
	336.0384	243.8386	183.3859	74.2672	19.6826	0.0000	0.0000	0.0000	0.0000	82.9548	214.2494	344.8614	(98a)
Space heating requirement - total per year (kWh/year)												1499.2782	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	336.0384	243.8386	183.3859	74.2672	19.6826	0.0000	0.0000	0.0000	0.0000	82.9548	214.2494	344.8614	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1499.2782	
Space heating per m2											(98c) / (4) =	17.2927	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	576.4484	453.7998	464.9168	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9561	0.9813	0.9722	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	551.1187	445.3221	451.9778	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	812.0280	778.1082	728.4611	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	187.8547	247.5929	205.7036	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	46.9637	61.8982	51.4259	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												160.2878	(107)
Energy for space heating												17.2927	(99)
Energy for space cooling												1.8488	(108)
Total												19.1415	(109)
Fabric Energy Efficiency (TFEE)												19.1	(109)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.43	**TER**	9.27
Environmental	99 A	**% DER < TER**			84.57
CO_2 Emissions (t/year)	0.1	**DFEE**	15.84	**TFEE**	19.14
Compliance Check	See BREL	**% DFEE < TFEE**			17.26
% DPER < TPER	61.17	**DPER**	19.13	**TPER**	49.26

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers
67.4410 66.4275 64.9507 62.1249 60.0396 57.7140 56.3922 57.8579 59.4646 61.9615 64.8480 67.1826 (42a)
Hot water usage for baths
29.1251 28.6925 28.0834 26.9603 26.1193 25.1868 24.6831 25.2880 25.9466 26.9444 28.0906 29.0266 (42b)
Hot water usage for other uses
41.0293 39.5373 38.0453 36.5534 35.0614 33.5694 33.5694 35.0614 36.5534 38.0453 39.5373 41.0293 (42c)
Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	

Distribution loss (46)m = 0.15 x (45)m
32.6876 28.7625 30.2196 25.7989 24.4779 21.4821 20.7979 21.9548 22.5592 25.8407 28.3104 32.2324 (46)
Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 (56)
If cylinder contains dedicated solar storage
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 (57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
12Total per year (kWh/year)												2752	(64)

Electric shower(s)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month
116.6790 103.6989 111.2083 99.9826 98.4807 90.4135 90.3235 92.8879 92.8011 101.5018 105.5497 115.6698 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(76)
East	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(76)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	652.0784	730.2946	789.6905	869.3922	912.9689	904.3786	866.5575	814.6416	757.3995	678.0557	637.1713	628.5612	(84)

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7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area	0.9652	0.9339	0.8716	0.7324	0.5591	0.3925	0.2821	0.3136	0.5027	0.7855	0.9310	0.9714	(86)
MIT	20.4706	20.6231	20.7918	20.9369	20.9888	20.9989	20.9999	20.9998	20.9954	20.9198	20.6824	20.4275	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house	0.9589	0.9231	0.8531	0.7034	0.5245	0.3556	0.2432	0.2723	0.4598	0.7530	0.9180	0.9661	(89)
MIT 2	19.7815	19.9685	20.1697	20.3317	20.3839	20.3927	20.3933	20.3933	20.3901	20.3170	20.0437	19.7278	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9970	20.1732	20.3643	20.5210	20.5731	20.5823	20.5830	20.5830	20.5794	20.5055	20.2435	19.9467	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9970	20.1732	20.3643	20.5210	20.5731	20.5823	20.5830	20.5830	20.5794	20.5055	20.2435	19.9467	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9542	0.9188	0.8522	0.7096	0.5349	0.3671	0.2554	0.2852	0.4730	0.7593	0.9145	0.9616	(94)
Useful gains	622.2063	670.9826	672.9501	616.9622	488.3069	332.0142	221.2813	232.3592	358.2729	514.8198	582.6685	604.4037	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	872.1794	848.6313	770.3487	645.7029	493.0207	332.3965	221.3114	232.4203	360.0175	550.3839	730.2945	874.9365	(97)
Space heating kWh	185.9800	119.3799	72.4646	20.6933	3.5071	0.0000	0.0000	0.0000	0.0000	26.4597	106.2907	201.2764	(98a)
Space heating requirement - total per year (kWh/year)												736.0516	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	185.9800	119.3799	72.4646	20.6933	3.5071	0.0000	0.0000	0.0000	0.0000	26.4597	106.2907	201.2764	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												736.0516	
Space heating per m2											(98c) / (4) =	8.4896	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	185.9800	119.3799	72.4646	20.6933	3.5071	0.0000	0.0000	0.0000	0.0000	26.4597	106.2907	201.2764	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	278.9699	179.0698	108.6969	31.0400	5.2606	0.0000	0.0000	0.0000	0.0000	39.6896	159.4361	301.9146	
Space heating requirement	278.9699	179.0698	108.6969	31.0400	5.2606	0.0000	0.0000	0.0000	0.0000	39.6896	159.4361	301.9146	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1104.0774	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												11.0408	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4523.1782	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1395.0876	0.1581	46.5525	(367)
Electrical energy for heat distribution (space & water)	11.0408	0.0000	7.5614	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			209.1981	(373)
Space and water heating			209.1981	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			123.6233	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.4300	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1395.0876	1.5853	466.7424	(467)
Electrical energy for heat distribution (space & water)	11.0408	0.0000	80.2821	(472)
Overall CO2 factor for heat network			0.4246	(486)
Total CO2 associated with community systems			2221.1370	(473)
Space and water heating			2221.1370	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1658.1937	(483)
Dwelling Primary energy Rate (DPER)			19.1300	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4892			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	13.5400	0.0700	0.9478
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.0900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.8787 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.3679 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	63.6543	63.4509	63.2515	62.3151	62.1399	61.3243	61.3243	61.1733	61.6385	62.1399	62.4943	62.8649	(39)
Average = Sum(39)m / 12 =												62.3143	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7342	0.7318	0.7295	0.7187	0.7167	0.7073	0.7073	0.7056	0.7109	0.7167	0.7208	0.7251	(40)
HLP (average)												0.7187	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(76)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)
Total gains	634.2986	701.5715	746.4857	809.2850	840.7342	827.5835	792.9978	750.1384	705.1835	645.1554	616.5661	612.8145	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4565	69.6791	69.8987	70.9491	71.1492	72.0954	72.0954	72.2734	71.7280	71.1492	70.7457	70.3287	
alpha	5.6304	5.6453	5.6599	5.7299	5.7433	5.8064	5.8064	5.8182	5.7819	5.7433	5.7164	5.6886	
util living area	0.9772	0.9591	0.9222	0.8197	0.6603	0.4709	0.3398	0.3743	0.5898	0.8524	0.9546	0.9805	(86)
MIT	20.2328	20.3960	20.6036	20.8425	20.9604	20.9952	20.9994	20.9990	20.9837	20.8325	20.5134	20.2101	(87)
Th 2	20.3107	20.3128	20.3148	20.3243	20.3261	20.3344	20.3344	20.3359	20.3312	20.3261	20.3225	20.3187	(88)
util rest of house	0.9727	0.9513	0.9080	0.7918	0.6193	0.4232	0.2886	0.3207	0.5371	0.8225	0.9447	0.9766	(89)
MIT 2	19.4173	19.6225	19.8789	20.1658	20.2918	20.3312	20.3341	20.3354	20.3193	20.1616	19.7789	19.3951	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.6724	19.8645	20.1056	20.3774	20.5009	20.5389	20.5422	20.5430	20.5271	20.3715	20.0086	19.6500	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6724	19.8645	20.1056	20.3774	20.5009	20.5389	20.5422	20.5430	20.5271	20.3715	20.0086	19.6500	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9675	0.9454	0.9032	0.7941	0.6301	0.4380	0.3046	0.3375	0.5528	0.8247	0.9393	0.9718	(94)
Useful gains	613.7056	663.2556	674.2084	642.6879	529.7738	362.4578	241.5837	253.1356	389.8443	532.0560	579.1531	595.5527	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	978.5208	949.5103	860.5766	715.2179	546.8866	364.2008	241.7535	253.4398	396.1594	607.1981	806.7171	971.2628	(97)
Space heating kWh	271.4225	192.3632	138.6579	52.2216	12.7319	0.0000	0.0000	0.0000	0.0000	55.9057	163.8461	279.5283	(98a)
Space heating requirement - total per year (kWh/year)												1166.6772	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	271.4225	192.3632	138.6579	52.2216	12.7319	0.0000	0.0000	0.0000	0.0000	55.9057	163.8461	279.5283	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1166.6772	
Space heating per m2											(98c) / (4) =	13.4565	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	271.4225	192.3632	138.6579	52.2216	12.7319	0.0000	0.0000	0.0000	0.0000	55.9057	163.8461	279.5283	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	294.0655	208.4108	150.2252	56.5781	13.7941	0.0000	0.0000	0.0000	0.0000	60.5695	177.5147	302.8476	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.3964	83.9003	83.0590	81.5571	80.3170	79.8000	79.8000	79.8000	79.8000	81.6372	83.5327	84.4864	(217)
Fuel for water heating, kWh/month	276.8852	246.2073	264.2776	237.1858	233.7569	212.3443	209.9929	218.2535	220.5242	239.9258	248.7341	273.6737	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1264.0056	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2881.7612	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3599.0721	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1264.0056	0.2100	265.4412	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2881.7612	0.2100	605.1699	(264)
Space and water heating			870.6110	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			803.7093	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.2700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1264.0056	1.1300	1428.3263	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2881.7612	1.1300	3256.3902	(278)
Space and water heating			4684.7165	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4270.9436	(286)
Target Primary Energy Rate (TPER)			49.2600	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.43	**TER**	9.27
Environmental	99 A	**% DER < TER**			84.57
CO_2 Emissions (t/year)	0.1	**DFEE**	15.84	**TFEE**	19.14
Compliance Check	See BREL	**% DFEE < TFEE**			17.26
% DPER < TPER	61.17	**DPER**	19.13	**TPER**	49.26

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(76)
East	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(76)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	706.5297	768.1759	833.8294	897.3119	933.0604	910.4848	872.9142	823.2320	769.6084	706.4837	673.4276	678.8029	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9504	0.9194	0.8478	0.7146	0.5478	0.3899	0.2800	0.3103	0.4950	0.7634	0.9147	0.9594	(86)
MIT	20.5453	20.6661	20.8249	20.9449	20.9900	20.9990	20.9999	20.9998	20.9958	20.9317	20.7227	20.4996	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9421	0.9071	0.8277	0.6855	0.5137	0.3532	0.2414	0.2695	0.4526	0.7301	0.8996	0.9524	(89)
MIT 2	19.8732	20.0200	20.2072	20.3398	20.3849	20.3927	20.3933	20.3933	20.3903	20.3289	20.0911	19.8170	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0835	20.2221	20.4004	20.5291	20.5742	20.5823	20.5831	20.5830	20.5797	20.5175	20.2887	20.0305	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0835	20.2221	20.4004	20.5291	20.5742	20.5823	20.5831	20.5830	20.5797	20.5175	20.2887	20.0305	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9373	0.9032	0.8279	0.6921	0.5239	0.3647	0.2535	0.2823	0.4657	0.7372	0.8967	0.9475	(94)
Useful gains	662.2410	693.8477	690.3523	621.0549	488.8709	332.0304	221.2827	232.3633	358.4350	520.8163	603.8839	643.1916	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	876.9824	851.3467	772.3535	646.1499	493.0804	332.3982	221.3116	232.4208	360.0346	551.0482	732.8068	879.5958	(97)
Space heating kWh													
	159.7676	105.8393	61.0089	18.0685	3.1318	0.0000	0.0000	0.0000	0.0000	22.4926	92.8245	175.8847	(98a)
Space heating requirement - total per year (kWh/year)												639.0180	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	159.7676	105.8393	61.0089	18.0685	3.1318	0.0000	0.0000	0.0000	0.0000	22.4926	92.8245	175.8847	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												639.0180	
Space heating per m2											(98c) / (4) =	7.3704	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	159.7676	105.8393	61.0089	18.0685	3.1318	0.0000	0.0000	0.0000	0.0000	22.4926	92.8245	175.8847	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	239.6514	158.7590	91.5134	27.1027	4.6977	0.0000	0.0000	0.0000	0.0000	33.7389	139.2368	263.8271	
Space heating requirement													
	239.6514	158.7590	91.5134	27.1027	4.6977	0.0000	0.0000	0.0000	0.0000	33.7389	139.2368	263.8271	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												958.5270	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												9.5853	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4377.6277	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	958.5270	4.4400	42.5586	(340a)
Space heating total			42.5586	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			251.1496	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.6865 (357)
SAP value		88.8716
SAP rating (Section 12)		89 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1356.2741	0.1581	40.4211	(367)
Electrical energy for heat distribution (space & water)	9.5853	0.0000	7.3315	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			202.8368	(373)
Space and water heating			202.8368	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			117.2620	(383)
CO2 emissions per m2			1.3500	(384)
EI value			98.8069	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15916.3300 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 183.5794 (35)

Thermal bridges (User defined value 0.030 * total exposed area) 1.4928 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)

Average = Sum(39)m / 12 = 55.5633

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss / Combi loss

Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS / PV diverter / Solar input / FGHRS

Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
									Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	7.4800	23.7835	0.7600	0.7000	0.7700	65.5876	(76)
East	1.7600	23.7835	0.7600	0.7000	0.7700	15.4324	(76)

Solar gains	81.0200	140.8292	228.1692	335.8028	395.8111	434.4066	405.9044	355.9037	279.8628	176.2264	99.5150	67.0100	(83)
Total gains	720.6439	778.1231	846.4545	918.7565	943.6137	950.5115	903.3528	856.6161	798.7845	727.4075	689.5188	690.7928	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9419	0.9093	0.8241	0.6822	0.5142	0.3388	0.2399	0.2659	0.4573	0.7198	0.8966	0.9526	(86)
MIT	20.5878	20.6979	20.8575	20.9586	20.9933	20.9996	21.0000	20.9999	20.9974	20.9531	20.7662	20.5412	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9323	0.8956	0.8018	0.6520	0.4799	0.3035	0.2026	0.2266	0.4159	0.6840	0.8790	0.9445	(89)
MIT 2	19.9253	20.0582	20.2443	20.3540	20.3879	20.3931	20.3933	20.3933	20.3916	20.3506	20.1424	19.8685	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.1325	20.2583	20.4361	20.5431	20.5773	20.5828	20.5831	20.5831	20.5811	20.5390	20.3375	20.0789	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1325	20.2583	20.4361	20.5431	20.5773	20.5828	20.5831	20.5831	20.5811	20.5390	20.3375	20.0789	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9277	0.8923	0.8034	0.6596	0.4904	0.3145	0.2142	0.2389	0.4288	0.6928	0.8773	0.9397	(94)
Useful gains	668.5372	694.3477	680.0767	606.0205	462.7143	298.9472	193.5231	204.6251	342.4828	503.9794	604.9046	649.1319	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	863.0398	836.6906	746.5566	624.7035	465.4699	299.0871	193.5323	204.6438	343.4411	524.4633	713.2949	865.6165	(97)
Space heating kWh													
	144.7099	95.6544	49.4611	13.4518	2.0502	0.0000	0.0000	0.0000	0.0000	15.2400	78.0410	161.0646	(98a)
Space heating requirement - total per year (kWh/year)												559.6730	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	144.7099	95.6544	49.4611	13.4518	2.0502	0.0000	0.0000	0.0000	0.0000	15.2400	78.0410	161.0646	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												559.6730	
Space heating per m2											(98c) / (4) =	6.4553	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	144.7099	95.6544	49.4611	13.4518	2.0502	0.0000	0.0000	0.0000	0.0000	15.2400	78.0410	161.0646	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	217.0649	143.4817	74.1916	20.1776	3.0753	0.0000	0.0000	0.0000	0.0000	22.8600	117.0615	241.5969	
Space heating requirement													
	217.0649	143.4817	74.1916	20.1776	3.0753	0.0000	0.0000	0.0000	0.0000	22.8600	117.0615	241.5969	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)

Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year		
Space heating fuel - community heating	839.5095	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4127.5010	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	8.3951	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4162.0842	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	839.5095	6.5500	54.9879	(340a)
Space heating total			54.9879	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			318.2929	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1324.5361	0.1586	35.5058	(367)
Electrical energy for heat distribution (space & water)	8.3951	0.0000	7.1471	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			197.7373	(373)
Space and water heating			197.7373	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			99.9043	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1324.5361	1.5871	355.2976	(467)
Electrical energy for heat distribution (space & water)	8.3951	0.0000	76.1029	(472)
Overall CO2 factor for heat network			0.4239	(486)
Total CO2 associated with community systems			2105.5131	(473)
Space and water heating			2105.5131	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1461.6779	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - West

Current energy efficiency rating: B 89
Current environmental impact rating: A 99

N Solar water heating — Not applicable
U Solar photovoltaic panels — Not applicable
V2 Wind turbine — Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 89
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£71	£71	£0
Community scheme	£429	£429	£0
Space heating	£169	£169	£0
Water heating	£270	£270	£0
Lighting	£62	£62	£0
Generated (PV)	-£182	-£182	£0
Total cost of fuels	£318	£318	£0
Total cost of uses	£319	£319	£0
Delivered energy	48 kWh/m²	48 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	17 kWh/m²	17 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		1.4928 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5778 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day)	126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(76)
East	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	706.5297	768.1759	833.8294	897.3119	933.0604	910.4848	872.9142	823.2320	769.6084	706.4837	673.4276	678.8029	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area	0.9504	0.9194	0.8478	0.7146	0.5478	0.3899	0.2800	0.3103	0.4950	0.7634	0.9147	0.9594	(86)
MIT	20.5453	20.6661	20.8249	20.9449	20.9900	20.9990	20.9999	20.9998	20.9958	20.9317	20.7227	20.4996	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house	0.9421	0.9071	0.8277	0.6855	0.5137	0.3532	0.2414	0.2695	0.4526	0.7301	0.8996	0.9524	(89)
MIT 2	19.8732	20.0200	20.2072	20.3398	20.3849	20.3927	20.3933	20.3933	20.3903	20.3289	20.0911	19.8170	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	20.0835	20.2221	20.4004	20.5291	20.5742	20.5823	20.5831	20.5830	20.5797	20.5175	20.2887	20.0305	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0835	20.2221	20.4004	20.5291	20.5742	20.5823	20.5831	20.5830	20.5797	20.5175	20.2887	20.0305	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9373	0.9032	0.8279	0.6921	0.5239	0.3647	0.2535	0.2823	0.4657	0.7372	0.8967	0.9475	(94)
Useful gains	662.2410	693.8477	690.3523	621.0549	488.8709	332.0304	221.2827	232.3633	358.4350	520.8163	603.8839	643.1916	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	876.9824	851.3467	772.3535	646.1499	493.0804	332.3982	221.3116	232.4208	360.0346	551.0482	732.8068	879.5958	(97)
Space heating kWh	159.7676	105.8393	61.0089	18.0685	3.1318	0.0000	0.0000	0.0000	0.0000	22.4926	92.8245	175.8847	(98a)
Space heating requirement - total per year (kWh/year)												639.0180	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	159.7676	105.8393	61.0089	18.0685	3.1318	0.0000	0.0000	0.0000	0.0000	22.4926	92.8245	175.8847	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												639.0180	
Space heating per m2										(98c) / (4) =		7.3704	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	159.7676	105.8393	61.0089	18.0685	3.1318	0.0000	0.0000	0.0000	0.0000	22.4926	92.8245	175.8847	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	239.6514	158.7590	91.5134	27.1027	4.6977	0.0000	0.0000	0.0000	0.0000	33.7389	139.2368	263.8271	
Space heating requirement													
	239.6514	158.7590	91.5134	27.1027	4.6977	0.0000	0.0000	0.0000	0.0000	33.7389	139.2368	263.8271	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												958.5270	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)

Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	9.5853	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4377.6277	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	958.5270	4.4400	42.5586	(340a)
Space heating total			42.5586	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			251.1496	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.6865	(357)
SAP value	88.8716	
SAP rating (Section 12)	89	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1356.2741	0.1581	40.4211	(367)
Electrical energy for heat distribution (space & water)	9.5853	0.0000	7.3315	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			202.8368	(373)
Space and water heating			202.8368	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			117.2620	(383)
CO2 emissions per m2			1.3500	(384)
EI value			98.8069	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 86.7000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.1900	3.1521	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			49.7600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0220			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Party Ceiling			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15916.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		183.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		1.4928 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	20.5148 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	55.5633	(39)
Average = Sum(39)m / 12 =												55.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	0.6409	(40)
HLP (average)												0.6409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5778	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	7.4800	23.7835	0.7600	0.7000	0.7700	65.5876	(76)
East	1.7600	23.7835	0.7600	0.7000	0.7700	15.4324	(76)

Solar gains	81.0200	140.8292	228.1692	335.8028	395.8111	434.4066	405.9044	355.9037	279.8628	176.2264	99.5150	67.0100	(83)
Total gains	720.6439	778.1231	846.4545	918.7565	943.6137	950.5115	903.3528	856.6161	798.7845	727.4075	689.5188	690.7928	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	79.5705	
alpha	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	6.3047	
util living area													
	0.9419	0.9093	0.8241	0.6822	0.5142	0.3388	0.2399	0.2659	0.4573	0.7198	0.8966	0.9526	(86)
MIT	20.5878	20.6979	20.8575	20.9586	20.9933	20.9996	21.0000	20.9999	20.9974	20.9531	20.7662	20.5412	(87)
Th 2	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	20.3934	(88)
util rest of house													
	0.9323	0.8956	0.8018	0.6520	0.4799	0.3035	0.2026	0.2266	0.4159	0.6840	0.8790	0.9445	(89)
MIT 2	19.9253	20.0582	20.2443	20.3540	20.3879	20.3931	20.3933	20.3933	20.3916	20.3506	20.1424	19.8685	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.1325	20.2583	20.4361	20.5431	20.5773	20.5828	20.5831	20.5831	20.5811	20.5390	20.3375	20.0789	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1325	20.2583	20.4361	20.5431	20.5773	20.5828	20.5831	20.5831	20.5811	20.5390	20.3375	20.0789	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9277	0.8923	0.8034	0.6596	0.4904	0.3145	0.2142	0.2389	0.4288	0.6928	0.8773	0.9397	(94)
Useful gains	668.5372	694.3477	680.0767	606.0205	462.7143	298.9472	193.5231	204.6251	342.4828	503.9794	604.9046	649.1319	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	863.0398	836.6906	746.5566	624.7035	465.4699	299.0871	193.5323	204.6438	343.4411	524.4633	713.2949	865.6165	(97)
Space heating kWh													
	144.7099	95.6544	49.4611	13.4518	2.0502	0.0000	0.0000	0.0000	0.0000	15.2400	78.0410	161.0646	(98a)
Space heating requirement - total per year (kWh/year)												559.6730	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	144.7099	95.6544	49.4611	13.4518	2.0502	0.0000	0.0000	0.0000	0.0000	15.2400	78.0410	161.0646	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												559.6730	
Space heating per m2											(98c) / (4) =	6.4553	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement

	144.7099	95.6544	49.4611	13.4518	2.0502	0.0000	0.0000	0.0000	0.0000	15.2400	78.0410	161.0646 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	217.0649	143.4817	74.1916	20.1776	3.0753	0.0000	0.0000	0.0000	0.0000	22.8600	117.0615	241.5969
Space heating requirement												
	217.0649	143.4817	74.1916	20.1776	3.0753	0.0000	0.0000	0.0000	0.0000	22.8600	117.0615	241.5969 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388
Water heating fuel												
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446 (331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year

Space heating fuel - community heating	839.5095 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	8.3951 (313)
Space cooling fuel	0.0000 (321)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)

mechanical ventilation fans (SFP = 0.1292)	33.4924 (330a)
Total electricity for the above, kWh/year	33.4924 (331)
Electricity for lighting (calculated in Appendix L)	216.3282 (332)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4162.0842 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	839.5095	6.5500	54.9879	(340a)
Space heating total			54.9879	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			318.2929	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1324.5361	0.1586	35.5058	(367)
Electrical energy for heat distribution (space & water)	8.3951	0.0000	7.1471	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			197.7373	(373)
Space and water heating			197.7373	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			99.9043	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)

Space and Water heating from Heat pump	1324.5361	1.5871	355.2976 (467)
Electrical energy for heat distribution (space & water)	8.3951	0.0000	76.1029 (472)
Overall CO2 factor for heat network			0.4239 (486)
Total CO2 associated with community systems			2105.5131 (473)
Space and water heating			2105.5131 (476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673 (478)
Energy for lighting	216.3282	1.5338	331.8115 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405
PV Unit electricity exported	-520.7528	0.4449	-231.6735
Total			-1026.3140 (480)
Total Primary energy kWh/year			1461.6779 (483)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	83 B	**DER**	3.02	**TER**	10.21
Environmental	97 A	**% DER < TER**			70.42
CO_2 Emissions (t/year)	0.25	**DFEE**	19.03	**TFEE**	23.52
Compliance Check	See BREL	**% DFEE < TFEE**			19.08
% DPER < TPER	41.06	**DPER**	32.02	**TPER**	54.33

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674 (64)
12Total per year (kWh/year)												2752 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201 (83)
Total gains	652.0784	730.2946	789.6905	869.3922	912.9689	904.3786	866.5575	814.6416	757.3995	678.0557	637.1713	628.5612 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area	0.9682	0.9424	0.8912	0.7703	0.6034	0.4289	0.3091	0.3435	0.5456	0.8178	0.9401	0.9735	(86)
MIT	20.2946	20.4652	20.6717	20.8766	20.9712	20.9963	20.9995	20.9991	20.9869	20.8554	20.5471	20.2479	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9625	0.9327	0.8742	0.7411	0.5649	0.3854	0.2627	0.2943	0.4964	0.7861	0.9284	0.9686	(89)
MIT 2	19.5189	19.7301	19.9802	20.2151	20.3135	20.3359	20.3381	20.3379	20.3288	20.1970	19.8342	19.4605	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.7615	19.9600	20.1965	20.4220	20.5192	20.5424	20.5450	20.5448	20.5346	20.4029	20.0572	19.7068	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7615	19.9600	20.1965	20.4220	20.5192	20.5424	20.5450	20.5448	20.5346	20.4029	20.0572	19.7068	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9565	0.9264	0.8703	0.7450	0.5756	0.3989	0.2772	0.3097	0.5112	0.7894	0.9227	0.9629	(94)
Useful gains	623.7347	676.5653	687.2569	647.6685	525.4789	360.7555	240.2383	252.2903	387.1876	535.2616	587.9151	605.2655	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	942.0898	917.6264	834.5437	702.0481	537.3651	362.0795	240.3750	252.5452	392.0693	597.3036	789.4977	944.8481	(97)
Space heating kWh	236.8562	161.9931	109.5814	39.1533	8.8434	0.0000	0.0000	0.0000	0.0000	46.1592	145.1395	252.6494	(98a)
Space heating requirement - total per year (kWh/year)												1000.3755	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	236.8562	161.9931	109.5814	39.1533	8.8434	0.0000	0.0000	0.0000	46.1592	145.1395	252.6494	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1000.3755	
Space heating per m2											(98c) / (4) =	11.5384	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	236.8562	161.9931	109.5814	39.1533	8.8434	0.0000	0.0000	0.0000	0.0000	46.1592	145.1395	252.6494	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	355.2843	242.9896	164.3721	58.7300	13.2651	0.0000	0.0000	0.0000	0.0000	69.2389	217.7092	378.9742	
Space heating requirement	355.2843	242.9896	164.3721	58.7300	13.2651	0.0000	0.0000	0.0000	0.0000	69.2389	217.7092	378.9742	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1500.5632	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												15.0056	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5877.8849	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1500.8171	0.1574	62.9737	(367)
Electrical energy for heat distribution (space & water)	15.0056	0.0000	8.1772	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			226.2352	(373)
Space and water heating			226.2352	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Total CO2, kg/year			262.1038	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.0200	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1500.8171	1.5826	633.2709	(467)
Electrical energy for heat distribution (space & water)	15.0056	0.0000	86.5269	(472)
Overall CO2 factor for heat network			0.4254	(486)
Total CO2 associated with community systems			2393.9104	(473)
Space and water heating			2393.9104	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Total Primary energy kWh/year			2776.3892	(483)
Dwelling Primary energy Rate (DPER)			32.0200	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
500mm mineral wool	43.3500		43.3500	0.1100	4.7685			(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2577			(33)

Main dwelling

Party Wall	79.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.7700	0.0600	0.4062
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	19.4300	0.1200	2.3316
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1426 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 30.4003 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	70.6867	70.4833	70.2839	69.3475	69.1723	68.3567	68.3567	68.2057	68.6709	69.1723	69.5267	69.8973	(39)
Average = Sum(39)m / 12 =												69.3467	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8153	0.8130	0.8107	0.7999	0.7978	0.7884	0.7884	0.7867	0.7921	0.7978	0.8019	0.8062	(40)
HLP (average)												0.7998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
West					9.2400	19.6403		0.6300	0.7000	0.7700		55.4614	(80)
Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)
Total gains	634.2986	701.5715	746.4857	809.2850	840.7342	827.5835	792.9978	750.1384	705.1835	645.1554	616.5661	612.8145	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1394	59.3101	59.4783	60.2815	60.4342	61.1552	61.1552	61.2906	60.8754	60.4342	60.1261	59.8073	
alpha	4.9426	4.9540	4.9652	5.0188	5.0289	5.0770	5.0770	5.0860	5.0584	5.0289	5.0084	4.9872	
util living area	0.9780	0.9626	0.9324	0.8486	0.7068	0.5186	0.3776	0.4153	0.6395	0.8760	0.9591	0.9809	(86)
MIT	20.0069	20.1849	20.4265	20.7288	20.9126	20.9852	20.9976	20.9961	20.9592	20.7254	20.3327	19.9815	(87)
Th 2	20.2401	20.2421	20.2441	20.2535	20.2552	20.2634	20.2634	20.2649	20.2602	20.2552	20.2517	20.2480	(88)
util rest of house	0.9736	0.9554	0.9195	0.8222	0.6634	0.4625	0.3152	0.3503	0.5809	0.8482	0.9501	0.9771	(89)
MIT 2	19.0817	19.3064	19.6073	19.9749	20.1773	20.2533	20.2622	20.2630	20.2296	19.9795	19.5015	19.0555	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.3711	19.5812	19.8635	20.2107	20.4073	20.4822	20.4923	20.4923	20.4579	20.2128	19.7615	19.3452	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3711	19.5812	19.8635	20.2107	20.4073	20.4822	20.4923	20.4923	20.4579	20.2128	19.7615	19.3452	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9673	0.9479	0.9121	0.8205	0.6726	0.4794	0.3346	0.3706	0.5971	0.8465	0.9429	0.9713	(94)
Useful gains	613.5639	665.0086	680.8355	664.0567	565.4461	396.7299	265.3698	277.9667	421.0368	546.1054	581.3836	595.2543	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1065.3248	1034.7792	939.2428	784.3688	602.3050	402.0911	266.0617	279.1176	436.5991	664.9400	880.3115	1058.6050	(97)
Space heating kWh	336.1101	248.4859	192.2550	86.6247	27.4230	0.0000	0.0000	0.0000	0.0000	88.4129	215.2280	344.7329	(98a)
Space heating requirement - total per year (kWh/year)												1539.2726	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	336.1101	248.4859	192.2550	86.6247	27.4230	0.0000	0.0000	0.0000	0.0000	88.4129	215.2280	344.7329	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1539.2726	
Space heating per m2										(98c) / (4) =		17.7540	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	336.1101	248.4859	192.2550	86.6247	27.4230	0.0000	0.0000	0.0000	0.0000	88.4129	215.2280	344.7329	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	364.1496	269.2154	208.2936	93.8513	29.7107	0.0000	0.0000	0.0000	0.0000	95.7887	233.1832	373.4918	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.8742	84.4752	83.7639	82.3825	80.8443	79.8000	79.8000	79.8000	79.8000	82.3972	84.1389	84.9536	(217)
Fuel for water heating, kWh/month	275.3264	244.5318	262.0536	234.8094	232.2322	212.3443	209.9929	218.2535	220.5242	237.7128	246.9419	272.1687	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1667.6843	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2866.8916	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3987.8813	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1667.6843	0.2100	350.2137	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2866.8916	0.2100	602.0472	(264)
Space and water heating			952.2610	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			885.3593	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.2100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1667.6843	1.1300	1884.4833	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2866.8916	1.1300	3239.5876	(278)
Space and water heating			5124.0709	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4710.2979	(286)
Target Primary Energy Rate (TPER)			54.3300	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	83 B	**DER**	3.02	**TER**	10.21
Environmental	97 A	**% DER < TER**			70.42
CO_2 Emissions (t/year)	0.25	**DFEE**	19.03	**TFEE**	23.52
Compliance Check	See BREL	**% DFEE < TFEE**			19.08
% DPER < TPER	41.06	**DPER**	32.02	**TPER**	54.33

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		3 * 10 =	30.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1412	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.2912	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2257	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2878	0.2821	0.2765	0.2483	0.2426	0.2144	0.2144	0.2088	0.2257	0.2426	0.2539	0.2652	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5414	0.5398	0.5382	0.5308	0.5294	0.5230	0.5230	0.5218	0.5255	0.5294	0.5322	0.5352	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15049.3300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							173.5794	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9510	37.8383	37.7278	37.2089	37.1118	36.6599	36.6599	36.5762	36.8339	37.1118	37.3082	37.5135	(38)
Heat transfer coeff	63.8337	63.7210	63.6105	63.0916	62.9945	62.5426	62.5426	62.4589	62.7167	62.9945	63.1909	63.3963	(39)
Average = Sum(39)m / 12 =												63.0912	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7363	0.7350	0.7337	0.7277	0.7266	0.7214	0.7214	0.7204	0.7234	0.7266	0.7288	0.7312	(40)
HLP (average)												0.7277	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =					614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	545.1343	624.6069	686.9038	773.6007	821.2924	817.0482	782.1979	728.3014	668.6668	584.4747	536.9133	522.5689	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.4884	65.6043	65.7182	66.2587	66.3608	66.8404	66.8404	66.9299	66.6548	66.3608	66.1546	65.9403	
alpha	5.3659	5.3736	5.3812	5.4172	5.4241	5.4560	5.4560	5.4620	5.4437	5.4241	5.4103	5.3960	
util living area	0.9864	0.9716	0.9383	0.8385	0.6764	0.4848	0.3510	0.3930	0.6244	0.8882	0.9717	0.9890	(86)

MIT	20.0437	20.2412	20.4967	20.7918	20.9449	20.9924	20.9989	20.9980	20.9724	20.7532	20.3531	20.0061	(87)
Th 2	20.3089	20.3101	20.3112	20.3164	20.3174	20.3220	20.3220	20.3228	20.3202	20.3174	20.3154	20.3133	(88)
util rest of house	0.9837	0.9661	0.9267	0.8125	0.6355	0.4353	0.2973	0.3358	0.5701	0.8632	0.9652	0.9867	(89)
MIT 2	19.4297	19.6246	19.8728	20.1500	20.2794	20.3179	20.3216	20.3221	20.3040	20.1221	19.7407	19.3963	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.6218	19.8175	20.0680	20.3508	20.4876	20.5289	20.5335	20.5335	20.5131	20.3195	19.9322	19.5870	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6218	19.8175	20.0680	20.3508	20.4876	20.5289	20.5335	20.5335	20.5131	20.3195	19.9322	19.5870	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9803	0.9614	0.9221	0.8139	0.6459	0.4505	0.3141	0.3537	0.5859	0.8633	0.9609	0.9837	(94)
Useful gains	534.3937	600.5218	633.3960	629.6398	530.5035	368.0722	245.7026	257.5964	391.7389	504.5545	515.9253	514.0515	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	978.0444	950.5557	863.0678	722.4481	553.5695	370.8085	246.0090	258.1748	402.2069	612.2735	810.8819	975.4807	(97)
Space heating kWh	330.0761	235.2228	170.8758	66.8220	17.1611	0.0000	0.0000	0.0000	0.0000	80.1429	212.3687	343.3033	(98a)
Space heating requirement - total per year (kWh/year)												1455.9728	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	330.0761	235.2228	170.8758	66.8220	17.1611	0.0000	0.0000	0.0000	0.0000	80.1429	212.3687	343.3033	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1455.9728	
Space heating per m2											(98c) / (4) =	16.7932	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	587.9004	462.8152	474.6877	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9622	0.9834	0.9747	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	565.6804	455.1416	462.6958	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	890.8770	853.1757	792.9430	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	234.1415	296.1374	245.7039	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	58.5354	74.0344	61.4260	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												193.9957	(107)
Energy for space heating												16.7932	(99)
Energy for space cooling												2.2376	(108)
Total												19.0308	(109)
Fabric Energy Efficiency (DFEE)												19.0	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
500mm mineral wool	43.3500		43.3500	0.1100	4.7685			(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2577			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.7700	0.0600	0.4062
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	19.4300	0.1200	2.3316
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1426 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.4003 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	70.6867	70.4833	70.2839	69.3475	69.1723	68.3567	68.3567	68.2057	68.6709	69.1723	69.5267	69.8973	(39)
Average = Sum(39)m / 12 =												69.3467	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8153	0.8130	0.8107	0.7999	0.7978	0.7884	0.7884	0.7867	0.7921	0.7978	0.8019	0.8062	(40)
HLP (average)												0.7998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												64.3029	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)

Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)

Water heating gains (Table 5)

49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)

Total internal gains

478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(80)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)
Total gains	533.6898	602.2192	650.0344	719.8289	755.3931	749.5884	717.9735	673.1335	625.7862	557.9097	522.6435	513.1575	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1394	59.3101	59.4783	60.2815	60.4342	61.1552	61.1552	61.2906	60.8754	60.4342	60.1261	59.8073	
alpha	4.9426	4.9540	4.9652	5.0188	5.0289	5.0770	5.0770	5.0860	5.0584	5.0289	5.0084	4.9872	
util living area	0.9891	0.9792	0.9583	0.8907	0.7608	0.5672	0.4160	0.4609	0.7019	0.9203	0.9783	0.9909	(86)
MIT	19.8430	20.0330	20.2967	20.6477	20.8778	20.9780	20.9962	20.9938	20.9383	20.6332	20.1903	19.8168	(87)
Th 2	20.2401	20.2421	20.2441	20.2535	20.2552	20.2634	20.2634	20.2649	20.2602	20.2552	20.2517	20.2480	(88)
util rest of house	0.9867	0.9748	0.9495	0.8689	0.7189	0.5076	0.3477	0.3896	0.6427	0.8994	0.9731	0.9889	(89)
MIT 2	19.1761	19.3652	19.6250	19.9653	20.1684	20.2515	20.2620	20.2624	20.2230	19.9593	19.5296	19.1564	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.3847	19.5741	19.8351	20.1787	20.3903	20.4788	20.4917	20.4912	20.4468	20.1701	19.7363	19.3629	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3847	19.5741	19.8351	20.1787	20.3903	20.4788	20.4917	20.4912	20.4468	20.1701	19.7363	19.3629	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9834	0.9701	0.9439	0.8665	0.7269	0.5254	0.3690	0.4118	0.6583	0.8966	0.9686	0.9860	(94)
Useful gains	524.8327	584.2407	613.5446	623.7020	549.0775	393.8023	264.9348	277.1807	411.9421	500.2349	506.2127	505.9545	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1066.2872	1034.2797	937.2438	782.1511	601.1278	401.8523	266.0207	279.0435	435.8379	661.9873	878.5600	1059.8483	(97)
Space heating kWh	402.8422	302.4263	240.8322	114.0833	38.7255	0.0000	0.0000	0.0000	0.0000	120.3438	268.0900	412.0970	(98a)
Space heating requirement - total per year (kWh/year)												1899.4402	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	402.8422	302.4263	240.8322	114.0833	38.7255	0.0000	0.0000	0.0000	0.0000	120.3438	268.0900	412.0970	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1899.4402	
Space heating per m2											(98c) / (4) =	21.9082	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	642.5530	505.8396	518.3630	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9162	0.9576	0.9415	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	588.7112	484.3929	488.0519	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	812.0280	778.1082	728.4611	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	160.7881	218.5242	178.8644	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	40.1970	54.6310	44.7161	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												139.5442	(107)
Energy for space heating												21.9082	(99)
Energy for space cooling												1.6095	(108)
Total												23.5177	(109)
Fabric Energy Efficiency (TFEE)												23.5	(109)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	83 B	**DER**	3.02	**TER**	10.21
Environmental	97 A	**% DER < TER**			70.42
CO_2 Emissions (t/year)	0.25	**DFEE**	19.03	**TFEE**	23.52
Compliance Check	See BREL	**% DFEE < TFEE**			19.08
% DPER < TPER	41.06	**DPER**	32.02	**TPER**	54.33

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674 (64)
12Total per year (kWh/year)												2752 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201 (83)
Total gains	652.0784	730.2946	789.6905	869.3922	912.9689	904.3786	866.5575	814.6416	757.3995	678.0557	637.1713	628.5612 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area	0.9682	0.9424	0.8912	0.7703	0.6034	0.4289	0.3091	0.3435	0.5456	0.8178	0.9401	0.9735	(86)
MIT	20.2946	20.4652	20.6717	20.8766	20.9712	20.9963	20.9995	20.9991	20.9869	20.8554	20.5471	20.2479	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9625	0.9327	0.8742	0.7411	0.5649	0.3854	0.2627	0.2943	0.4964	0.7861	0.9284	0.9686	(89)
MIT 2	19.5189	19.7301	19.9802	20.2151	20.3135	20.3359	20.3381	20.3379	20.3288	20.1970	19.8342	19.4605	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.7615	19.9600	20.1965	20.4220	20.5192	20.5424	20.5450	20.5448	20.5346	20.4029	20.0572	19.7068	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7615	19.9600	20.1965	20.4220	20.5192	20.5424	20.5450	20.5448	20.5346	20.4029	20.0572	19.7068	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9565	0.9264	0.8703	0.7450	0.5756	0.3989	0.2772	0.3097	0.5112	0.7894	0.9227	0.9629	(94)
Useful gains	623.7347	676.5653	687.2569	647.6685	525.4789	360.7555	240.2383	252.2903	387.1876	535.2616	587.9151	605.2655	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	942.0898	917.6264	834.5437	702.0481	537.3651	362.0795	240.3750	252.5452	392.0693	597.3036	789.4977	944.8481	(97)
Space heating kWh	236.8562	161.9931	109.5814	39.1533	8.8434	0.0000	0.0000	0.0000	0.0000	46.1592	145.1395	252.6494	(98a)
Space heating requirement - total per year (kWh/year)												1000.3755	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	236.8562	161.9931	109.5814	39.1533	8.8434	0.0000	0.0000	0.0000	46.1592	145.1395	252.6494	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1000.3755	
Space heating per m2											(98c) / (4) =	11.5384	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	236.8562	161.9931	109.5814	39.1533	8.8434	0.0000	0.0000	0.0000	0.0000	46.1592	145.1395	252.6494	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	355.2843	242.9896	164.3721	58.7300	13.2651	0.0000	0.0000	0.0000	0.0000	69.2389	217.7092	378.9742	
Space heating requirement	355.2843	242.9896	164.3721	58.7300	13.2651	0.0000	0.0000	0.0000	0.0000	69.2389	217.7092	378.9742	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1500.5632	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												15.0056	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5877.8849	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1500.8171	0.1574	62.9737	(367)
Electrical energy for heat distribution (space & water)	15.0056	0.0000	8.1772	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			226.2352	(373)
Space and water heating			226.2352	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Total CO2, kg/year			262.1038	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.0200	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1500.8171	1.5826	633.2709	(467)
Electrical energy for heat distribution (space & water)	15.0056	0.0000	86.5269	(472)
Overall CO2 factor for heat network			0.4254	(486)
Total CO2 associated with community systems			2393.9104	(473)
Space and water heating			2393.9104	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Total Primary energy kWh/year			2776.3892	(483)
Dwelling Primary energy Rate (DPER)			32.0200	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
500mm mineral wool	43.3500		43.3500	0.1100	4.7685			(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2577			(33)

Main dwelling

Party Wall	79.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.7700	0.0600	0.4062
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	19.4300	0.1200	2.3316
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1426 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 30.4003 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	70.6867	70.4833	70.2839	69.3475	69.1723	68.3567	68.3567	68.2057	68.6709	69.1723	69.5267	69.8973	(39)
Average = Sum(39)m / 12 =												69.3467	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8153	0.8130	0.8107	0.7999	0.7978	0.7884	0.7884	0.7867	0.7921	0.7978	0.8019	0.8062	(40)
HLP (average)												0.7998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
West					9.2400	19.6403		0.6300	0.7000	0.7700		55.4614	(80)
Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)
Total gains	634.2986	701.5715	746.4857	809.2850	840.7342	827.5835	792.9978	750.1384	705.1835	645.1554	616.5661	612.8145	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1394	59.3101	59.4783	60.2815	60.4342	61.1552	61.1552	61.2906	60.8754	60.4342	60.1261	59.8073	
alpha	4.9426	4.9540	4.9652	5.0188	5.0289	5.0770	5.0770	5.0860	5.0584	5.0289	5.0084	4.9872	
util living area	0.9780	0.9626	0.9324	0.8486	0.7068	0.5186	0.3776	0.4153	0.6395	0.8760	0.9591	0.9809	(86)
MIT	20.0069	20.1849	20.4265	20.7288	20.9126	20.9852	20.9976	20.9961	20.9592	20.7254	20.3327	19.9815	(87)
Th 2	20.2401	20.2421	20.2441	20.2535	20.2552	20.2634	20.2634	20.2649	20.2602	20.2552	20.2517	20.2480	(88)
util rest of house	0.9736	0.9554	0.9195	0.8222	0.6634	0.4625	0.3152	0.3503	0.5809	0.8482	0.9501	0.9771	(89)
MIT 2	19.0817	19.3064	19.6073	19.9749	20.1773	20.2533	20.2622	20.2630	20.2296	19.9795	19.5015	19.0555	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.3711	19.5812	19.8635	20.2107	20.4073	20.4822	20.4923	20.4923	20.4579	20.2128	19.7615	19.3452	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3711	19.5812	19.8635	20.2107	20.4073	20.4822	20.4923	20.4923	20.4579	20.2128	19.7615	19.3452	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9673	0.9479	0.9121	0.8205	0.6726	0.4794	0.3346	0.3706	0.5971	0.8465	0.9429	0.9713	(94)
Useful gains	613.5639	665.0086	680.8355	664.0567	565.4461	396.7299	265.3698	277.9667	421.0368	546.1054	581.3836	595.2543	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1065.3248	1034.7792	939.2428	784.3688	602.3050	402.0911	266.0617	279.1176	436.5991	664.9400	880.3115	1058.6050	(97)
Space heating kWh	336.1101	248.4859	192.2550	86.6247	27.4230	0.0000	0.0000	0.0000	0.0000	88.4129	215.2280	344.7329	(98a)
Space heating requirement - total per year (kWh/year)												1539.2726	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	336.1101	248.4859	192.2550	86.6247	27.4230	0.0000	0.0000	0.0000	0.0000	88.4129	215.2280	344.7329	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1539.2726	
Space heating per m2										(98c) / (4) =		17.7540	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	336.1101	248.4859	192.2550	86.6247	27.4230	0.0000	0.0000	0.0000	0.0000	88.4129	215.2280	344.7329	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	364.1496	269.2154	208.2936	93.8513	29.7107	0.0000	0.0000	0.0000	0.0000	95.7887	233.1832	373.4918	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.8742	84.4752	83.7639	82.3825	80.8443	79.8000	79.8000	79.8000	79.8000	82.3972	84.1389	84.9536	(217)
Fuel for water heating, kWh/month	275.3264	244.5318	262.0536	234.8094	232.2322	212.3443	209.9929	218.2535	220.5242	237.7128	246.9419	272.1687	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1667.6843	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2866.8916	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3987.8813	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1667.6843	0.2100	350.2137	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2866.8916	0.2100	602.0472	(264)
Space and water heating			952.2610	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			885.3593	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.2100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1667.6843	1.1300	1884.4833	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2866.8916	1.1300	3239.5876	(278)
Space and water heating			5124.0709	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4710.2979	(286)
Target Primary Energy Rate (TPER)			54.3300	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	83 B	**DER**	3.02	**TER**	10.21
Environmental	97 A	**% DER < TER**			70.42
CO_2 Emissions (t/year)	0.25	**DFEE**	19.03	**TFEE**	23.52
Compliance Check	See BREL	**% DFEE < TFEE**			19.08
% DPER < TPER	41.06	**DPER**	32.02	**TPER**	54.33

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	706.5297	768.1759	833.8294	897.3119	933.0604	910.4848	872.9142	823.2320	769.6084	706.4837	673.4276	678.8029	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area													
	0.9560	0.9306	0.8713	0.7540	0.5919	0.4261	0.3068	0.3399	0.5376	0.7983	0.9267	0.9634	(86)
MIT	20.3751	20.5139	20.7132	20.8892	20.9738	20.9964	20.9995	20.9992	20.9878	20.8726	20.5928	20.3248	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house													
	0.9485	0.9194	0.8526	0.7244	0.5538	0.3829	0.2608	0.2913	0.4890	0.7654	0.9131	0.9570	(89)
MIT 2	19.6185	19.7890	20.0283	20.2283	20.3157	20.3359	20.3382	20.3380	20.3294	20.2150	19.8890	19.5562	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8552	20.0157	20.2426	20.4350	20.5216	20.5425	20.5450	20.5448	20.5354	20.4207	20.1091	19.7966	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8552	20.0157	20.2426	20.4350	20.5216	20.5425	20.5450	20.5448	20.5354	20.4207	20.1091	19.7966	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9421	0.9134	0.8497	0.7288	0.5645	0.3963	0.2752	0.3065	0.5036	0.7697	0.9078	0.9508	(94)
Useful gains	665.6232	701.6258	708.4743	654.0033	526.6868	360.8043	240.2441	252.3055	387.5770	543.7723	611.3326	645.4182	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	947.7957	921.0206	837.3507	702.8419	537.5093	362.0852	240.3757	252.5470	392.1155	598.3872	792.6626	950.3189	(97)
Space heating kWh													
	209.9363	147.4333	95.8841	35.1638	8.0519	0.0000	0.0000	0.0000	0.0000	40.6336	130.5576	226.8461	(98a)
Space heating requirement - total per year (kWh/year)												894.5067	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	209.9363	147.4333	95.8841	35.1638	8.0519	0.0000	0.0000	0.0000	0.0000	40.6336	130.5576	226.8461	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												894.5067	
Space heating per m2											(98c) / (4) =	10.3173	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	209.9363	147.4333	95.8841	35.1638	8.0519	0.0000	0.0000	0.0000	0.0000	40.6336	130.5576	226.8461	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	314.9045	221.1499	143.8261	52.7457	12.0779	0.0000	0.0000	0.0000	0.0000	60.9503	195.8364	340.2692	
Space heating requirement													
	314.9045	221.1499	143.8261	52.7457	12.0779	0.0000	0.0000	0.0000	0.0000	60.9503	195.8364	340.2692	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1341.7601	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												13.4176	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5719.0818	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1341.7601	4.4400	59.5741	(340a)
Space heating total			59.5741	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Total energy cost			376.0306	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0279 (357)
SAP value		83.3382
SAP rating (Section 12)		83 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1458.4696	0.1574	56.3147	(367)
Electrical energy for heat distribution (space & water)	13.4176	0.0000	7.9275	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			219.3265	(373)
Space and water heating			219.3265	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Total CO2, kg/year			255.1951	(383)
CO2 emissions per m2			2.9400	(384)
EI value			97.4035	(384a)
EI rating			97	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation		0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers
67.4410 66.4275 64.9507 62.1249 60.0396 57.7140 56.3922 57.8579 59.4646 61.9615 64.8480 67.1826 (42a)
Hot water usage for baths
29.1251 28.6925 28.0834 26.9603 26.1193 25.1868 24.6831 25.2880 25.9466 26.9444 28.0906 29.0266 (42b)
Hot water usage for other uses
41.0293 39.5373 38.0453 36.5534 35.0614 33.5694 33.5694 35.0614 36.5534 38.0453 39.5373 41.0293 (42c)
Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)

Water heating gains (Table 5)

	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702 (72)
Total internal gains												
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	23.7835	0.7600	0.7000	0.7700	65.5876	(80)
West	1.7600	23.7835	0.7600	0.7000	0.7700	15.4324	(80)

Solar gains	81.0200	140.8292	228.1692	335.8028	395.8111	434.4066	405.9044	355.9037	279.8628	176.2264	99.5150	67.0100 (83)
Total gains	720.6439	778.1231	846.4545	918.7565	943.6137	950.5115	903.3528	856.6161	798.7845	727.4075	689.5188	690.7928 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area	0.9490	0.9223	0.8511	0.7238	0.5575	0.3709	0.2629	0.2914	0.4979	0.7588	0.9119	0.9578	(86)
MIT	20.4239	20.5524	20.7578	20.9126	20.9814	20.9984	20.9998	20.9997	20.9920	20.9064	20.6460	20.3721	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9403	0.9100	0.8301	0.6925	0.5185	0.3289	0.2184	0.2445	0.4500	0.7224	0.8959	0.9504	(89)
MIT 2	19.6790	19.8360	20.0804	20.2532	20.3229	20.3374	20.3383	20.3382	20.3327	20.2506	19.9528	19.6153	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.9120	20.0601	20.2923	20.4594	20.5289	20.5441	20.5452	20.5451	20.5389	20.4558	20.1696	19.8520	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9120	20.0601	20.2923	20.4594	20.5289	20.5441	20.5452	20.5451	20.5389	20.4558	20.1696	19.8520	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9339	0.9042	0.8286	0.6984	0.5298	0.3420	0.2323	0.2592	0.4646	0.7291	0.8914	0.9441	(94)
Useful gains	673.0450	703.5786	701.3423	641.6458	499.9677	325.0775	209.8744	222.0133	371.1353	530.3712	614.6497	652.1881	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	932.9783	905.4425	809.9161	679.9568	507.4882	325.6242	209.9217	222.1021	374.0528	570.0578	771.9758	935.4164	(97)
Space heating kWh	193.3904	135.6525	80.7789	27.5839	5.5952	0.0000	0.0000	0.0000	0.0000	29.5268	113.2748	210.7218	(98a)
Space heating requirement - total per year (kWh/year)												796.5245	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	193.3904	135.6525	80.7789	27.5839	5.5952	0.0000	0.0000	0.0000	0.0000	29.5268	113.2748	210.7218	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												796.5245	
Space heating per m2											(98c) / (4) =	9.1871	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	193.3904	135.6525	80.7789	27.5839	5.5952	0.0000	0.0000	0.0000	0.0000	29.5268	113.2748	210.7218	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	290.0857	203.4788	121.1684	41.3758	8.3928	0.0000	0.0000	0.0000	0.0000	44.2902	169.9122	316.0827	
Space heating requirement													
	290.0857	203.4788	121.1684	41.3758	8.3928	0.0000	0.0000	0.0000	0.0000	44.2902	169.9122	316.0827	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1194.7867	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4127.5010	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	11.9479	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5572.1084	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1194.7867	6.5500	78.2585	(340a)
Space heating total			78.2585	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Total energy cost			523.6339	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1419.2767	0.1579	50.2948	(367)
Electrical energy for heat distribution (space & water)	11.9479	0.0000	7.7017	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			213.0809	(373)
Space and water heating			213.0809	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Total CO2, kg/year			248.9495	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1419.2767	1.5844	504.7916	(467)
Electrical energy for heat distribution (space & water)	11.9479	0.0000	81.7089	(472)
Overall CO2 factor for heat network			0.4247	(486)
Total CO2 associated with community systems			2260.6131	(473)
Space and water heating			2260.6131	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Total Primary energy kWh/year			2643.0919	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Be Clean

Current energy efficiency rating: B 83
Current environmental impact rating: A 97

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 83
Potential environmental impact rating: A 97

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)

Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£71	£71	£0
Community scheme	£453	£453	£0
Space heating	£192	£192	£0
Water heating	£270	£270	£0
Lighting	£62	£62	£0
Total cost of fuels	£524	£524	£0
Total cost of uses	£524	£524	£0
Delivered energy	64 kWh/m²	64 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	3 kg/m²	3 kg/m²	0 kg/m²
Primary energy	30 kWh/m²	30 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15049.3300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		173.5794	(35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	25.8827	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778	(42)
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	706.5297	768.1759	833.8294	897.3119	933.0604	910.4848	872.9142	823.2320	769.6084	706.4837	673.4276	678.8029	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	

util living area													
	0.9560	0.9306	0.8713	0.7540	0.5919	0.4261	0.3068	0.3399	0.5376	0.7983	0.9267	0.9634	(86)
MIT	20.3751	20.5139	20.7132	20.8892	20.9738	20.9964	20.9995	20.9992	20.9878	20.8726	20.5928	20.3248	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house													
	0.9485	0.9194	0.8526	0.7244	0.5538	0.3829	0.2608	0.2913	0.4890	0.7654	0.9131	0.9570	(89)
MIT 2	19.6185	19.7890	20.0283	20.2283	20.3157	20.3359	20.3382	20.3380	20.3294	20.2150	19.8890	19.5562	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8552	20.0157	20.2426	20.4350	20.5216	20.5425	20.5450	20.5448	20.5354	20.4207	20.1091	19.7966	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8552	20.0157	20.2426	20.4350	20.5216	20.5425	20.5450	20.5448	20.5354	20.4207	20.1091	19.7966	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9421	0.9134	0.8497	0.7288	0.5645	0.3963	0.2752	0.3065	0.5036	0.7697	0.9078	0.9508	(94)
Useful gains	665.6232	701.6258	708.4743	654.0033	526.6868	360.8043	240.2441	252.3055	387.5770	543.7723	611.3326	645.4182	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	947.7957	921.0206	837.3507	702.8419	537.5093	362.0852	240.3757	252.5470	392.1155	598.3872	792.6626	950.3189	(97)
Space heating kWh													
	209.9363	147.4333	95.8841	35.1638	8.0519	0.0000	0.0000	0.0000	0.0000	40.6336	130.5576	226.8461	(98a)
Space heating requirement - total per year (kWh/year)												894.5067	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	209.9363	147.4333	95.8841	35.1638	8.0519	0.0000	0.0000	0.0000	0.0000	40.6336	130.5576	226.8461	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												894.5067	
Space heating per m2											(98c) / (4) =	10.3173	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	209.9363	147.4333	95.8841	35.1638	8.0519	0.0000	0.0000	0.0000	0.0000	40.6336	130.5576	226.8461	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	314.9045	221.1499	143.8261	52.7457	12.0779	0.0000	0.0000	0.0000	0.0000	60.9503	195.8364	340.2692	
Space heating requirement													
	314.9045	221.1499	143.8261	52.7457	12.0779	0.0000	0.0000	0.0000	0.0000	60.9503	195.8364	340.2692	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1341.7601	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												13.4176	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5719.0818	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	1341.7601	4.4400	59.5741	(340a)
Space heating total			59.5741	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Total energy cost			376.0306	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0279	(357)
SAP value		83.3382	
SAP rating (Section 12)		83	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1458.4696	0.1574	56.3147	(367)
Electrical energy for heat distribution (space & water)	13.4176	0.0000	7.9275	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			219.3265	(373)
Space and water heating			219.3265	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Total CO2, kg/year			255.1951	(383)
CO2 emissions per m2			2.9400	(384)
EI value			97.4035	(384a)
EI rating			97	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5778 (42)
Hot water usage for mixer showers	67.4410 66.4275 64.9507 62.1249 60.0396 57.7140 56.3922 57.8579 59.4646 61.9615 64.8480	67.1826 (42a)
Hot water usage for baths	29.1251 28.6925 28.0834 26.9603 26.1193 25.1868 24.6831 25.2880 25.9466 26.9444 28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293 39.5373 38.0453 36.5534 35.0614 33.5694 33.5694 35.0614 36.5534 38.0453 39.5373	41.0293 (42c)
Average daily hot water use (litres/day)		126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
									Total per year (kWh/year) = Sum(64)m =			2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	23.7835	0.7600	0.7000	0.7700	65.5876	(80)
West	1.7600	23.7835	0.7600	0.7000	0.7700	15.4324	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	81.0200	140.8292	228.1692	335.8028	395.8111	434.4066	405.9044	355.9037	279.8628	176.2264	99.5150	67.0100	(83)
Total gains	720.6439	778.1231	846.4545	918.7565	943.6137	950.5115	903.3528	856.6161	798.7845	727.4075	689.5188	690.7928	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area	0.9490	0.9223	0.8511	0.7238	0.5575	0.3709	0.2629	0.2914	0.4979	0.7588	0.9119	0.9578	(86)
MIT	20.4239	20.5524	20.7578	20.9126	20.9814	20.9984	20.9998	20.9997	20.9920	20.9064	20.6460	20.3721	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9403	0.9100	0.8301	0.6925	0.5185	0.3289	0.2184	0.2445	0.4500	0.7224	0.8959	0.9504	(89)
MIT 2	19.6790	19.8360	20.0804	20.2532	20.3229	20.3374	20.3383	20.3382	20.3327	20.2506	19.9528	19.6153	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.9120	20.0601	20.2923	20.4594	20.5289	20.5441	20.5452	20.5451	20.5389	20.4558	20.1696	19.8520	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9120	20.0601	20.2923	20.4594	20.5289	20.5441	20.5452	20.5451	20.5389	20.4558	20.1696	19.8520	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9339	0.9042	0.8286	0.6984	0.5298	0.3420	0.2323	0.2592	0.4646	0.7291	0.8914	0.9441	(94)
Useful gains	673.0450	703.5786	701.3423	641.6458	499.9677	325.0775	209.8744	222.0133	371.1353	530.3712	614.6497	652.1881	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	932.9783	905.4425	809.9161	679.9568	507.4882	325.6242	209.9217	222.1021	374.0528	570.0578	771.9758	935.4164	(97)
Space heating kWh	193.3904	135.6525	80.7789	27.5839	5.5952	0.0000	0.0000	0.0000	0.0000	29.5268	113.2748	210.7218	(98a)
Space heating requirement - total per year (kWh/year)												796.5245	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	193.3904	135.6525	80.7789	27.5839	5.5952	0.0000	0.0000	0.0000	0.0000	29.5268	113.2748	210.7218	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												796.5245	
Space heating per m2											(98c) / (4) =	9.1871	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	193.3904	135.6525	80.7789	27.5839	5.5952	0.0000	0.0000	0.0000	0.0000	29.5268	113.2748	210.7218	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	290.0857	203.4788	121.1684	41.3758	8.3928	0.0000	0.0000	0.0000	0.0000	44.2902	169.9122	316.0827	
Space heating requirement	290.0857	203.4788	121.1684	41.3758	8.3928	0.0000	0.0000	0.0000	0.0000	44.2902	169.9122	316.0827	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1194.7867	(307)
Space heating fuel - secondary												0.0000	(309)

Water heating fuel - community heating	4127.5010	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	11.9479	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5572.1084	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1194.7867	6.5500	78.2585	(340a)
Space heating total			78.2585	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Total energy cost			523.6339	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1419.2767	0.1579	50.2948	(367)
Electrical energy for heat distribution (space & water)	11.9479	0.0000	7.7017	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			213.0809	(373)
Space and water heating			213.0809	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Total CO2, kg/year			248.9495	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1419.2767	1.5844	504.7916	(467)
Electrical energy for heat distribution (space & water)	11.9479	0.0000	81.7089	(472)
Overall CO2 factor for heat network			0.4247	(486)
Total CO2 associated with community systems			2260.6131	(473)
Space and water heating			2260.6131	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Total Primary energy kWh/year			2643.0919	(483)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.62	**TER**	10.21
Environmental	99 A	**% DER < TER**			84.13
CO_2 Emissions (t/year)	0.12	**DFEE**	19.03	**TFEE**	23.52
Compliance Check	See BREL	**% DFEE < TFEE**			19.08
% DPER < TPER	61.13	**DPER**	21.12	**TPER**	54.33

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674 (64)
12Total per year (kWh/year)												2752 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)

Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201 (83)
Total gains	652.0784	730.2946	789.6905	869.3922	912.9689	904.3786	866.5575	814.6416	757.3995	678.0557	637.1713	628.5612 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area	0.9682	0.9424	0.8912	0.7703	0.6034	0.4289	0.3091	0.3435	0.5456	0.8178	0.9401	0.9735	(86)
MIT	20.2946	20.4652	20.6717	20.8766	20.9712	20.9963	20.9995	20.9991	20.9869	20.8554	20.5471	20.2479	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9625	0.9327	0.8742	0.7411	0.5649	0.3854	0.2627	0.2943	0.4964	0.7861	0.9284	0.9686	(89)
MIT 2	19.5189	19.7301	19.9802	20.2151	20.3135	20.3359	20.3381	20.3379	20.3288	20.1970	19.8342	19.4605	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.7615	19.9600	20.1965	20.4220	20.5192	20.5424	20.5450	20.5448	20.5346	20.4029	20.0572	19.7068	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7615	19.9600	20.1965	20.4220	20.5192	20.5424	20.5450	20.5448	20.5346	20.4029	20.0572	19.7068	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9565	0.9264	0.8703	0.7450	0.5756	0.3989	0.2772	0.3097	0.5112	0.7894	0.9227	0.9629	(94)
Useful gains	623.7347	676.5653	687.2569	647.6685	525.4789	360.7555	240.2383	252.2903	387.1876	535.2616	587.9151	605.2655	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	942.0898	917.6264	834.5437	702.0481	537.3651	362.0795	240.3750	252.5452	392.0693	597.3036	789.4977	944.8481	(97)
Space heating kWh	236.8562	161.9931	109.5814	39.1533	8.8434	0.0000	0.0000	0.0000	0.0000	46.1592	145.1395	252.6494	(98a)
Space heating requirement - total per year (kWh/year)												1000.3755	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	236.8562	161.9931	109.5814	39.1533	8.8434	0.0000	0.0000	0.0000	0.0000	46.1592	145.1395	252.6494	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1000.3755	
Space heating per m2											(98c) / (4) =	11.5384	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	236.8562	161.9931	109.5814	39.1533	8.8434	0.0000	0.0000	0.0000	0.0000	46.1592	145.1395	252.6494	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	355.2843	242.9896	164.3721	58.7300	13.2651	0.0000	0.0000	0.0000	0.0000	69.2389	217.7092	378.9742	
Space heating requirement	355.2843	242.9896	164.3721	58.7300	13.2651	0.0000	0.0000	0.0000	0.0000	69.2389	217.7092	378.9742	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1500.5632	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												15.0056	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4919.6640	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1500.8171	0.1574	62.9737	(367)
Electrical energy for heat distribution (space & water)	15.0056	0.0000	8.1772	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			226.2352	(373)
Space and water heating			226.2352	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			140.6603	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6200	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1500.8171	1.5826	633.2709	(467)
Electrical energy for heat distribution (space & water)	15.0056	0.0000	86.5269	(472)
Overall CO2 factor for heat network			0.4254	(486)
Total CO2 associated with community systems			2393.9104	(473)
Space and water heating			2393.9104	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1830.9671	(483)
Dwelling Primary energy Rate (DPER)			21.1200	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
500mm mineral wool	43.3500		43.3500	0.1100	4.7685			(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2577			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.7700	0.0600	0.4062
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	19.4300	0.1200	2.3316
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1426 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 30.4003 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	70.6867	70.4833	70.2839	69.3475	69.1723	68.3567	68.3567	68.2057	68.6709	69.1723	69.5267	69.8973	(39)
Average = Sum(39)m / 12 =												69.3467	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8153	0.8130	0.8107	0.7999	0.7978	0.7884	0.7884	0.7867	0.7921	0.7978	0.8019	0.8062	(40)
HLP (average)												0.7998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(80)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)
Total gains	634.2986	701.5715	746.4857	809.2850	840.7342	827.5835	792.9978	750.1384	705.1835	645.1554	616.5661	612.8145	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1394	59.3101	59.4783	60.2815	60.4342	61.1552	61.1552	61.2906	60.8754	60.4342	60.1261	59.8073	
alpha	4.9426	4.9540	4.9652	5.0188	5.0289	5.0770	5.0770	5.0860	5.0584	5.0289	5.0084	4.9872	
util living area	0.9780	0.9626	0.9324	0.8486	0.7068	0.5186	0.3776	0.4153	0.6395	0.8760	0.9591	0.9809	(86)
MIT	20.0069	20.1849	20.4265	20.7288	20.9126	20.9852	20.9976	20.9961	20.9592	20.7254	20.3327	19.9815	(87)
Th 2	20.2401	20.2421	20.2441	20.2535	20.2552	20.2634	20.2634	20.2649	20.2602	20.2552	20.2517	20.2480	(88)
util rest of house	0.9736	0.9554	0.9195	0.8222	0.6634	0.4625	0.3152	0.3503	0.5809	0.8482	0.9501	0.9771	(89)
MIT 2	19.0817	19.3064	19.6073	19.9749	20.1773	20.2533	20.2622	20.2630	20.2296	19.9795	19.5015	19.0555	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.3711	19.5812	19.8635	20.2107	20.4073	20.4822	20.4923	20.4923	20.4579	20.2128	19.7615	19.3452	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3711	19.5812	19.8635	20.2107	20.4073	20.4822	20.4923	20.4923	20.4579	20.2128	19.7615	19.3452	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9673	0.9479	0.9121	0.8205	0.6726	0.4794	0.3346	0.3706	0.5971	0.8465	0.9429	0.9713	(94)
Useful gains	613.5639	665.0086	680.8355	664.0567	565.4461	396.7299	265.3698	277.9667	421.0368	546.1054	581.3836	595.2543	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1065.3248	1034.7792	939.2428	784.3688	602.3050	402.0911	266.0617	279.1176	436.5991	664.9400	880.3115	1058.6050	(97)
Space heating kWh	336.1101	248.4859	192.2550	86.6247	27.4230	0.0000	0.0000	0.0000	0.0000	88.4129	215.2280	344.7329	(98a)
Space heating requirement - total per year (kWh/year)												1539.2726	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	336.1101	248.4859	192.2550	86.6247	27.4230	0.0000	0.0000	0.0000	0.0000	88.4129	215.2280	344.7329	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1539.2726	
Space heating per m2											(98c) / (4) =	17.7540	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	336.1101	248.4859	192.2550	86.6247	27.4230	0.0000	0.0000	0.0000	0.0000	88.4129	215.2280	344.7329	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	364.1496	269.2154	208.2936	93.8513	29.7107	0.0000	0.0000	0.0000	0.0000	95.7887	233.1832	373.4918	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.8742	84.4752	83.7639	82.3825	80.8443	79.8000	79.8000	79.8000	79.8000	82.3972	84.1389	84.9536	(217)
Fuel for water heating, kWh/month	275.3264	244.5318	262.0536	234.8094	232.2322	212.3443	209.9929	218.2535	220.5242	237.7128	246.9419	272.1687	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1667.6843	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2866.8916	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3987.8813	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1667.6843	0.2100	350.2137	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2866.8916	0.2100	602.0472	(264)
Space and water heating			952.2610	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			885.3593	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.2100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1667.6843	1.1300	1884.4833	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2866.8916	1.1300	3239.5876	(278)
Space and water heating			5124.0709	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4710.2979	(286)
Target Primary Energy Rate (TPER)			54.3300	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.62	**TER**	10.21
Environmental	99 A	**% DER < TER**			84.13
CO_2 Emissions (t/year)	0.12	**DFEE**	19.03	**TFEE**	23.52
Compliance Check	See BREL	**% DFEE < TFEE**			19.08
% DPER < TPER	61.13	**DPER**	21.12	**TPER**	54.33

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2257	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2878	0.2821	0.2765	0.2483	0.2426	0.2144	0.2144	0.2088	0.2257	0.2426	0.2539	0.2652	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5414	0.5398	0.5382	0.5308	0.5294	0.5230	0.5230	0.5218	0.5255	0.5294	0.5322	0.5352	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15049.3300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							173.5794	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9510	37.8383	37.7278	37.2089	37.1118	36.6599	36.6599	36.5762	36.8339	37.1118	37.3082	37.5135	(38)
Heat transfer coeff	63.8337	63.7210	63.6105	63.0916	62.9945	62.5426	62.5426	62.4589	62.7167	62.9945	63.1909	63.3963	(39)
Average = Sum(39)m / 12 =												63.0912	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7363	0.7350	0.7337	0.7277	0.7266	0.7214	0.7214	0.7204	0.7234	0.7266	0.7288	0.7312	(40)
HLP (average)												0.7277	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =					614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	545.1343	624.6069	686.9038	773.6007	821.2924	817.0482	782.1979	728.3014	668.6668	584.4747	536.9133	522.5689	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.4884	65.6043	65.7182	66.2587	66.3608	66.8404	66.8404	66.9299	66.6548	66.3608	66.1546	65.9403	
alpha	5.3659	5.3736	5.3812	5.4172	5.4241	5.4560	5.4560	5.4620	5.4437	5.4241	5.4103	5.3960	
util living area	0.9864	0.9716	0.9383	0.8385	0.6764	0.4848	0.3510	0.3930	0.6244	0.8882	0.9717	0.9890	(86)

MIT	20.0437	20.2412	20.4967	20.7918	20.9449	20.9924	20.9989	20.9980	20.9724	20.7532	20.3531	20.0061	(87)
Th 2	20.3089	20.3101	20.3112	20.3164	20.3174	20.3220	20.3220	20.3228	20.3202	20.3174	20.3154	20.3133	(88)
util rest of house	0.9837	0.9661	0.9267	0.8125	0.6355	0.4353	0.2973	0.3358	0.5701	0.8632	0.9652	0.9867	(89)
MIT 2	19.4297	19.6246	19.8728	20.1500	20.2794	20.3179	20.3216	20.3221	20.3040	20.1221	19.7407	19.3963	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.6218	19.8175	20.0680	20.3508	20.4876	20.5289	20.5335	20.5335	20.5131	20.3195	19.9322	19.5870	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6218	19.8175	20.0680	20.3508	20.4876	20.5289	20.5335	20.5335	20.5131	20.3195	19.9322	19.5870	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9803	0.9614	0.9221	0.8139	0.6459	0.4505	0.3141	0.3537	0.5859	0.8633	0.9609	0.9837	(94)
Useful gains	534.3937	600.5218	633.3960	629.6398	530.5035	368.0722	245.7026	257.5964	391.7389	504.5545	515.9253	514.0515	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	978.0444	950.5557	863.0678	722.4481	553.5695	370.8085	246.0090	258.1748	402.2069	612.2735	810.8819	975.4807	(97)
Space heating kWh	330.0761	235.2228	170.8758	66.8220	17.1611	0.0000	0.0000	0.0000	0.0000	80.1429	212.3687	343.3033	(98a)
Space heating requirement - total per year (kWh/year)												1455.9728	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	330.0761	235.2228	170.8758	66.8220	17.1611	0.0000	0.0000	0.0000	0.0000	80.1429	212.3687	343.3033	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1455.9728	
Space heating per m2											(98c) / (4) =	16.7932	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	587.9004	462.8152	474.6877	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9622	0.9834	0.9747	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	565.6804	455.1416	462.6958	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	890.8770	853.1757	792.9430	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	234.1415	296.1374	245.7039	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	58.5354	74.0344	61.4260	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												193.9957	(107)
Energy for space heating												16.7932	(99)
Energy for space cooling												2.2376	(108)
Total												19.0308	(109)
Fabric Energy Efficiency (DFEE)												19.0	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
500mm mineral wool	43.3500		43.3500	0.1100	4.7685			(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2577			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.7700	0.0600	0.4062
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	19.4300	0.1200	2.3316
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1426 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.4003 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	70.6867	70.4833	70.2839	69.3475	69.1723	68.3567	68.3567	68.2057	68.6709	69.1723	69.5267	69.8973	(39)
Average = Sum(39)m / 12 =												69.3467	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8153	0.8130	0.8107	0.7999	0.7978	0.7884	0.7884	0.7867	0.7921	0.7978	0.8019	0.8062	(40)
HLP (average)												0.7998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												64.3029	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)

Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)

Water heating gains (Table 5)

49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)

Total internal gains

478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(80)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)
Total gains	533.6898	602.2192	650.0344	719.8289	755.3931	749.5884	717.9735	673.1335	625.7862	557.9097	522.6435	513.1575	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1394	59.3101	59.4783	60.2815	60.4342	61.1552	61.1552	61.2906	60.8754	60.4342	60.1261	59.8073	
alpha	4.9426	4.9540	4.9652	5.0188	5.0289	5.0770	5.0770	5.0860	5.0584	5.0289	5.0084	4.9872	
util living area	0.9891	0.9792	0.9583	0.8907	0.7608	0.5672	0.4160	0.4609	0.7019	0.9203	0.9783	0.9909	(86)
MIT	19.8430	20.0330	20.2967	20.6477	20.8778	20.9780	20.9962	20.9938	20.9383	20.6332	20.1903	19.8168	(87)
Th 2	20.2401	20.2421	20.2441	20.2535	20.2552	20.2634	20.2634	20.2649	20.2602	20.2552	20.2517	20.2480	(88)
util rest of house	0.9867	0.9748	0.9495	0.8689	0.7189	0.5076	0.3477	0.3896	0.6427	0.8994	0.9731	0.9889	(89)
MIT 2	19.1761	19.3652	19.6250	19.9653	20.1684	20.2515	20.2620	20.2624	20.2230	19.9593	19.5296	19.1564	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.3847	19.5741	19.8351	20.1787	20.3903	20.4788	20.4917	20.4912	20.4468	20.1701	19.7363	19.3629	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3847	19.5741	19.8351	20.1787	20.3903	20.4788	20.4917	20.4912	20.4468	20.1701	19.7363	19.3629	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9834	0.9701	0.9439	0.8665	0.7269	0.5254	0.3690	0.4118	0.6583	0.8966	0.9686	0.9860	(94)
Useful gains	524.8327	584.2407	613.5446	623.7020	549.0775	393.8023	264.9348	277.1807	411.9421	500.2349	506.2127	505.9545	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1066.2872	1034.2797	937.2438	782.1511	601.1278	401.8523	266.0207	279.0435	435.8379	661.9873	878.5600	1059.8483	(97)
Space heating kWh	402.8422	302.4263	240.8322	114.0833	38.7255	0.0000	0.0000	0.0000	0.0000	120.3438	268.0900	412.0970	(98a)
Space heating requirement - total per year (kWh/year)												1899.4402	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	402.8422	302.4263	240.8322	114.0833	38.7255	0.0000	0.0000	0.0000	0.0000	120.3438	268.0900	412.0970	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1899.4402	
Space heating per m2											(98c) / (4) =	21.9082	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	642.5530	505.8396	518.3630	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9162	0.9576	0.9415	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	588.7112	484.3929	488.0519	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	812.0280	778.1082	728.4611	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	160.7881	218.5242	178.8644	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	40.1970	54.6310	44.7161	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												139.5442	(107)
Energy for space heating												21.9082	(99)
Energy for space cooling												1.6095	(108)
Total												23.5177	(109)
Fabric Energy Efficiency (TFEE)												23.5	(109)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.62	**TER**	10.21
Environmental	99 A	**% DER < TER**			84.13
CO_2 Emissions (t/year)	0.12	**DFEE**	19.03	**TFEE**	23.52
Compliance Check	See BREL	**% DFEE < TFEE**			19.08
% DPER < TPER	61.13	**DPER**	21.12	**TPER**	54.33

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674 (64)
12Total per year (kWh/year)												2752 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)

Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201 (83)
Total gains	652.0784	730.2946	789.6905	869.3922	912.9689	904.3786	866.5575	814.6416	757.3995	678.0557	637.1713	628.5612 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area	0.9682	0.9424	0.8912	0.7703	0.6034	0.4289	0.3091	0.3435	0.5456	0.8178	0.9401	0.9735	(86)
MIT	20.2946	20.4652	20.6717	20.8766	20.9712	20.9963	20.9995	20.9991	20.9869	20.8554	20.5471	20.2479	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9625	0.9327	0.8742	0.7411	0.5649	0.3854	0.2627	0.2943	0.4964	0.7861	0.9284	0.9686	(89)
MIT 2	19.5189	19.7301	19.9802	20.2151	20.3135	20.3359	20.3381	20.3379	20.3288	20.1970	19.8342	19.4605	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.7615	19.9600	20.1965	20.4220	20.5192	20.5424	20.5450	20.5448	20.5346	20.4029	20.0572	19.7068	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7615	19.9600	20.1965	20.4220	20.5192	20.5424	20.5450	20.5448	20.5346	20.4029	20.0572	19.7068	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9565	0.9264	0.8703	0.7450	0.5756	0.3989	0.2772	0.3097	0.5112	0.7894	0.9227	0.9629	(94)
Useful gains	623.7347	676.5653	687.2569	647.6685	525.4789	360.7555	240.2383	252.2903	387.1876	535.2616	587.9151	605.2655	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	942.0898	917.6264	834.5437	702.0481	537.3651	362.0795	240.3750	252.5452	392.0693	597.3036	789.4977	944.8481	(97)
Space heating kWh	236.8562	161.9931	109.5814	39.1533	8.8434	0.0000	0.0000	0.0000	0.0000	46.1592	145.1395	252.6494	(98a)
Space heating requirement - total per year (kWh/year)												1000.3755	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	236.8562	161.9931	109.5814	39.1533	8.8434	0.0000	0.0000	0.0000	0.0000	46.1592	145.1395	252.6494	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1000.3755	
Space heating per m2											(98c) / (4) =	11.5384	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	236.8562	161.9931	109.5814	39.1533	8.8434	0.0000	0.0000	0.0000	0.0000	46.1592	145.1395	252.6494	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	355.2843	242.9896	164.3721	58.7300	13.2651	0.0000	0.0000	0.0000	0.0000	69.2389	217.7092	378.9742	
Space heating requirement	355.2843	242.9896	164.3721	58.7300	13.2651	0.0000	0.0000	0.0000	0.0000	69.2389	217.7092	378.9742	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1500.5632	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												15.0056	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4919.6640	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1500.8171	0.1574	62.9737	(367)
Electrical energy for heat distribution (space & water)	15.0056	0.0000	8.1772	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			226.2352	(373)
Space and water heating			226.2352	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			140.6603	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6200	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1500.8171	1.5826	633.2709	(467)
Electrical energy for heat distribution (space & water)	15.0056	0.0000	86.5269	(472)
Overall CO2 factor for heat network			0.4254	(486)
Total CO2 associated with community systems			2393.9104	(473)
Space and water heating			2393.9104	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1830.9671	(483)
Dwelling Primary energy Rate (DPER)			21.1200	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
500mm mineral wool	43.3500		43.3500	0.1100	4.7685			(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2577			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.7700	0.0600	0.4062
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	19.4300	0.1200	2.3316
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1426 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 30.4003 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	70.6867	70.4833	70.2839	69.3475	69.1723	68.3567	68.3567	68.2057	68.6709	69.1723	69.5267	69.8973	(39)
Average = Sum(39)m / 12 =												69.3467	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8153	0.8130	0.8107	0.7999	0.7978	0.7884	0.7884	0.7867	0.7921	0.7978	0.8019	0.8062	(40)
HLP (average)												0.7998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(80)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)
Total gains	634.2986	701.5715	746.4857	809.2850	840.7342	827.5835	792.9978	750.1384	705.1835	645.1554	616.5661	612.8145	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1394	59.3101	59.4783	60.2815	60.4342	61.1552	61.1552	61.2906	60.8754	60.4342	60.1261	59.8073	
alpha	4.9426	4.9540	4.9652	5.0188	5.0289	5.0770	5.0770	5.0860	5.0584	5.0289	5.0084	4.9872	
util living area	0.9780	0.9626	0.9324	0.8486	0.7068	0.5186	0.3776	0.4153	0.6395	0.8760	0.9591	0.9809	(86)
MIT	20.0069	20.1849	20.4265	20.7288	20.9126	20.9852	20.9976	20.9961	20.9592	20.7254	20.3327	19.9815	(87)
Th 2	20.2401	20.2421	20.2441	20.2535	20.2552	20.2634	20.2634	20.2649	20.2602	20.2552	20.2517	20.2480	(88)
util rest of house	0.9736	0.9554	0.9195	0.8222	0.6634	0.4625	0.3152	0.3503	0.5809	0.8482	0.9501	0.9771	(89)
MIT 2	19.0817	19.3064	19.6073	19.9749	20.1773	20.2533	20.2622	20.2630	20.2296	19.9795	19.5015	19.0555	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.3711	19.5812	19.8635	20.2107	20.4073	20.4822	20.4923	20.4923	20.4579	20.2128	19.7615	19.3452	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3711	19.5812	19.8635	20.2107	20.4073	20.4822	20.4923	20.4923	20.4579	20.2128	19.7615	19.3452	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9673	0.9479	0.9121	0.8205	0.6726	0.4794	0.3346	0.3706	0.5971	0.8465	0.9429	0.9713	(94)
Useful gains	613.5639	665.0086	680.8355	664.0567	565.4461	396.7299	265.3698	277.9667	421.0368	546.1054	581.3836	595.2543	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1065.3248	1034.7792	939.2428	784.3688	602.3050	402.0911	266.0617	279.1176	436.5991	664.9400	880.3115	1058.6050	(97)
Space heating kWh	336.1101	248.4859	192.2550	86.6247	27.4230	0.0000	0.0000	0.0000	0.0000	88.4129	215.2280	344.7329	(98a)
Space heating requirement - total per year (kWh/year)												1539.2726	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	336.1101	248.4859	192.2550	86.6247	27.4230	0.0000	0.0000	0.0000	0.0000	88.4129	215.2280	344.7329	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1539.2726	
Space heating per m2											(98c) / (4) =	17.7540	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	336.1101	248.4859	192.2550	86.6247	27.4230	0.0000	0.0000	0.0000	0.0000	88.4129	215.2280	344.7329	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	364.1496	269.2154	208.2936	93.8513	29.7107	0.0000	0.0000	0.0000	0.0000	95.7887	233.1832	373.4918	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.8742	84.4752	83.7639	82.3825	80.8443	79.8000	79.8000	79.8000	79.8000	82.3972	84.1389	84.9536	(217)
Fuel for water heating, kWh/month	275.3264	244.5318	262.0536	234.8094	232.2322	212.3443	209.9929	218.2535	220.5242	237.7128	246.9419	272.1687	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1667.6843	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2866.8916	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3987.8813	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1667.6843	0.2100	350.2137	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2866.8916	0.2100	602.0472	(264)
Space and water heating			952.2610	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			885.3593	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.2100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1667.6843	1.1300	1884.4833	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2866.8916	1.1300	3239.5876	(278)
Space and water heating			5124.0709	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4710.2979	(286)
Target Primary Energy Rate (TPER)			54.3300	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.62	**TER**	10.21
Environmental	99 A	**% DER < TER**			84.13
CO_2 Emissions (t/year)	0.12	**DFEE**	19.03	**TFEE**	23.52
Compliance Check	See BREL	**% DFEE < TFEE**			19.08
% DPER < TPER	61.13	**DPER**	21.12	**TPER**	54.33

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	706.5297	768.1759	833.8294	897.3119	933.0604	910.4848	872.9142	823.2320	769.6084	706.4837	673.4276	678.8029	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area													
	0.9560	0.9306	0.8713	0.7540	0.5919	0.4261	0.3068	0.3399	0.5376	0.7983	0.9267	0.9634	(86)
MIT	20.3751	20.5139	20.7132	20.8892	20.9738	20.9964	20.9995	20.9992	20.9878	20.8726	20.5928	20.3248	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house													
	0.9485	0.9194	0.8526	0.7244	0.5538	0.3829	0.2608	0.2913	0.4890	0.7654	0.9131	0.9570	(89)
MIT 2	19.6185	19.7890	20.0283	20.2283	20.3157	20.3359	20.3382	20.3380	20.3294	20.2150	19.8890	19.5562	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8552	20.0157	20.2426	20.4350	20.5216	20.5425	20.5450	20.5448	20.5354	20.4207	20.1091	19.7966	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8552	20.0157	20.2426	20.4350	20.5216	20.5425	20.5450	20.5448	20.5354	20.4207	20.1091	19.7966	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9421	0.9134	0.8497	0.7288	0.5645	0.3963	0.2752	0.3065	0.5036	0.7697	0.9078	0.9508	(94)
Useful gains	665.6232	701.6258	708.4743	654.0033	526.6868	360.8043	240.2441	252.3055	387.5770	543.7723	611.3326	645.4182	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	947.7957	921.0206	837.3507	702.8419	537.5093	362.0852	240.3757	252.5470	392.1155	598.3872	792.6626	950.3189	(97)
Space heating kWh													
	209.9363	147.4333	95.8841	35.1638	8.0519	0.0000	0.0000	0.0000	0.0000	40.6336	130.5576	226.8461	(98a)
Space heating requirement - total per year (kWh/year)												894.5067	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	209.9363	147.4333	95.8841	35.1638	8.0519	0.0000	0.0000	0.0000	0.0000	40.6336	130.5576	226.8461	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												894.5067	
Space heating per m2											(98c) / (4) =	10.3173	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	209.9363	147.4333	95.8841	35.1638	8.0519	0.0000	0.0000	0.0000	0.0000	40.6336	130.5576	226.8461	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	314.9045	221.1499	143.8261	52.7457	12.0779	0.0000	0.0000	0.0000	0.0000	60.9503	195.8364	340.2692	
Space heating requirement													
	314.9045	221.1499	143.8261	52.7457	12.0779	0.0000	0.0000	0.0000	0.0000	60.9503	195.8364	340.2692	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1341.7601	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												13.4176	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4760.8608	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1341.7601	4.4400	59.5741	(340a)
Space heating total			59.5741	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			268.1652	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7330 (357)
SAP value		88.1177
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1458.4696	0.1574	56.3147	(367)
Electrical energy for heat distribution (space & water)	13.4176	0.0000	7.9275	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			219.3265	(373)
Space and water heating			219.3265	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			133.7516	(383)
CO2 emissions per m2			1.5400	(384)
EI value			98.6391	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)

Average = Sum(39)m / 12 = 60.9312

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)											Total = Sum(45)m =	2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)

Total per year (kWh/year) = Sum(64)m = 2751.6674 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	23.7835	0.7600	0.7000	0.7700	65.5876	(80)
West	1.7600	23.7835	0.7600	0.7000	0.7700	15.4324	(80)

Solar gains	81.0200	140.8292	228.1692	335.8028	395.8111	434.4066	405.9044	355.9037	279.8628	176.2264	99.5150	67.0100	(83)
Total gains	720.6439	778.1231	846.4545	918.7565	943.6137	950.5115	903.3528	856.6161	798.7845	727.4075	689.5188	690.7928	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area													
	0.9490	0.9223	0.8511	0.7238	0.5575	0.3709	0.2629	0.2914	0.4979	0.7588	0.9119	0.9578	(86)
MIT	20.4239	20.5524	20.7578	20.9126	20.9814	20.9984	20.9998	20.9997	20.9920	20.9064	20.6460	20.3721	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house													
	0.9403	0.9100	0.8301	0.6925	0.5185	0.3289	0.2184	0.2445	0.4500	0.7224	0.8959	0.9504	(89)
MIT 2	19.6790	19.8360	20.0804	20.2532	20.3229	20.3374	20.3383	20.3382	20.3327	20.2506	19.9528	19.6153	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9120	20.0601	20.2923	20.4594	20.5289	20.5441	20.5452	20.5451	20.5389	20.4558	20.1696	19.8520	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9120	20.0601	20.2923	20.4594	20.5289	20.5441	20.5452	20.5451	20.5389	20.4558	20.1696	19.8520	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9339	0.9042	0.8286	0.6984	0.5298	0.3420	0.2323	0.2592	0.4646	0.7291	0.8914	0.9441	(94)
Useful gains	673.0450	703.5786	701.3423	641.6458	499.9677	325.0775	209.8744	222.0133	371.1353	530.3712	614.6497	652.1881	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	932.9783	905.4425	809.9161	679.9568	507.4882	325.6242	209.9217	222.1021	374.0528	570.0578	771.9758	935.4164	(97)
Space heating kWh													
	193.3904	135.6525	80.7789	27.5839	5.5952	0.0000	0.0000	0.0000	0.0000	29.5268	113.2748	210.7218	(98a)
Space heating requirement - total per year (kWh/year)												796.5245	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	193.3904	135.6525	80.7789	27.5839	5.5952	0.0000	0.0000	0.0000	0.0000	29.5268	113.2748	210.7218	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												796.5245	
Space heating per m2											(98c) / (4) =	9.1871	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	193.3904	135.6525	80.7789	27.5839	5.5952	0.0000	0.0000	0.0000	0.0000	29.5268	113.2748	210.7218	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	290.0857	203.4788	121.1684	41.3758	8.3928	0.0000	0.0000	0.0000	0.0000	44.2902	169.9122	316.0827	
Space heating requirement													
	290.0857	203.4788	121.1684	41.3758	8.3928	0.0000	0.0000	0.0000	0.0000	44.2902	169.9122	316.0827	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)

Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year	
Space heating fuel - community heating	1194.7867 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	11.9479 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)	
mechanical ventilation fans (SFP = 0.1292)	33.4924 (330a)
Total electricity for the above, kWh/year	33.4924 (331)
Electricity for lighting (calculated in Appendix L)	216.3282 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4517.3614 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1194.7867	6.5500	78.2585	(340a)
Space heating total			78.2585	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			341.5636	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1419.2767	0.1579	50.2948	(367)
Electrical energy for heat distribution (space & water)	11.9479	0.0000	7.7017	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			213.0809	(373)
Space and water heating			213.0809	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			115.2479	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1419.2767	1.5844	504.7916	(467)
Electrical energy for heat distribution (space & water)	11.9479	0.0000	81.7089	(472)
Overall CO2 factor for heat network			0.4247	(486)
Total CO2 associated with community systems			2260.6131	(473)
Space and water heating			2260.6131	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1616.7779	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Be Green

Current energy efficiency rating: B 88
Current environmental impact rating: A 99

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£71	£71	£0
Community scheme	£453	£453	£0
Space heating	£192	£192	£0
Water heating	£270	£270	£0
Lighting	£62	£62	£0
Generated (PV)	-£182	-£182	£0
Total cost of fuels	£342	£342	£0
Total cost of uses	£342	£342	£0
Delivered energy	52 kWh/m²	52 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	19 kWh/m²	19 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5778 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day)	126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	706.5297	768.1759	833.8294	897.3119	933.0604	910.4848	872.9142	823.2320	769.6084	706.4837	673.4276	678.8029	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area	0.9560	0.9306	0.8713	0.7540	0.5919	0.4261	0.3068	0.3399	0.5376	0.7983	0.9267	0.9634	(86)
MIT	20.3751	20.5139	20.7132	20.8892	20.9738	20.9964	20.9995	20.9992	20.9878	20.8726	20.5928	20.3248	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9485	0.9194	0.8526	0.7244	0.5538	0.3829	0.2608	0.2913	0.4890	0.7654	0.9131	0.9570	(89)
MIT 2	19.6185	19.7890	20.0283	20.2283	20.3157	20.3359	20.3382	20.3380	20.3294	20.2150	19.8890	19.5562	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8552	20.0157	20.2426	20.4350	20.5216	20.5425	20.5450	20.5448	20.5354	20.4207	20.1091	19.7966	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8552	20.0157	20.2426	20.4350	20.5216	20.5425	20.5450	20.5448	20.5354	20.4207	20.1091	19.7966	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9421	0.9134	0.8497	0.7288	0.5645	0.3963	0.2752	0.3065	0.5036	0.7697	0.9078	0.9508	(94)
Useful gains	665.6232	701.6258	708.4743	654.0033	526.6868	360.8043	240.2441	252.3055	387.5770	543.7723	611.3326	645.4182	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	947.7957	921.0206	837.3507	702.8419	537.5093	362.0852	240.3757	252.5470	392.1155	598.3872	792.6626	950.3189	(97)
Space heating kWh	209.9363	147.4333	95.8841	35.1638	8.0519	0.0000	0.0000	0.0000	0.0000	40.6336	130.5576	226.8461	(98a)
Space heating requirement - total per year (kWh/year)												894.5067	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	209.9363	147.4333	95.8841	35.1638	8.0519	0.0000	0.0000	0.0000	0.0000	40.6336	130.5576	226.8461	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												894.5067	
Space heating per m2										(98c) / (4) =		10.3173	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	209.9363	147.4333	95.8841	35.1638	8.0519	0.0000	0.0000	0.0000	0.0000	40.6336	130.5576	226.8461	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	314.9045	221.1499	143.8261	52.7457	12.0779	0.0000	0.0000	0.0000	0.0000	60.9503	195.8364	340.2692	
Space heating requirement													
	314.9045	221.1499	143.8261	52.7457	12.0779	0.0000	0.0000	0.0000	0.0000	60.9503	195.8364	340.2692	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1341.7601	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)

Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	13.4176	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4760.8608	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1341.7601	4.4400	59.5741	(340a)
Space heating total			59.5741	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			268.1652	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.7330	(357)
SAP value	88.1177	
SAP rating (Section 12)	88	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1458.4696	0.1574	56.3147	(367)
Electrical energy for heat distribution (space & water)	13.4176	0.0000	7.9275	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			219.3265	(373)
Space and water heating			219.3265	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			133.7516	(383)
CO2 emissions per m2			1.5400	(384)
EI value			98.6391	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5778	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	23.7835	0.7600	0.7000	0.7700	65.5876	(80)
West	1.7600	23.7835	0.7600	0.7000	0.7700	15.4324	(80)

Solar gains	81.0200	140.8292	228.1692	335.8028	395.8111	434.4066	405.9044	355.9037	279.8628	176.2264	99.5150	67.0100	(83)
Total gains	720.6439	778.1231	846.4545	918.7565	943.6137	950.5115	903.3528	856.6161	798.7845	727.4075	689.5188	690.7928	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area													
	0.9490	0.9223	0.8511	0.7238	0.5575	0.3709	0.2629	0.2914	0.4979	0.7588	0.9119	0.9578	(86)
MIT	20.4239	20.5524	20.7578	20.9126	20.9814	20.9984	20.9998	20.9997	20.9920	20.9064	20.6460	20.3721	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house													
	0.9403	0.9100	0.8301	0.6925	0.5185	0.3289	0.2184	0.2445	0.4500	0.7224	0.8959	0.9504	(89)
MIT 2	19.6790	19.8360	20.0804	20.2532	20.3229	20.3374	20.3383	20.3382	20.3327	20.2506	19.9528	19.6153	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9120	20.0601	20.2923	20.4594	20.5289	20.5441	20.5452	20.5451	20.5389	20.4558	20.1696	19.8520	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9120	20.0601	20.2923	20.4594	20.5289	20.5441	20.5452	20.5451	20.5389	20.4558	20.1696	19.8520	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9339	0.9042	0.8286	0.6984	0.5298	0.3420	0.2323	0.2592	0.4646	0.7291	0.8914	0.9441	(94)
Useful gains	673.0450	703.5786	701.3423	641.6458	499.9677	325.0775	209.8744	222.0133	371.1353	530.3712	614.6497	652.1881	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	932.9783	905.4425	809.9161	679.9568	507.4882	325.6242	209.9217	222.1021	374.0528	570.0578	771.9758	935.4164	(97)
Space heating kWh													
	193.3904	135.6525	80.7789	27.5839	5.5952	0.0000	0.0000	0.0000	0.0000	29.5268	113.2748	210.7218	(98a)
Space heating requirement - total per year (kWh/year)												796.5245	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	193.3904	135.6525	80.7789	27.5839	5.5952	0.0000	0.0000	0.0000	0.0000	29.5268	113.2748	210.7218	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												796.5245	
Space heating per m2											(98c) / (4) =	9.1871	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement

	193.3904	135.6525	80.7789	27.5839	5.5952	0.0000	0.0000	0.0000	0.0000	29.5268	113.2748	210.7218 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	290.0857	203.4788	121.1684	41.3758	8.3928	0.0000	0.0000	0.0000	0.0000	44.2902	169.9122	316.0827
Space heating requirement												
	290.0857	203.4788	121.1684	41.3758	8.3928	0.0000	0.0000	0.0000	0.0000	44.2902	169.9122	316.0827 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388
Water heating fuel												
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446 (331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year	
Space heating fuel - community heating	1194.7867 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	11.9479 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)	
mechanical ventilation fans (SFP = 0.1292)	33.4924 (330a)
Total electricity for the above, kWh/year	33.4924 (331)
Electricity for lighting (calculated in Appendix L)	216.3282 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4517.3614 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1194.7867	6.5500	78.2585	(340a)
Space heating total			78.2585	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			341.5636	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1419.2767	0.1579	50.2948	(367)
Electrical energy for heat distribution (space & water)	11.9479	0.0000	7.7017	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			213.0809	(373)
Space and water heating			213.0809	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			115.2479	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)

Space and Water heating from Heat pump	1419.2767	1.5844	504.7916 (467)
Electrical energy for heat distribution (space & water)	11.9479	0.0000	81.7089 (472)
Overall CO2 factor for heat network			0.4247 (486)
Total CO2 associated with community systems			2260.6131 (473)
Space and water heating			2260.6131 (476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673 (478)
Energy for lighting	216.3282	1.5338	331.8115 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405
PV Unit electricity exported	-520.7528	0.4449	-231.6735
Total			-1026.3140 (480)
Total Primary energy kWh/year			1616.7779 (483)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	9.82	**TER**	10.59
Environmental	92 A	**% DER < TER**			7.27
CO_2 Emissions (t/year)	0.8	**DFEE**	19.03	**TFEE**	23.52
Compliance Check	See BREL	**% DFEE < TFEE**			19.08
% DPER < TPER	1.02	**DPER**	55.79	**TPER**	56.37

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2796	12.8855	14.2401	13.7256	14.1482	13.6565	14.0893	14.1078	13.6737	14.1700	13.7658	14.2723	(61)
Total heat required for water heating calculated for each month	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
										Total per year (kWh/year) = Sum(64)m =		2267.8420	(64)
12Total per year (kWh/year)												2268	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	76.0275	66.9783	70.5469	60.6190	57.7963	51.0327	49.6244	52.1934	53.4246	60.8228	66.1962	75.0165	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	102.1874	99.6702	94.8210	84.1931	77.6833	70.8788	66.6995	70.1525	74.2008	81.7511	91.9392	100.8286	(72)
Total internal gains	533.5334	547.7688	522.4940	503.3624	476.0278	455.3032	436.3887	437.4252	452.0232	471.0771	502.0899	521.8995	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	600.4392	678.6509	738.0381	817.7206	861.2856	849.6831	811.8544	759.9447	702.7099	626.3797	585.5137	576.9196	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739

util living area													
	0.9776	0.9566	0.9129	0.8008	0.6346	0.4557	0.3298	0.3679	0.5841	0.8528	0.9567	0.9817	(86)
MIT	20.2136	20.3940	20.6169	20.8494	20.9633	20.9950	20.9993	20.9988	20.9818	20.8182	20.4762	20.1647	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house													
	0.9734	0.9489	0.8983	0.7729	0.5952	0.4098	0.2804	0.3154	0.5327	0.8240	0.9477	0.9782	(89)
MIT 2	19.4178	19.6429	19.9159	20.1861	20.3063	20.3349	20.3381	20.3378	20.3248	20.1574	19.7483	19.3563	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.6667	19.8778	20.1352	20.3936	20.5118	20.5414	20.5449	20.5445	20.5303	20.3641	19.9760	19.6092	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.5167	19.7278	19.9852	20.2436	20.3618	20.3914	20.3949	20.3945	20.3803	20.2141	19.8260	19.4592	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9668	0.9404	0.8895	0.7686	0.5967	0.4135	0.2846	0.3199	0.5360	0.8181	0.9392	0.9723	(94)
Useful gains	580.5107	638.2186	656.4602	628.5299	513.8890	351.3326	231.0770	243.1004	376.6685	512.4420	549.9413	560.9101	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	927.1710	903.4782	821.6681	691.1783	527.7749	352.8769	231.2278	243.3907	382.6674	585.7974	775.4093	929.7606	(97)
Space heating kWh	257.9153	178.2544	122.9147	45.1068	10.3311	0.0000	0.0000	0.0000	0.0000	54.5764	162.3370	274.4248	(98a)
Space heating requirement - total per year (kWh/year)												1105.8606	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	257.9153	178.2544	122.9147	45.1068	10.3311	0.0000	0.0000	0.0000	0.0000	54.5764	162.3370	274.4248	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1105.8606	
Space heating per m2											(98c) / (4) =	12.7550	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	257.9153	178.2544	122.9147	45.1068	10.3311	0.0000	0.0000	0.0000	0.0000	54.5764	162.3370	274.4248	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	289.7925	200.2859	138.1064	50.6818	11.6080	0.0000	0.0000	0.0000	0.0000	61.3218	182.4011	308.3424	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.1864	88.0833	87.9095	87.6271	87.3919	87.3000	87.3000	87.3000	87.3000	87.6792	88.0483	88.2183	(217)
Fuel for water heating, kWh/month	263.3025	232.3208	245.3707	211.9419	202.9182	179.6911	174.9625	183.8181	187.9361	212.6406	229.9895	259.7587	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.1487	9.1665	10.1487	9.8213	10.1487	9.8213	10.1487	10.1487	9.8213	10.1487	9.8213	10.1487	(231)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1242.5400	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.3000	
Water heating fuel used												2584.6508	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												119.4924	(231)
Electricity for lighting (calculated in Appendix L)												216.3282	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)

Total delivered energy for all uses 4163.0115 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1242.5400	0.2100	260.9334	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2584.6508	0.2100	542.7767	(264)
Space and water heating			803.7101	(265)
Pumps, fans and electric keep-hot	119.4924	0.1387	16.5751	(267)
Energy for lighting	216.3282	0.1443	31.2229	(268)
Total CO2, kg/year			851.5080	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.8200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1242.5400	1.1300	1404.0702	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2584.6508	1.1300	2920.6555	(278)
Space and water heating			4324.7256	(279)
Pumps, fans and electric keep-hot	119.4924	1.5128	180.7681	(281)
Energy for lighting	216.3282	1.5338	331.8115	(282)
Total Primary energy kWh/year			4837.3052	(286)
Dwelling Primary energy Rate (DPER)			55.7900	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
500mm mineral wool	43.3500		43.3500	0.1100	4.7685			(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2577			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.7700	0.0600	0.4062
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	19.4300	0.1200	2.3316
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1426 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 30.4003 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	70.6867	70.4833	70.2839	69.3475	69.1723	68.3567	68.3567	68.2057	68.6709	69.1723	69.5267	69.8973	(39)
Average = Sum(39)m / 12 =												69.3467	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8153	0.8130	0.8107	0.7999	0.7978	0.7884	0.7884	0.7867	0.7921	0.7978	0.8019	0.8062	(40)
HLP (average)												0.7998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)											Total = Sum(45)m =	2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	268.8764	237.7777	252.4231	221.3080	214.1447	192.5289	189.6118	197.3242	199.7096	223.2306	238.0513	265.8413	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	238.0452	210.5103	223.8702	197.6651	192.1104	173.6740	171.9383	178.5303	180.2015	200.2327	211.9975	235.5810	(64)
										Total per year (kWh/year) = Sum(64)m =		2414.3567	(64)
12Total per year (kWh/year)												2414	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	85.1973	75.2638	79.7266	69.5164	66.9990	59.9474	58.8418	61.4062	62.3349	70.0200	75.0836	84.1881	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	114.5125	111.9997	107.1594	96.5506	90.0524	83.2602	79.0885	82.5352	86.5763	94.1130	104.2827	113.1561	(72)
Total internal gains	545.8584	560.0984	534.8323	515.7198	488.3970	467.6846	448.7777	449.8079	464.3987	483.4390	514.4334	534.2270	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(80)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)

Total gains	601.3198	668.5927	713.5070	776.3062	807.7554	794.6048	760.0190	717.1596	672.2047	612.1767	583.5873	579.8358	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1394	59.3101	59.4783	60.2815	60.4342	61.1552	61.1552	61.2906	60.8754	60.4342	60.1261	59.8073	
alpha	4.9426	4.9540	4.9652	5.0188	5.0289	5.0770	5.0770	5.0860	5.0584	5.0289	5.0084	4.9872	
util living area													
	0.9822	0.9688	0.9420	0.8645	0.7273	0.5383	0.3936	0.4338	0.6646	0.8936	0.9667	0.9848	(86)
MIT	19.9542	20.1359	20.3841	20.7010	20.9005	20.9826	20.9971	20.9953	20.9517	20.6930	20.2843	19.9279	(87)
Th 2	20.2401	20.2421	20.2441	20.2535	20.2552	20.2634	20.2634	20.2649	20.2602	20.2552	20.2517	20.2480	(88)
util rest of house													
	0.9786	0.9626	0.9305	0.8397	0.6842	0.4806	0.3287	0.3661	0.6055	0.8682	0.9591	0.9817	(89)
MIT 2	19.0154	19.2456	19.5561	19.9440	20.1659	20.2514	20.2620	20.2625	20.2235	19.9436	19.4419	18.9880	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.3091	19.5241	19.8151	20.1808	20.3957	20.4801	20.4919	20.4917	20.4513	20.1780	19.7054	19.2820	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3091	19.5241	19.8151	20.1808	20.3957	20.4801	20.4919	20.4917	20.4513	20.1780	19.7054	19.2820	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9729	0.9555	0.9229	0.8370	0.6927	0.4979	0.3489	0.3872	0.6213	0.8653	0.9523	0.9765	(94)
Useful gains	585.0206	638.8140	658.5198	649.7991	559.5379	395.6029	265.1998	277.6720	417.6280	529.7012	555.7278	566.2200	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1060.9414	1030.7537	935.8373	782.2935	601.5006	401.9457	266.0394	279.0792	436.1485	662.5317	876.4146	1054.1923	(97)
Space heating kWh													
	354.0851	263.3835	206.3242	95.3960	31.2203	0.0000	0.0000	0.0000	0.0000	98.8259	230.8945	363.0514	(98a)
Space heating requirement - total per year (kWh/year)												1643.1809	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	354.0851	263.3835	206.3242	95.3960	31.2203	0.0000	0.0000	0.0000	0.0000	98.8259	230.8945	363.0514	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1643.1809	
Space heating per m2											(98c) / (4) =	18.9525	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	354.0851	263.3835	206.3242	95.3960	31.2203	0.0000	0.0000	0.0000	0.0000	98.8259	230.8945	363.0514	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	383.2089	285.0471	223.2946	103.2424	33.7882	0.0000	0.0000	0.0000	0.0000	106.9544	249.8858	392.9128	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	238.0452	210.5103	223.8702	197.6651	192.1104	173.6740	171.9383	178.5303	180.2015	200.2327	211.9975	235.5810	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.2304	84.8627	84.2069	82.9108	81.4008	80.3000	80.3000	80.3000	80.3000	82.9518	84.5648	85.3047	(217)
Fuel for water heating, kWh/month													
	279.2961	248.0599	265.8574	238.4069	236.0055	216.2814	214.1200	222.3291	224.4104	241.3845	250.6923	276.1642	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1778.3343	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2913.0078	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												224.3782	(232)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4144.6474	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1778.3343	0.2100	373.4502	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2913.0078	0.2100	611.7316	(264)
Space and water heating			985.1818	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			918.2801	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.5900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1778.3343	1.1300	2009.5177	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2913.0078	1.1300	3291.6988	(278)
Space and water heating			5301.2165	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4887.4436	(286)
Target Primary Energy Rate (TPER)			56.3700	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	9.82	**TER**	10.59
Environmental	92 A	**% DER < TER**			7.27
CO_2 Emissions (t/year)	0.8	**DFEE**	19.03	**TFEE**	23.52
Compliance Check	See BREL	**% DFEE < TFEE**			19.08
% DPER < TPER	1.02	**DPER**	55.79	**TPER**	56.37

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2257	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2878	0.2821	0.2765	0.2483	0.2426	0.2144	0.2144	0.2088	0.2257	0.2426	0.2539	0.2652	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5414	0.5398	0.5382	0.5308	0.5294	0.5230	0.5230	0.5218	0.5255	0.5294	0.5322	0.5352	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15049.3300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							173.5794	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9510	37.8383	37.7278	37.2089	37.1118	36.6599	36.6599	36.5762	36.8339	37.1118	37.3082	37.5135	(38)
Heat transfer coeff	63.8337	63.7210	63.6105	63.0916	62.9945	62.5426	62.5426	62.4589	62.7167	62.9945	63.1909	63.3963	(39)
Average = Sum(39)m / 12 =												63.0912	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7363	0.7350	0.7337	0.7277	0.7266	0.7214	0.7214	0.7204	0.7234	0.7266	0.7288	0.7312	(40)
HLP (average)												0.7277	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =					614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	545.1343	624.6069	686.9038	773.6007	821.2924	817.0482	782.1979	728.3014	668.6668	584.4747	536.9133	522.5689	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.4884	65.6043	65.7182	66.2587	66.3608	66.8404	66.8404	66.9299	66.6548	66.3608	66.1546	65.9403	
alpha	5.3659	5.3736	5.3812	5.4172	5.4241	5.4560	5.4560	5.4620	5.4437	5.4241	5.4103	5.3960	
util living area	0.9864	0.9716	0.9383	0.8385	0.6764	0.4848	0.3510	0.3930	0.6244	0.8882	0.9717	0.9890	(86)

MIT	20.0437	20.2412	20.4967	20.7918	20.9449	20.9924	20.9989	20.9980	20.9724	20.7532	20.3531	20.0061	(87)
Th 2	20.3089	20.3101	20.3112	20.3164	20.3174	20.3220	20.3220	20.3228	20.3202	20.3174	20.3154	20.3133	(88)
util rest of house	0.9837	0.9661	0.9267	0.8125	0.6355	0.4353	0.2973	0.3358	0.5701	0.8632	0.9652	0.9867	(89)
MIT 2	19.4297	19.6246	19.8728	20.1500	20.2794	20.3179	20.3216	20.3221	20.3040	20.1221	19.7407	19.3963	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.6218	19.8175	20.0680	20.3508	20.4876	20.5289	20.5335	20.5335	20.5131	20.3195	19.9322	19.5870	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6218	19.8175	20.0680	20.3508	20.4876	20.5289	20.5335	20.5335	20.5131	20.3195	19.9322	19.5870	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9803	0.9614	0.9221	0.8139	0.6459	0.4505	0.3141	0.3537	0.5859	0.8633	0.9609	0.9837	(94)
Useful gains	534.3937	600.5218	633.3960	629.6398	530.5035	368.0722	245.7026	257.5964	391.7389	504.5545	515.9253	514.0515	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	978.0444	950.5557	863.0678	722.4481	553.5695	370.8085	246.0090	258.1748	402.2069	612.2735	810.8819	975.4807	(97)
Space heating kWh	330.0761	235.2228	170.8758	66.8220	17.1611	0.0000	0.0000	0.0000	0.0000	80.1429	212.3687	343.3033	(98a)
Space heating requirement - total per year (kWh/year)												1455.9728	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	330.0761	235.2228	170.8758	66.8220	17.1611	0.0000	0.0000	0.0000	0.0000	80.1429	212.3687	343.3033	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1455.9728	
Space heating per m2											(98c) / (4) =	16.7932	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	587.9004	462.8152	474.6877	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9622	0.9834	0.9747	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	565.6804	455.1416	462.6958	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	890.8770	853.1757	792.9430	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	234.1415	296.1374	245.7039	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	58.5354	74.0344	61.4260	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												193.9957	(107)
Energy for space heating												16.7932	(99)
Energy for space cooling												2.2376	(108)
Total												19.0308	(109)
Fabric Energy Efficiency (DFEE)												19.0	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
500mm mineral wool	43.3500		43.3500	0.1100	4.7685			(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2577			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.7700	0.0600	0.4062
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	19.4300	0.1200	2.3316
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1426 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.4003 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	70.6867	70.4833	70.2839	69.3475	69.1723	68.3567	68.3567	68.2057	68.6709	69.1723	69.5267	69.8973	(39)
Average = Sum(39)m / 12 =												69.3467	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8153	0.8130	0.8107	0.7999	0.7978	0.7884	0.7884	0.7867	0.7921	0.7978	0.8019	0.8062	(40)
HLP (average)												0.7998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												64.3029	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)

Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)

Water heating gains (Table 5)

49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)

Total internal gains

478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(80)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)
Total gains	533.6898	602.2192	650.0344	719.8289	755.3931	749.5884	717.9735	673.1335	625.7862	557.9097	522.6435	513.1575	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1394	59.3101	59.4783	60.2815	60.4342	61.1552	61.1552	61.2906	60.8754	60.4342	60.1261	59.8073	
alpha	4.9426	4.9540	4.9652	5.0188	5.0289	5.0770	5.0770	5.0860	5.0584	5.0289	5.0084	4.9872	
util living area	0.9891	0.9792	0.9583	0.8907	0.7608	0.5672	0.4160	0.4609	0.7019	0.9203	0.9783	0.9909	(86)
MIT	19.8430	20.0330	20.2967	20.6477	20.8778	20.9780	20.9962	20.9938	20.9383	20.6332	20.1903	19.8168	(87)
Th 2	20.2401	20.2421	20.2441	20.2535	20.2552	20.2634	20.2634	20.2649	20.2602	20.2552	20.2517	20.2480	(88)
util rest of house	0.9867	0.9748	0.9495	0.8689	0.7189	0.5076	0.3477	0.3896	0.6427	0.8994	0.9731	0.9889	(89)
MIT 2	19.1761	19.3652	19.6250	19.9653	20.1684	20.2515	20.2620	20.2624	20.2230	19.9593	19.5296	19.1564	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.3847	19.5741	19.8351	20.1787	20.3903	20.4788	20.4917	20.4912	20.4468	20.1701	19.7363	19.3629	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3847	19.5741	19.8351	20.1787	20.3903	20.4788	20.4917	20.4912	20.4468	20.1701	19.7363	19.3629	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9834	0.9701	0.9439	0.8665	0.7269	0.5254	0.3690	0.4118	0.6583	0.8966	0.9686	0.9860	(94)
Useful gains	524.8327	584.2407	613.5446	623.7020	549.0775	393.8023	264.9348	277.1807	411.9421	500.2349	506.2127	505.9545	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1066.2872	1034.2797	937.2438	782.1511	601.1278	401.8523	266.0207	279.0435	435.8379	661.9873	878.5600	1059.8483	(97)
Space heating kWh	402.8422	302.4263	240.8322	114.0833	38.7255	0.0000	0.0000	0.0000	0.0000	120.3438	268.0900	412.0970	(98a)
Space heating requirement - total per year (kWh/year)												1899.4402	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	402.8422	302.4263	240.8322	114.0833	38.7255	0.0000	0.0000	0.0000	0.0000	120.3438	268.0900	412.0970	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1899.4402	
Space heating per m2											(98c) / (4) =	21.9082	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	642.5530	505.8396	518.3630	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9162	0.9576	0.9415	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	588.7112	484.3929	488.0519	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	812.0280	778.1082	728.4611	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	160.7881	218.5242	178.8644	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	40.1970	54.6310	44.7161	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												139.5442	(107)
Energy for space heating												21.9082	(99)
Energy for space cooling												1.6095	(108)
Total												23.5177	(109)
Fabric Energy Efficiency (TFEE)												23.5	(109)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	9.82	**TER**	10.59
Environmental	92 A	**% DER < TER**			7.27
CO_2 Emissions (t/year)	0.8	**DFEE**	19.03	**TFEE**	23.52
Compliance Check	See BREL	**% DFEE < TFEE**			19.08
% DPER < TPER	1.02	**DPER**	55.79	**TPER**	56.37

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2796	12.8855	14.2401	13.7256	14.1482	13.6565	14.0893	14.1078	13.6737	14.1700	13.7658	14.2723	(61)
Total heat required for water heating calculated for each month	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
										Total per year (kWh/year) = Sum(64)m =		2267.8420	(64)
12Total per year (kWh/year)												2268	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	76.0275	66.9783	70.5469	60.6190	57.7963	51.0327	49.6244	52.1934	53.4246	60.8228	66.1962	75.0165	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	102.1874	99.6702	94.8210	84.1931	77.6833	70.8788	66.6995	70.1525	74.2008	81.7511	91.9392	100.8286	(72)
Total internal gains	533.5334	547.7688	522.4940	503.3624	476.0278	455.3032	436.3887	437.4252	452.0232	471.0771	502.0899	521.8995	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	600.4392	678.6509	738.0381	817.7206	861.2856	849.6831	811.8544	759.9447	702.7099	626.3797	585.5137	576.9196	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739

util living area													
	0.9776	0.9566	0.9129	0.8008	0.6346	0.4557	0.3298	0.3679	0.5841	0.8528	0.9567	0.9817	(86)
MIT	20.2136	20.3940	20.6169	20.8494	20.9633	20.9950	20.9993	20.9988	20.9818	20.8182	20.4762	20.1647	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house													
	0.9734	0.9489	0.8983	0.7729	0.5952	0.4098	0.2804	0.3154	0.5327	0.8240	0.9477	0.9782	(89)
MIT 2	19.4178	19.6429	19.9159	20.1861	20.3063	20.3349	20.3381	20.3378	20.3248	20.1574	19.7483	19.3563	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.6667	19.8778	20.1352	20.3936	20.5118	20.5414	20.5449	20.5445	20.5303	20.3641	19.9760	19.6092	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.5167	19.7278	19.9852	20.2436	20.3618	20.3914	20.3949	20.3945	20.3803	20.2141	19.8260	19.4592	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9668	0.9404	0.8895	0.7686	0.5967	0.4135	0.2846	0.3199	0.5360	0.8181	0.9392	0.9723	(94)
Useful gains	580.5107	638.2186	656.4602	628.5299	513.8890	351.3326	231.0770	243.1004	376.6685	512.4420	549.9413	560.9101	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	927.1710	903.4782	821.6681	691.1783	527.7749	352.8769	231.2278	243.3907	382.6674	585.7974	775.4093	929.7606	(97)
Space heating kWh	257.9153	178.2544	122.9147	45.1068	10.3311	0.0000	0.0000	0.0000	0.0000	54.5764	162.3370	274.4248	(98a)
Space heating requirement - total per year (kWh/year)												1105.8606	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	257.9153	178.2544	122.9147	45.1068	10.3311	0.0000	0.0000	0.0000	0.0000	54.5764	162.3370	274.4248	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1105.8606	
Space heating per m2											(98c) / (4) =	12.7550	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	257.9153	178.2544	122.9147	45.1068	10.3311	0.0000	0.0000	0.0000	0.0000	54.5764	162.3370	274.4248	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	289.7925	200.2859	138.1064	50.6818	11.6080	0.0000	0.0000	0.0000	0.0000	61.3218	182.4011	308.3424	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.1864	88.0833	87.9095	87.6271	87.3919	87.3000	87.3000	87.3000	87.3000	87.6792	88.0483	88.2183	(217)
Fuel for water heating, kWh/month	263.3025	232.3208	245.3707	211.9419	202.9182	179.6911	174.9625	183.8181	187.9361	212.6406	229.9895	259.7587	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.1487	9.1665	10.1487	9.8213	10.1487	9.8213	10.1487	10.1487	9.8213	10.1487	9.8213	10.1487	(231)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1242.5400	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.3000	
Water heating fuel used												2584.6508	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												119.4924	(231)
Electricity for lighting (calculated in Appendix L)												216.3282	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)

Total delivered energy for all uses 4163.0115 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1242.5400	0.2100	260.9334	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2584.6508	0.2100	542.7767	(264)
Space and water heating			803.7101	(265)
Pumps, fans and electric keep-hot	119.4924	0.1387	16.5751	(267)
Energy for lighting	216.3282	0.1443	31.2229	(268)
Total CO2, kg/year			851.5080	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.8200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1242.5400	1.1300	1404.0702	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2584.6508	1.1300	2920.6555	(278)
Space and water heating			4324.7256	(279)
Pumps, fans and electric keep-hot	119.4924	1.5128	180.7681	(281)
Energy for lighting	216.3282	1.5338	331.8115	(282)
Total Primary energy kWh/year			4837.3052	(286)
Dwelling Primary energy Rate (DPER)			55.7900	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
500mm mineral wool	43.3500		43.3500	0.1100	4.7685			(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2577			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.7700	0.0600	0.4062
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	19.4300	0.1200	2.3316
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1426 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 30.4003 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	70.6867	70.4833	70.2839	69.3475	69.1723	68.3567	68.3567	68.2057	68.6709	69.1723	69.5267	69.8973	(39)
Average = Sum(39)m / 12 =												69.3467	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8153	0.8130	0.8107	0.7999	0.7978	0.7884	0.7884	0.7867	0.7921	0.7978	0.8019	0.8062	(40)
HLP (average)												0.7998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)											Total = Sum(45)m =	2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	268.8764	237.7777	252.4231	221.3080	214.1447	192.5289	189.6118	197.3242	199.7096	223.2306	238.0513	265.8413	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	238.0452	210.5103	223.8702	197.6651	192.1104	173.6740	171.9383	178.5303	180.2015	200.2327	211.9975	235.5810	(64)
										Total per year (kWh/year) = Sum(64)m =		2414.3567	(64)
12Total per year (kWh/year)												2414	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	85.1973	75.2638	79.7266	69.5164	66.9990	59.9474	58.8418	61.4062	62.3349	70.0200	75.0836	84.1881	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	114.5125	111.9997	107.1594	96.5506	90.0524	83.2602	79.0885	82.5352	86.5763	94.1130	104.2827	113.1561	(72)
Total internal gains	545.8584	560.0984	534.8323	515.7198	488.3970	467.6846	448.7777	449.8079	464.3987	483.4390	514.4334	534.2270	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(80)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)

Total gains	601.3198	668.5927	713.5070	776.3062	807.7554	794.6048	760.0190	717.1596	672.2047	612.1767	583.5873	579.8358	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1394	59.3101	59.4783	60.2815	60.4342	61.1552	61.1552	61.2906	60.8754	60.4342	60.1261	59.8073	
alpha	4.9426	4.9540	4.9652	5.0188	5.0289	5.0770	5.0770	5.0860	5.0584	5.0289	5.0084	4.9872	
util living area													
	0.9822	0.9688	0.9420	0.8645	0.7273	0.5383	0.3936	0.4338	0.6646	0.8936	0.9667	0.9848	(86)
MIT	19.9542	20.1359	20.3841	20.7010	20.9005	20.9826	20.9971	20.9953	20.9517	20.6930	20.2843	19.9279	(87)
Th 2	20.2401	20.2421	20.2441	20.2535	20.2552	20.2634	20.2634	20.2649	20.2602	20.2552	20.2517	20.2480	(88)
util rest of house													
	0.9786	0.9626	0.9305	0.8397	0.6842	0.4806	0.3287	0.3661	0.6055	0.8682	0.9591	0.9817	(89)
MIT 2	19.0154	19.2456	19.5561	19.9440	20.1659	20.2514	20.2620	20.2625	20.2235	19.9436	19.4419	18.9880	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.3091	19.5241	19.8151	20.1808	20.3957	20.4801	20.4919	20.4917	20.4513	20.1780	19.7054	19.2820	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3091	19.5241	19.8151	20.1808	20.3957	20.4801	20.4919	20.4917	20.4513	20.1780	19.7054	19.2820	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9729	0.9555	0.9229	0.8370	0.6927	0.4979	0.3489	0.3872	0.6213	0.8653	0.9523	0.9765	(94)
Useful gains	585.0206	638.8140	658.5198	649.7991	559.5379	395.6029	265.1998	277.6720	417.6280	529.7012	555.7278	566.2200	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1060.9414	1030.7537	935.8373	782.2935	601.5006	401.9457	266.0394	279.0792	436.1485	662.5317	876.4146	1054.1923	(97)
Space heating kWh													
	354.0851	263.3835	206.3242	95.3960	31.2203	0.0000	0.0000	0.0000	0.0000	98.8259	230.8945	363.0514	(98a)
Space heating requirement - total per year (kWh/year)												1643.1809	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	354.0851	263.3835	206.3242	95.3960	31.2203	0.0000	0.0000	0.0000	0.0000	98.8259	230.8945	363.0514	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1643.1809	
Space heating per m2											(98c) / (4) =	18.9525	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	354.0851	263.3835	206.3242	95.3960	31.2203	0.0000	0.0000	0.0000	0.0000	98.8259	230.8945	363.0514	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	383.2089	285.0471	223.2946	103.2424	33.7882	0.0000	0.0000	0.0000	0.0000	106.9544	249.8858	392.9128	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	238.0452	210.5103	223.8702	197.6651	192.1104	173.6740	171.9383	178.5303	180.2015	200.2327	211.9975	235.5810	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.2304	84.8627	84.2069	82.9108	81.4008	80.3000	80.3000	80.3000	80.3000	82.9518	84.5648	85.3047	(217)
Fuel for water heating, kWh/month													
	279.2961	248.0599	265.8574	238.4069	236.0055	216.2814	214.1200	222.3291	224.4104	241.3845	250.6923	276.1642	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1778.3343	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2913.0078	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												224.3782	(232)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4144.6474	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1778.3343	0.2100	373.4502	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2913.0078	0.2100	611.7316	(264)
Space and water heating			985.1818	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			918.2801	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.5900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1778.3343	1.1300	2009.5177	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2913.0078	1.1300	3291.6988	(278)
Space and water heating			5301.2165	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4887.4436	(286)
Target Primary Energy Rate (TPER)			56.3700	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	9.82	**TER**	10.59
Environmental	92 A	**% DER < TER**			7.27
CO_2 Emissions (t/year)	0.8	**DFEE**	19.03	**TFEE**	23.52
Compliance Check	See BREL	**% DFEE < TFEE**			19.08
% DPER < TPER	1.02	**DPER**	55.79	**TPER**	56.37

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2796	12.8855	14.2401	13.7256	14.1482	13.6565	14.0893	14.1078	13.6737	14.1700	13.7658	14.2723	(61)
Total heat required for water heating calculated for each month	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
									Total per year (kWh/year) = Sum(64)m =			2267.8420	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	76.0275	66.9783	70.5469	60.6190	57.7963	51.0327	49.6244	52.1934	53.4246	60.8228	66.1962	75.0165	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	102.1874	99.6702	94.8210	84.1931	77.6833	70.8788	66.6995	70.1525	74.2008	81.7511	91.9392	100.8286	(72)
Total internal gains	587.9847	585.6501	566.6328	531.2821	496.1193	461.4093	442.7453	446.0155	464.2321	499.5052	538.3462	572.1411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	654.8905	716.5322	782.1769	845.6403	881.3771	855.7892	818.2111	768.5351	714.9188	654.8078	621.7699	627.1612	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area													

	0.9677	0.9464	0.8944	0.7843	0.6222	0.4526	0.3272	0.3639	0.5751	0.8336	0.9454	0.9737	(86)
MIT	20.2989	20.4468	20.6641	20.8647	20.9667	20.9951	20.9993	20.9988	20.9831	20.8396	20.5266	20.2457	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9618	0.9372	0.8778	0.7556	0.5831	0.4069	0.2782	0.3119	0.5242	0.8032	0.9344	0.9689	(89)
MIT 2	19.5242	19.7076	19.9714	20.2025	20.3093	20.3351	20.3381	20.3378	20.3258	20.1803	19.8095	19.4578	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.7665	19.9388	20.1881	20.4097	20.5149	20.5415	20.5449	20.5446	20.5314	20.3865	20.0339	19.7042	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.6165	19.7888	20.0381	20.2597	20.3649	20.3915	20.3949	20.3946	20.3814	20.2365	19.8839	19.5542	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9541	0.9284	0.8695	0.7520	0.5847	0.4106	0.2824	0.3163	0.5276	0.7981	0.9256	0.9618	(94)
Useful gains	624.8389	665.2260	680.0897	635.9530	515.3630	351.3937	231.0840	243.1194	377.1797	522.6115	575.5370	603.1831	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	933.2550	907.1943	824.8913	692.1579	527.9651	352.8851	231.2288	243.3934	382.7349	587.1665	778.9357	935.5513	(97)
Space heating kWh	229.4616	162.6027	107.7324	40.4675	9.3759	0.0000	0.0000	0.0000	0.0000	48.0289	146.4470	247.2819	(98a)
Space heating requirement - total per year (kWh/year)												991.3979	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	229.4616	162.6027	107.7324	40.4675	9.3759	0.0000	0.0000	0.0000	0.0000	48.0289	146.4470	247.2819	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												991.3979	
Space heating per m2											(98c) / (4) =	11.4348	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	229.4616	162.6027	107.7324	40.4675	9.3759	0.0000	0.0000	0.0000	0.0000	48.0289	146.4470	247.2819	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	257.8220	182.6996	121.0477	45.4691	10.5347	0.0000	0.0000	0.0000	0.0000	53.9650	164.5472	277.8449	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.1368	88.0446	87.8590	87.5994	87.3838	87.3000	87.3000	87.3000	87.3000	87.6429	88.0055	88.1742	(217)
Fuel for water heating, kWh/month	263.4508	232.4228	245.5119	212.0090	202.9369	179.6911	174.9625	183.8181	187.9361	212.7287	230.1015	259.8887	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.1487	9.1665	10.1487	9.8213	10.1487	9.8213	10.1487	10.1487	9.8213	10.1487	9.8213	10.1487	(231)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1113.9302	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.3000	
Water heating fuel used												2585.4582	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												119.4924	(231)
Electricity for lighting (calculated in Appendix L)												216.3282	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												4035.2091	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1113.9302	3.6400	40.5471	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2585.4582	3.6400	94.1107	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	119.4924	16.4900	19.7043	(249)
Energy for lighting	216.3282	16.4900	35.6725	(250)
Additional standing charges			92.0000	(251)
Total energy cost			282.0346	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7709	(257)
SAP value		87.5031	
SAP rating (Section 12)		88	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1113.9302	0.2100	233.9253	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2585.4582	0.2100	542.9462	(264)
Space and water heating			776.8716	(265)
Pumps, fans and electric keep-hot	119.4924	0.1387	16.5751	(267)
Energy for lighting	216.3282	0.1443	31.2229	(268)
Total CO2, kg/year			824.6695	(272)
CO2 emissions per m2			9.5100	(273)
EI value			91.6093	
EI rating			92	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	0 * 10 = 0.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5778 (42)
Hot water usage for mixer showers	67.4410 66.4275 64.9507 62.1249 60.0396 57.7140 56.3922 57.8579 59.4646 61.9615 64.8480	67.1826 (42a)
Hot water usage for baths	29.1251 28.6925 28.0834 26.9603 26.1193 25.1868 24.6831 25.2880 25.9466 26.9444 28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293 39.5373 38.0453 36.5534 35.0614 33.5694 33.5694 35.0614 36.5534 38.0453 39.5373	41.0293 (42c)
Average daily hot water use (litres/day)		126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2796	12.8855	14.2401	13.7256	14.1482	13.6565	14.0893	14.1078	13.6737	14.1700	13.7658	14.2723	(61)
Total heat required for water heating calculated for each month	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
										Total per year (kWh/year) = Sum(64)m =		2267.8420	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	76.0275	66.9783	70.5469	60.6190	57.7963	51.0327	49.6244	52.1934	53.4246	60.8228	66.1962	75.0165	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	102.1874	99.6702	94.8210	84.1931	77.6833	70.8788	66.6995	70.1525	74.2008	81.7511	91.9392	100.8286	(72)
Total internal gains	587.9847	585.6501	566.6328	531.2821	496.1193	461.4093	442.7453	446.0155	464.2321	499.5052	538.3462	572.1411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	23.7835	0.7600	0.7000	0.7700	65.5876	(80)
West	1.7600	23.7835	0.7600	0.7000	0.7700	15.4324	(80)

Solar gains	81.0200	140.8292	228.1692	335.8028	395.8111	434.4066	405.9044	355.9037	279.8628	176.2264	99.5150	67.0100	(83)
Total gains	669.0047	726.4794	794.8020	867.0849	891.9304	895.8159	848.6497	801.9193	744.0949	675.7315	637.8612	639.1511	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area	0.9620	0.9394	0.8762	0.7544	0.5866	0.3932	0.2798	0.3112	0.5323	0.7959	0.9330	0.9693	(86)
MIT	20.3503	20.4881	20.7139	20.8926	20.9763	20.9978	20.9997	20.9995	20.9889	20.8806	20.5845	20.2952	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9552	0.9291	0.8572	0.7237	0.5464	0.3489	0.2325	0.2611	0.4817	0.7612	0.9199	0.9636	(89)
MIT 2	19.5884	19.7585	20.0303	20.2326	20.3184	20.3370	20.3383	20.3382	20.3305	20.2245	19.8801	19.5200	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.8267	19.9867	20.2441	20.4391	20.5242	20.5437	20.5452	20.5450	20.5364	20.4298	20.1005	19.7625	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.6767	19.8367	20.0941	20.2891	20.3742	20.3937	20.3952	20.3950	20.3864	20.2798	19.9505	19.6125	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9470	0.9201	0.8495	0.7213	0.5486	0.3526	0.2365	0.2654	0.4855	0.7579	0.9110	0.9560	(94)
Useful gains	633.5524	668.4619	675.1807	625.3925	489.3246	315.8387	200.7297	212.8608	361.2311	512.1183	581.0627	611.0580	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	918.6439	891.8312	797.8405	669.5776	498.0619	316.4591	200.7794	212.9574	364.7600	559.3335	758.6215	920.8209	(97)
Space heating kWh	212.1081	150.1042	91.2589	31.8133	6.5006	0.0000	0.0000	0.0000	0.0000	35.1281	127.8423	230.4636	(98a)
Space heating requirement - total per year (kWh/year)												885.2191	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	212.1081	150.1042	91.2589	31.8133	6.5006	0.0000	0.0000	0.0000	0.0000	35.1281	127.8423	230.4636	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												885.2191	
Space heating per m2											(98c) / (4) =	10.2101	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	212.1081	150.1042	91.2589	31.8133	6.5006	0.0000	0.0000	0.0000	0.0000	35.1281	127.8423	230.4636	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	238.3237	168.6564	102.5381	35.7453	7.3040	0.0000	0.0000	0.0000	0.0000	39.4698	143.6431	258.9479	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.1034	88.0113	87.7986	87.5446	87.3590	87.3000	87.3000	87.3000	87.3000	87.5652	87.9501	88.1442	(217)
Fuel for water heating, kWh/month	263.5506	232.5107	245.6808	212.1417	202.9946	179.6911	174.9625	183.8181	187.9361	212.9176	230.2463	259.9770	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.1487	9.1665	10.1487	9.8213	10.1487	9.8213	10.1487	10.1487	9.8213	10.1487	9.8213	10.1487	(231)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													

Space heating fuel - main system 1	994.6282	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2586.4271	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	119.4924	(231)
Electricity for lighting (calculated in Appendix L)	216.3282	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3916.8760	(238)

10a. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	994.6282	6.5500	65.1481	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2586.4271	6.5500	169.4110	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	119.4924	28.4300	33.9717	(249)
Energy for lighting	216.3282	28.4300	61.5021	(250)
Additional standing charges			104.0000	(251)
Total energy cost			434.0329	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	994.6282	0.2100	208.8719	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2586.4271	0.2100	543.1497	(264)
Space and water heating			752.0216	(265)
Pumps, fans and electric keep-hot	119.4924	0.1387	16.5751	(267)
Energy for lighting	216.3282	0.1443	31.2229	(268)
Total CO2, kg/year			799.8195	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	994.6282	1.1300	1123.9299	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2586.4271	1.1300	2922.6626	(278)
Space and water heating			4046.5925	(279)
Pumps, fans and electric keep-hot	119.4924	1.5128	180.7681	(281)
Energy for lighting	216.3282	1.5338	331.8115	(282)
Total Primary energy kWh/year			4559.1721	(286)

SAP 10 EPC IMPROVEMENTS

Rev C - Be Lean

Current energy efficiency rating: B 88
Current environmental impact rating: A 92

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 92

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£95	£95	£0
Mains gas	£339	£339	£0
Space heating	£203	£203	£0

Water heating	£169	£169	£0
Lighting	£62	£62	£0
Total cost of fuels	£434	£434	£0
Total cost of uses	£434	£434	£0
Delivered energy	45 kWh/m²	45 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.8 tonnes	0.0 tonnes
CO2 emissions per m²	9 kg/m²	9 kg/m²	0 kg/m²
Primary energy	53 kWh/m²	53 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15049.3300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							173.5794	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.7933	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		25.8827	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778	(42)
Hot water usage for mixer showers													
	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths													
	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses													
	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m													
	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2796	12.8855	14.2401	13.7256	14.1482	13.6565	14.0893	14.1078	13.6737	14.1700	13.7658	14.2723	(61)
Total heat required for water heating calculated for each month													
	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
										Total per year (kWh/year) = Sum(64)m =		2267.8420	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	76.0275	66.9783	70.5469	60.6190	57.7963	51.0327	49.6244	52.1934	53.4246	60.8228	66.1962	75.0165	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	102.1874	99.6702	94.8210	84.1931	77.6833	70.8788	66.6995	70.1525	74.2008	81.7511	91.9392	100.8286	(72)
Total internal gains													
	587.9847	585.6501	566.6328	531.2821	496.1193	461.4093	442.7453	446.0155	464.2321	499.5052	538.3462	572.1411	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	654.8905	716.5322	782.1769	845.6403	881.3771	855.7892	818.2111	768.5351	714.9188	654.8078	621.7699	627.1612	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area													
	0.9677	0.9464	0.8944	0.7843	0.6222	0.4526	0.3272	0.3639	0.5751	0.8336	0.9454	0.9737	(86)
MIT	20.2989	20.4468	20.6641	20.8647	20.9667	20.9951	20.9993	20.9988	20.9831	20.8396	20.5266	20.2457	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house													
	0.9618	0.9372	0.8778	0.7556	0.5831	0.4069	0.2782	0.3119	0.5242	0.8032	0.9344	0.9689	(89)
MIT 2	19.5242	19.7076	19.9714	20.2025	20.3093	20.3351	20.3381	20.3378	20.3258	20.1803	19.8095	19.4578	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.7665	19.9388	20.1881	20.4097	20.5149	20.5415	20.5449	20.5446	20.5314	20.3865	20.0339	19.7042	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.6165	19.7888	20.0381	20.2597	20.3649	20.3915	20.3949	20.3946	20.3814	20.2365	19.8839	19.5542	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9541	0.9284	0.8695	0.7520	0.5847	0.4106	0.2824	0.3163	0.5276	0.7981	0.9256	0.9618	(94)
Useful gains	624.8389	665.2260	680.0897	635.9530	515.3630	351.3937	231.0840	243.1194	377.1797	522.6115	575.5370	603.1831	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	933.2550	907.1943	824.8913	692.1579	527.9651	352.8851	231.2288	243.3934	382.7349	587.1665	778.9357	935.5513	(97)
Space heating kWh	229.4616	162.6027	107.7324	40.4675	9.3759	0.0000	0.0000	0.0000	0.0000	48.0289	146.4470	247.2819	(98a)
Space heating requirement - total per year (kWh/year)												991.3979	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	229.4616	162.6027	107.7324	40.4675	9.3759	0.0000	0.0000	0.0000	0.0000	48.0289	146.4470	247.2819	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												991.3979	
Space heating per m2											(98c) / (4) =	11.4348	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	229.4616	162.6027	107.7324	40.4675	9.3759	0.0000	0.0000	0.0000	0.0000	48.0289	146.4470	247.2819	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	257.8220	182.6996	121.0477	45.4691	10.5347	0.0000	0.0000	0.0000	0.0000	53.9650	164.5472	277.8449	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.1368	88.0446	87.8590	87.5994	87.3838	87.3000	87.3000	87.3000	87.3000	87.6429	88.0055	88.1742	(217)
Fuel for water heating, kWh/month	263.4508	232.4228	245.5119	212.0090	202.9369	179.6911	174.9625	183.8181	187.9361	212.7287	230.1015	259.8887	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.1487	9.1665	10.1487	9.8213	10.1487	9.8213	10.1487	10.1487	9.8213	10.1487	9.8213	10.1487	(231)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1113.9302	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.3000	
Water heating fuel used												2585.4582	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												119.4924	(231)
Electricity for lighting (calculated in Appendix L)												216.3282	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												4035.2091	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1113.9302	3.6400	40.5471	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2585.4582	3.6400	94.1107	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	119.4924	16.4900	19.7043	(249)

Energy for lighting	216.3282	16.4900	35.6725	(250)
Additional standing charges			92.0000	(251)
Total energy cost			282.0346	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):			0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =		0.7709	(257)
SAP value			87.5031	
SAP rating (Section 12)			88	(258)
SAP band			B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1113.9302	0.2100	233.9253	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2585.4582	0.2100	542.9462	(264)
Space and water heating			776.8716	(265)
Pumps, fans and electric keep-hot	119.4924	0.1387	16.5751	(267)
Energy for lighting	216.3282	0.1443	31.2229	(268)
Total CO2, kg/year			824.6695	(272)
CO2 emissions per m2			9.5100	(273)
EI value			91.6093	
EI rating			92	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)

Wall to Access Corridor	16.5900	16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500	43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)		93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		23.0894			(33)
Main dwelling							
Party Wall		79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor		43.3500			70.0000	3034.5000	(32d)
Timber partitions		141.0200			9.0000	1269.1800	(32c)
Internal Floor 1		43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1		43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778	(42)
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)											Total = Sum(45)m =	2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2796	12.8855	14.2401	13.7256	14.1482	13.6565	14.0893	14.1078	13.6737	14.1700	13.7658	14.2723	(61)
Total heat required for water heating calculated for each month	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
										Total per year (kWh/year) = Sum(64)m =		2267.8420	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	76.0275	66.9783	70.5469	60.6190	57.7963	51.0327	49.6244	52.1934	53.4246	60.8228	66.1962	75.0165	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	102.1874	99.6702	94.8210	84.1931	77.6833	70.8788	66.6995	70.1525	74.2008	81.7511	91.9392	100.8286	(72)
Total internal gains	587.9847	585.6501	566.6328	531.2821	496.1193	461.4093	442.7453	446.0155	464.2321	499.5052	538.3462	572.1411	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	23.7835	0.7600	0.7000	0.7700	65.5876	(80)
West	1.7600	23.7835	0.7600	0.7000	0.7700	15.4324	(80)

Solar gains	81.0200	140.8292	228.1692	335.8028	395.8111	434.4066	405.9044	355.9037	279.8628	176.2264	99.5150	67.0100	(83)
Total gains	669.0047	726.4794	794.8020	867.0849	891.9304	895.8159	848.6497	801.9193	744.0949	675.7315	637.8612	639.1511	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area	0.9620	0.9394	0.8762	0.7544	0.5866	0.3932	0.2798	0.3112	0.5323	0.7959	0.9330	0.9693	(86)
MIT	20.3503	20.4881	20.7139	20.8926	20.9763	20.9978	20.9997	20.9995	20.9889	20.8806	20.5845	20.2952	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9552	0.9291	0.8572	0.7237	0.5464	0.3489	0.2325	0.2611	0.4817	0.7612	0.9199	0.9636	(89)
MIT 2	19.5884	19.7585	20.0303	20.2326	20.3184	20.3370	20.3383	20.3382	20.3305	20.2245	19.8801	19.5200	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8267	19.9867	20.2441	20.4391	20.5242	20.5437	20.5452	20.5450	20.5364	20.4298	20.1005	19.7625	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.6767	19.8367	20.0941	20.2891	20.3742	20.3937	20.3952	20.3950	20.3864	20.2798	19.9505	19.6125	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9470	0.9201	0.8495	0.7213	0.5486	0.3526	0.2365	0.2654	0.4855	0.7579	0.9110	0.9560	(94)
Useful gains	633.5524	668.4619	675.1807	625.3925	489.3246	315.8387	200.7297	212.8608	361.2311	512.1183	581.0627	611.0580	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	918.6439	891.8312	797.8405	669.5776	498.0619	316.4591	200.7794	212.9574	364.7600	559.3335	758.6215	920.8209	(97)
Space heating kWh	212.1081	150.1042	91.2589	31.8133	6.5006	0.0000	0.0000	0.0000	0.0000	35.1281	127.8423	230.4636	(98a)
Space heating requirement - total per year (kWh/year)												885.2191	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	212.1081	150.1042	91.2589	31.8133	6.5006	0.0000	0.0000	0.0000	0.0000	35.1281	127.8423	230.4636	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												885.2191	
Space heating per m2											(98c) / (4) =	10.2101	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 89.0000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	212.1081	150.1042	91.2589	31.8133	6.5006	0.0000	0.0000	0.0000	0.0000	35.1281	127.8423	230.4636	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	238.3237	168.6564	102.5381	35.7453	7.3040	0.0000	0.0000	0.0000	0.0000	39.4698	143.6431	258.9479	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.1034	88.0113	87.7986	87.5446	87.3590	87.3000	87.3000	87.3000	87.3000	87.5652	87.9501	88.1442	(217)
Fuel for water heating, kWh/month	263.5506	232.5107	245.6808	212.1417	202.9946	179.6911	174.9625	183.8181	187.9361	212.9176	230.2463	259.9770	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.1487	9.1665	10.1487	9.8213	10.1487	9.8213	10.1487	10.1487	9.8213	10.1487	9.8213	10.1487	(231)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 994.6282 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 87.3000

Water heating fuel used 2586.4271 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)

mechanical ventilation fans (SFP = 0.1292) 33.4924 (230a)

central heating pump 41.0000 (230c)

main heating flue fan 45.0000 (230e)

Total electricity for the above, kWh/year 119.4924 (231)

Electricity for lighting (calculated in Appendix L)	216.3282	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3916.8760	(238)

10a. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	994.6282	6.5500	65.1481	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2586.4271	6.5500	169.4110	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	119.4924	28.4300	33.9717	(249)
Energy for lighting	216.3282	28.4300	61.5021	(250)
Additional standing charges			104.0000	(251)
Total energy cost			434.0329	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	994.6282	0.2100	208.8719	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2586.4271	0.2100	543.1497	(264)
Space and water heating			752.0216	(265)
Pumps, fans and electric keep-hot	119.4924	0.1387	16.5751	(267)
Energy for lighting	216.3282	0.1443	31.2229	(268)
Total CO2, kg/year			799.8195	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	994.6282	1.1300	1123.9299	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2586.4271	1.1300	2922.6626	(278)
Space and water heating			4046.5925	(279)
Pumps, fans and electric keep-hot	119.4924	1.5128	180.7681	(281)
Energy for lighting	216.3282	1.5338	331.8115	(282)
Total Primary energy kWh/year			4559.1721	(286)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.62	**TER**	10.21
Environmental	99 A	**% DER < TER**			84.13
CO_2 Emissions (t/year)	0.12	**DFEE**	19.03	**TFEE**	23.52
Compliance Check	See BREL	**% DFEE < TFEE**			19.08
% DPER < TPER	61.13	**DPER**	21.12	**TPER**	54.33

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674 (64)
12Total per year (kWh/year)												2752 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)

Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201 (83)
Total gains	652.0784	730.2946	789.6905	869.3922	912.9689	904.3786	866.5575	814.6416	757.3995	678.0557	637.1713	628.5612 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area	0.9682	0.9424	0.8912	0.7703	0.6034	0.4289	0.3091	0.3435	0.5456	0.8178	0.9401	0.9735	(86)
MIT	20.2946	20.4652	20.6717	20.8766	20.9712	20.9963	20.9995	20.9991	20.9869	20.8554	20.5471	20.2479	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9625	0.9327	0.8742	0.7411	0.5649	0.3854	0.2627	0.2943	0.4964	0.7861	0.9284	0.9686	(89)
MIT 2	19.5189	19.7301	19.9802	20.2151	20.3135	20.3359	20.3381	20.3379	20.3288	20.1970	19.8342	19.4605	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.7615	19.9600	20.1965	20.4220	20.5192	20.5424	20.5450	20.5448	20.5346	20.4029	20.0572	19.7068	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7615	19.9600	20.1965	20.4220	20.5192	20.5424	20.5450	20.5448	20.5346	20.4029	20.0572	19.7068	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9565	0.9264	0.8703	0.7450	0.5756	0.3989	0.2772	0.3097	0.5112	0.7894	0.9227	0.9629	(94)
Useful gains	623.7347	676.5653	687.2569	647.6685	525.4789	360.7555	240.2383	252.2903	387.1876	535.2616	587.9151	605.2655	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	942.0898	917.6264	834.5437	702.0481	537.3651	362.0795	240.3750	252.5452	392.0693	597.3036	789.4977	944.8481	(97)
Space heating kWh	236.8562	161.9931	109.5814	39.1533	8.8434	0.0000	0.0000	0.0000	0.0000	46.1592	145.1395	252.6494	(98a)
Space heating requirement - total per year (kWh/year)												1000.3755	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	236.8562	161.9931	109.5814	39.1533	8.8434	0.0000	0.0000	0.0000	0.0000	46.1592	145.1395	252.6494	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1000.3755	
Space heating per m2											(98c) / (4) =	11.5384	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	236.8562	161.9931	109.5814	39.1533	8.8434	0.0000	0.0000	0.0000	0.0000	46.1592	145.1395	252.6494	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	355.2843	242.9896	164.3721	58.7300	13.2651	0.0000	0.0000	0.0000	0.0000	69.2389	217.7092	378.9742	
Space heating requirement	355.2843	242.9896	164.3721	58.7300	13.2651	0.0000	0.0000	0.0000	0.0000	69.2389	217.7092	378.9742	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1500.5632	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												15.0056	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4919.6640	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1500.8171	0.1574	62.9737	(367)
Electrical energy for heat distribution (space & water)	15.0056	0.0000	8.1772	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			226.2352	(373)
Space and water heating			226.2352	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			140.6603	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6200	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1500.8171	1.5826	633.2709	(467)
Electrical energy for heat distribution (space & water)	15.0056	0.0000	86.5269	(472)
Overall CO2 factor for heat network			0.4254	(486)
Total CO2 associated with community systems			2393.9104	(473)
Space and water heating			2393.9104	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1830.9671	(483)
Dwelling Primary energy Rate (DPER)			21.1200	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
500mm mineral wool	43.3500		43.3500	0.1100	4.7685			(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2577			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.7700	0.0600	0.4062
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	19.4300	0.1200	2.3316
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1426 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 30.4003 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	70.6867	70.4833	70.2839	69.3475	69.1723	68.3567	68.3567	68.2057	68.6709	69.1723	69.5267	69.8973	(39)
Average = Sum(39)m / 12 =												69.3467	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8153	0.8130	0.8107	0.7999	0.7978	0.7884	0.7884	0.7867	0.7921	0.7978	0.8019	0.8062	(40)
HLP (average)												0.7998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(80)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)
Total gains	634.2986	701.5715	746.4857	809.2850	840.7342	827.5835	792.9978	750.1384	705.1835	645.1554	616.5661	612.8145	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1394	59.3101	59.4783	60.2815	60.4342	61.1552	61.1552	61.2906	60.8754	60.4342	60.1261	59.8073	
alpha	4.9426	4.9540	4.9652	5.0188	5.0289	5.0770	5.0770	5.0860	5.0584	5.0289	5.0084	4.9872	
util living area	0.9780	0.9626	0.9324	0.8486	0.7068	0.5186	0.3776	0.4153	0.6395	0.8760	0.9591	0.9809	(86)
MIT	20.0069	20.1849	20.4265	20.7288	20.9126	20.9852	20.9976	20.9961	20.9592	20.7254	20.3327	19.9815	(87)
Th 2	20.2401	20.2421	20.2441	20.2535	20.2552	20.2634	20.2634	20.2649	20.2602	20.2552	20.2517	20.2480	(88)
util rest of house	0.9736	0.9554	0.9195	0.8222	0.6634	0.4625	0.3152	0.3503	0.5809	0.8482	0.9501	0.9771	(89)
MIT 2	19.0817	19.3064	19.6073	19.9749	20.1773	20.2533	20.2622	20.2630	20.2296	19.9795	19.5015	19.0555	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.3711	19.5812	19.8635	20.2107	20.4073	20.4822	20.4923	20.4923	20.4579	20.2128	19.7615	19.3452	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3711	19.5812	19.8635	20.2107	20.4073	20.4822	20.4923	20.4923	20.4579	20.2128	19.7615	19.3452	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9673	0.9479	0.9121	0.8205	0.6726	0.4794	0.3346	0.3706	0.5971	0.8465	0.9429	0.9713	(94)
Useful gains	613.5639	665.0086	680.8355	664.0567	565.4461	396.7299	265.3698	277.9667	421.0368	546.1054	581.3836	595.2543	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1065.3248	1034.7792	939.2428	784.3688	602.3050	402.0911	266.0617	279.1176	436.5991	664.9400	880.3115	1058.6050	(97)
Space heating kWh	336.1101	248.4859	192.2550	86.6247	27.4230	0.0000	0.0000	0.0000	0.0000	88.4129	215.2280	344.7329	(98a)
Space heating requirement - total per year (kWh/year)												1539.2726	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	336.1101	248.4859	192.2550	86.6247	27.4230	0.0000	0.0000	0.0000	0.0000	88.4129	215.2280	344.7329	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1539.2726	
Space heating per m2											(98c) / (4) =	17.7540	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	336.1101	248.4859	192.2550	86.6247	27.4230	0.0000	0.0000	0.0000	0.0000	88.4129	215.2280	344.7329	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	364.1496	269.2154	208.2936	93.8513	29.7107	0.0000	0.0000	0.0000	0.0000	95.7887	233.1832	373.4918	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.8742	84.4752	83.7639	82.3825	80.8443	79.8000	79.8000	79.8000	79.8000	82.3972	84.1389	84.9536	(217)
Fuel for water heating, kWh/month	275.3264	244.5318	262.0536	234.8094	232.2322	212.3443	209.9929	218.2535	220.5242	237.7128	246.9419	272.1687	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1667.6843	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2866.8916	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3987.8813	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1667.6843	0.2100	350.2137	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2866.8916	0.2100	602.0472	(264)
Space and water heating			952.2610	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			885.3593	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.2100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1667.6843	1.1300	1884.4833	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2866.8916	1.1300	3239.5876	(278)
Space and water heating			5124.0709	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4710.2979	(286)
Target Primary Energy Rate (TPER)			54.3300	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.62	**TER**	10.21
Environmental	99 A	**% DER < TER**			84.13
CO_2 Emissions (t/year)	0.12	**DFEE**	19.03	**TFEE**	23.52
Compliance Check	See BREL	**% DFEE < TFEE**			19.08
% DPER < TPER	61.13	**DPER**	21.12	**TPER**	54.33

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2257	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2878	0.2821	0.2765	0.2483	0.2426	0.2144	0.2144	0.2088	0.2257	0.2426	0.2539	0.2652	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5414	0.5398	0.5382	0.5308	0.5294	0.5230	0.5230	0.5218	0.5255	0.5294	0.5322	0.5352	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15049.3300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							173.5794	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9510	37.8383	37.7278	37.2089	37.1118	36.6599	36.6599	36.5762	36.8339	37.1118	37.3082	37.5135	(38)
Heat transfer coeff	63.8337	63.7210	63.6105	63.0916	62.9945	62.5426	62.5426	62.4589	62.7167	62.9945	63.1909	63.3963	(39)
Average = Sum(39)m / 12 =												63.0912	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7363	0.7350	0.7337	0.7277	0.7266	0.7214	0.7214	0.7204	0.7234	0.7266	0.7288	0.7312	(40)
HLP (average)												0.7277	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =					614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	545.1343	624.6069	686.9038	773.6007	821.2924	817.0482	782.1979	728.3014	668.6668	584.4747	536.9133	522.5689	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.4884	65.6043	65.7182	66.2587	66.3608	66.8404	66.8404	66.9299	66.6548	66.3608	66.1546	65.9403	
alpha	5.3659	5.3736	5.3812	5.4172	5.4241	5.4560	5.4560	5.4620	5.4437	5.4241	5.4103	5.3960	
util living area	0.9864	0.9716	0.9383	0.8385	0.6764	0.4848	0.3510	0.3930	0.6244	0.8882	0.9717	0.9890	(86)

MIT	20.0437	20.2412	20.4967	20.7918	20.9449	20.9924	20.9989	20.9980	20.9724	20.7532	20.3531	20.0061	(87)
Th 2	20.3089	20.3101	20.3112	20.3164	20.3174	20.3220	20.3220	20.3228	20.3202	20.3174	20.3154	20.3133	(88)
util rest of house	0.9837	0.9661	0.9267	0.8125	0.6355	0.4353	0.2973	0.3358	0.5701	0.8632	0.9652	0.9867	(89)
MIT 2	19.4297	19.6246	19.8728	20.1500	20.2794	20.3179	20.3216	20.3221	20.3040	20.1221	19.7407	19.3963	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.6218	19.8175	20.0680	20.3508	20.4876	20.5289	20.5335	20.5335	20.5131	20.3195	19.9322	19.5870	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6218	19.8175	20.0680	20.3508	20.4876	20.5289	20.5335	20.5335	20.5131	20.3195	19.9322	19.5870	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9803	0.9614	0.9221	0.8139	0.6459	0.4505	0.3141	0.3537	0.5859	0.8633	0.9609	0.9837	(94)
Useful gains	534.3937	600.5218	633.3960	629.6398	530.5035	368.0722	245.7026	257.5964	391.7389	504.5545	515.9253	514.0515	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	978.0444	950.5557	863.0678	722.4481	553.5695	370.8085	246.0090	258.1748	402.2069	612.2735	810.8819	975.4807	(97)
Space heating kWh	330.0761	235.2228	170.8758	66.8220	17.1611	0.0000	0.0000	0.0000	0.0000	80.1429	212.3687	343.3033	(98a)
Space heating requirement - total per year (kWh/year)												1455.9728	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	330.0761	235.2228	170.8758	66.8220	17.1611	0.0000	0.0000	0.0000	0.0000	80.1429	212.3687	343.3033	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1455.9728	
Space heating per m2											(98c) / (4) =	16.7932	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	587.9004	462.8152	474.6877	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9622	0.9834	0.9747	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	565.6804	455.1416	462.6958	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	890.8770	853.1757	792.9430	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	234.1415	296.1374	245.7039	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	58.5354	74.0344	61.4260	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												193.9957	(107)
Energy for space heating												16.7932	(99)
Energy for space cooling												2.2376	(108)
Total												19.0308	(109)
Fabric Energy Efficiency (DFEE)												19.0	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
500mm mineral wool	43.3500		43.3500	0.1100	4.7685			(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2577			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.7700	0.0600	0.4062
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	19.4300	0.1200	2.3316
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1426 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.4003 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	70.6867	70.4833	70.2839	69.3475	69.1723	68.3567	68.3567	68.2057	68.6709	69.1723	69.5267	69.8973	(39)
Average = Sum(39)m / 12 =												69.3467	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8153	0.8130	0.8107	0.7999	0.7978	0.7884	0.7884	0.7867	0.7921	0.7978	0.8019	0.8062	(40)
HLP (average)												0.7998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												64.3029	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)

Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)

Water heating gains (Table 5)

49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)

Total internal gains

478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(80)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)
Total gains	533.6898	602.2192	650.0344	719.8289	755.3931	749.5884	717.9735	673.1335	625.7862	557.9097	522.6435	513.1575	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1394	59.3101	59.4783	60.2815	60.4342	61.1552	61.1552	61.2906	60.8754	60.4342	60.1261	59.8073	
alpha	4.9426	4.9540	4.9652	5.0188	5.0289	5.0770	5.0770	5.0860	5.0584	5.0289	5.0084	4.9872	
util living area	0.9891	0.9792	0.9583	0.8907	0.7608	0.5672	0.4160	0.4609	0.7019	0.9203	0.9783	0.9909	(86)
MIT	19.8430	20.0330	20.2967	20.6477	20.8778	20.9780	20.9962	20.9938	20.9383	20.6332	20.1903	19.8168	(87)
Th 2	20.2401	20.2421	20.2441	20.2535	20.2552	20.2634	20.2634	20.2649	20.2602	20.2552	20.2517	20.2480	(88)
util rest of house	0.9867	0.9748	0.9495	0.8689	0.7189	0.5076	0.3477	0.3896	0.6427	0.8994	0.9731	0.9889	(89)
MIT 2	19.1761	19.3652	19.6250	19.9653	20.1684	20.2515	20.2620	20.2624	20.2230	19.9593	19.5296	19.1564	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.3847	19.5741	19.8351	20.1787	20.3903	20.4788	20.4917	20.4912	20.4468	20.1701	19.7363	19.3629	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3847	19.5741	19.8351	20.1787	20.3903	20.4788	20.4917	20.4912	20.4468	20.1701	19.7363	19.3629	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9834	0.9701	0.9439	0.8665	0.7269	0.5254	0.3690	0.4118	0.6583	0.8966	0.9686	0.9860	(94)
Useful gains	524.8327	584.2407	613.5446	623.7020	549.0775	393.8023	264.9348	277.1807	411.9421	500.2349	506.2127	505.9545	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1066.2872	1034.2797	937.2438	782.1511	601.1278	401.8523	266.0207	279.0435	435.8379	661.9873	878.5600	1059.8483	(97)
Space heating kWh	402.8422	302.4263	240.8322	114.0833	38.7255	0.0000	0.0000	0.0000	0.0000	120.3438	268.0900	412.0970	(98a)
Space heating requirement - total per year (kWh/year)												1899.4402	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	402.8422	302.4263	240.8322	114.0833	38.7255	0.0000	0.0000	0.0000	0.0000	120.3438	268.0900	412.0970	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1899.4402	
Space heating per m2											(98c) / (4) =	21.9082	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	642.5530	505.8396	518.3630	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9162	0.9576	0.9415	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	588.7112	484.3929	488.0519	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	812.0280	778.1082	728.4611	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	160.7881	218.5242	178.8644	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	40.1970	54.6310	44.7161	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												139.5442	(107)
Energy for space heating												21.9082	(99)
Energy for space cooling												1.6095	(108)
Total												23.5177	(109)
Fabric Energy Efficiency (TFEE)												23.5	(109)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.62	**TER**	10.21
Environmental	99 A	**% DER < TER**			84.13
CO_2 Emissions (t/year)	0.12	**DFEE**	19.03	**TFEE**	23.52
Compliance Check	See BREL	**% DFEE < TFEE**			19.08
% DPER < TPER	61.13	**DPER**	21.12	**TPER**	54.33

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674 (64)
12Total per year (kWh/year)												2752 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)

Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201 (83)
Total gains	652.0784	730.2946	789.6905	869.3922	912.9689	904.3786	866.5575	814.6416	757.3995	678.0557	637.1713	628.5612 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area	0.9682	0.9424	0.8912	0.7703	0.6034	0.4289	0.3091	0.3435	0.5456	0.8178	0.9401	0.9735	(86)
MIT	20.2946	20.4652	20.6717	20.8766	20.9712	20.9963	20.9995	20.9991	20.9869	20.8554	20.5471	20.2479	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9625	0.9327	0.8742	0.7411	0.5649	0.3854	0.2627	0.2943	0.4964	0.7861	0.9284	0.9686	(89)
MIT 2	19.5189	19.7301	19.9802	20.2151	20.3135	20.3359	20.3381	20.3379	20.3288	20.1970	19.8342	19.4605	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.7615	19.9600	20.1965	20.4220	20.5192	20.5424	20.5450	20.5448	20.5346	20.4029	20.0572	19.7068	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7615	19.9600	20.1965	20.4220	20.5192	20.5424	20.5450	20.5448	20.5346	20.4029	20.0572	19.7068	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9565	0.9264	0.8703	0.7450	0.5756	0.3989	0.2772	0.3097	0.5112	0.7894	0.9227	0.9629	(94)
Useful gains	623.7347	676.5653	687.2569	647.6685	525.4789	360.7555	240.2383	252.2903	387.1876	535.2616	587.9151	605.2655	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	942.0898	917.6264	834.5437	702.0481	537.3651	362.0795	240.3750	252.5452	392.0693	597.3036	789.4977	944.8481	(97)
Space heating kWh	236.8562	161.9931	109.5814	39.1533	8.8434	0.0000	0.0000	0.0000	0.0000	46.1592	145.1395	252.6494	(98a)
Space heating requirement - total per year (kWh/year)												1000.3755	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	236.8562	161.9931	109.5814	39.1533	8.8434	0.0000	0.0000	0.0000	0.0000	46.1592	145.1395	252.6494	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1000.3755	
Space heating per m2											(98c) / (4) =	11.5384	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	236.8562	161.9931	109.5814	39.1533	8.8434	0.0000	0.0000	0.0000	0.0000	46.1592	145.1395	252.6494	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	355.2843	242.9896	164.3721	58.7300	13.2651	0.0000	0.0000	0.0000	0.0000	69.2389	217.7092	378.9742	
Space heating requirement	355.2843	242.9896	164.3721	58.7300	13.2651	0.0000	0.0000	0.0000	0.0000	69.2389	217.7092	378.9742	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1500.5632	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												15.0056	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4919.6640	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1500.8171	0.1574	62.9737	(367)
Electrical energy for heat distribution (space & water)	15.0056	0.0000	8.1772	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			226.2352	(373)
Space and water heating			226.2352	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			140.6603	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6200	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1500.8171	1.5826	633.2709	(467)
Electrical energy for heat distribution (space & water)	15.0056	0.0000	86.5269	(472)
Overall CO2 factor for heat network			0.4254	(486)
Total CO2 associated with community systems			2393.9104	(473)
Space and water heating			2393.9104	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1830.9671	(483)
Dwelling Primary energy Rate (DPER)			21.1200	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
500mm mineral wool	43.3500		43.3500	0.1100	4.7685			(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2577			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.7700	0.0600	0.4062
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	19.4300	0.1200	2.3316
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1426 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 30.4003 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	70.6867	70.4833	70.2839	69.3475	69.1723	68.3567	68.3567	68.2057	68.6709	69.1723	69.5267	69.8973	(39)
Average = Sum(39)m / 12 =												69.3467	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8153	0.8130	0.8107	0.7999	0.7978	0.7884	0.7884	0.7867	0.7921	0.7978	0.8019	0.8062	(40)
HLP (average)												0.7998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(80)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)
Total gains	634.2986	701.5715	746.4857	809.2850	840.7342	827.5835	792.9978	750.1384	705.1835	645.1554	616.5661	612.8145	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1394	59.3101	59.4783	60.2815	60.4342	61.1552	61.1552	61.2906	60.8754	60.4342	60.1261	59.8073	
alpha	4.9426	4.9540	4.9652	5.0188	5.0289	5.0770	5.0770	5.0860	5.0584	5.0289	5.0084	4.9872	
util living area	0.9780	0.9626	0.9324	0.8486	0.7068	0.5186	0.3776	0.4153	0.6395	0.8760	0.9591	0.9809	(86)
MIT	20.0069	20.1849	20.4265	20.7288	20.9126	20.9852	20.9976	20.9961	20.9592	20.7254	20.3327	19.9815	(87)
Th 2	20.2401	20.2421	20.2441	20.2535	20.2552	20.2634	20.2634	20.2649	20.2602	20.2552	20.2517	20.2480	(88)
util rest of house	0.9736	0.9554	0.9195	0.8222	0.6634	0.4625	0.3152	0.3503	0.5809	0.8482	0.9501	0.9771	(89)
MIT 2	19.0817	19.3064	19.6073	19.9749	20.1773	20.2533	20.2622	20.2630	20.2296	19.9795	19.5015	19.0555	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.3711	19.5812	19.8635	20.2107	20.4073	20.4822	20.4923	20.4923	20.4579	20.2128	19.7615	19.3452	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3711	19.5812	19.8635	20.2107	20.4073	20.4822	20.4923	20.4923	20.4579	20.2128	19.7615	19.3452	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9673	0.9479	0.9121	0.8205	0.6726	0.4794	0.3346	0.3706	0.5971	0.8465	0.9429	0.9713	(94)
Useful gains	613.5639	665.0086	680.8355	664.0567	565.4461	396.7299	265.3698	277.9667	421.0368	546.1054	581.3836	595.2543	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1065.3248	1034.7792	939.2428	784.3688	602.3050	402.0911	266.0617	279.1176	436.5991	664.9400	880.3115	1058.6050	(97)
Space heating kWh	336.1101	248.4859	192.2550	86.6247	27.4230	0.0000	0.0000	0.0000	0.0000	88.4129	215.2280	344.7329	(98a)
Space heating requirement - total per year (kWh/year)												1539.2726	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	336.1101	248.4859	192.2550	86.6247	27.4230	0.0000	0.0000	0.0000	0.0000	88.4129	215.2280	344.7329	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1539.2726	
Space heating per m2											(98c) / (4) =	17.7540	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	336.1101	248.4859	192.2550	86.6247	27.4230	0.0000	0.0000	0.0000	0.0000	88.4129	215.2280	344.7329	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	364.1496	269.2154	208.2936	93.8513	29.7107	0.0000	0.0000	0.0000	0.0000	95.7887	233.1832	373.4918	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.8742	84.4752	83.7639	82.3825	80.8443	79.8000	79.8000	79.8000	79.8000	82.3972	84.1389	84.9536	(217)
Fuel for water heating, kWh/month	275.3264	244.5318	262.0536	234.8094	232.2322	212.3443	209.9929	218.2535	220.5242	237.7128	246.9419	272.1687	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1667.6843	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2866.8916	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3987.8813	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1667.6843	0.2100	350.2137	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2866.8916	0.2100	602.0472	(264)
Space and water heating			952.2610	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			885.3593	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.2100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1667.6843	1.1300	1884.4833	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2866.8916	1.1300	3239.5876	(278)
Space and water heating			5124.0709	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4710.2979	(286)
Target Primary Energy Rate (TPER)			54.3300	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.62	**TER**	10.21
Environmental	99 A	**% DER < TER**			84.13
CO_2 Emissions (t/year)	0.12	**DFEE**	19.03	**TFEE**	23.52
Compliance Check	See BREL	**% DFEE < TFEE**			19.08
% DPER < TPER	61.13	**DPER**	21.12	**TPER**	54.33

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	706.5297	768.1759	833.8294	897.3119	933.0604	910.4848	872.9142	823.2320	769.6084	706.4837	673.4276	678.8029	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area													
	0.9560	0.9306	0.8713	0.7540	0.5919	0.4261	0.3068	0.3399	0.5376	0.7983	0.9267	0.9634	(86)
MIT	20.3751	20.5139	20.7132	20.8892	20.9738	20.9964	20.9995	20.9992	20.9878	20.8726	20.5928	20.3248	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house													
	0.9485	0.9194	0.8526	0.7244	0.5538	0.3829	0.2608	0.2913	0.4890	0.7654	0.9131	0.9570	(89)
MIT 2	19.6185	19.7890	20.0283	20.2283	20.3157	20.3359	20.3382	20.3380	20.3294	20.2150	19.8890	19.5562	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8552	20.0157	20.2426	20.4350	20.5216	20.5425	20.5450	20.5448	20.5354	20.4207	20.1091	19.7966	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8552	20.0157	20.2426	20.4350	20.5216	20.5425	20.5450	20.5448	20.5354	20.4207	20.1091	19.7966	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9421	0.9134	0.8497	0.7288	0.5645	0.3963	0.2752	0.3065	0.5036	0.7697	0.9078	0.9508	(94)
Useful gains	665.6232	701.6258	708.4743	654.0033	526.6868	360.8043	240.2441	252.3055	387.5770	543.7723	611.3326	645.4182	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	947.7957	921.0206	837.3507	702.8419	537.5093	362.0852	240.3757	252.5470	392.1155	598.3872	792.6626	950.3189	(97)
Space heating kWh													
	209.9363	147.4333	95.8841	35.1638	8.0519	0.0000	0.0000	0.0000	0.0000	40.6336	130.5576	226.8461	(98a)
Space heating requirement - total per year (kWh/year)												894.5067	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	209.9363	147.4333	95.8841	35.1638	8.0519	0.0000	0.0000	0.0000	0.0000	40.6336	130.5576	226.8461	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												894.5067	
Space heating per m2											(98c) / (4) =	10.3173	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	209.9363	147.4333	95.8841	35.1638	8.0519	0.0000	0.0000	0.0000	0.0000	40.6336	130.5576	226.8461	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	314.9045	221.1499	143.8261	52.7457	12.0779	0.0000	0.0000	0.0000	0.0000	60.9503	195.8364	340.2692	
Space heating requirement													
	314.9045	221.1499	143.8261	52.7457	12.0779	0.0000	0.0000	0.0000	0.0000	60.9503	195.8364	340.2692	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1341.7601	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												13.4176	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4760.8608	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1341.7601	4.4400	59.5741	(340a)
Space heating total			59.5741	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			268.1652	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7330 (357)
SAP value		88.1177
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1458.4696	0.1574	56.3147	(367)
Electrical energy for heat distribution (space & water)	13.4176	0.0000	7.9275	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			219.3265	(373)
Space and water heating			219.3265	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			133.7516	(383)
CO2 emissions per m2			1.5400	(384)
EI value			98.6391	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)

Average = Sum(39)m / 12 = 60.9312

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)											Total = Sum(45)m =	2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)

Total per year (kWh/year) = Sum(64)m = 2751.6674 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	23.7835	0.7600	0.7000	0.7700	65.5876	(80)
West	1.7600	23.7835	0.7600	0.7000	0.7700	15.4324	(80)

Solar gains	81.0200	140.8292	228.1692	335.8028	395.8111	434.4066	405.9044	355.9037	279.8628	176.2264	99.5150	67.0100	(83)
Total gains	720.6439	778.1231	846.4545	918.7565	943.6137	950.5115	903.3528	856.6161	798.7845	727.4075	689.5188	690.7928	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area													
	0.9490	0.9223	0.8511	0.7238	0.5575	0.3709	0.2629	0.2914	0.4979	0.7588	0.9119	0.9578	(86)
MIT	20.4239	20.5524	20.7578	20.9126	20.9814	20.9984	20.9998	20.9997	20.9920	20.9064	20.6460	20.3721	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house													
	0.9403	0.9100	0.8301	0.6925	0.5185	0.3289	0.2184	0.2445	0.4500	0.7224	0.8959	0.9504	(89)
MIT 2	19.6790	19.8360	20.0804	20.2532	20.3229	20.3374	20.3383	20.3382	20.3327	20.2506	19.9528	19.6153	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9120	20.0601	20.2923	20.4594	20.5289	20.5441	20.5452	20.5451	20.5389	20.4558	20.1696	19.8520	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9120	20.0601	20.2923	20.4594	20.5289	20.5441	20.5452	20.5451	20.5389	20.4558	20.1696	19.8520	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9339	0.9042	0.8286	0.6984	0.5298	0.3420	0.2323	0.2592	0.4646	0.7291	0.8914	0.9441	(94)
Useful gains	673.0450	703.5786	701.3423	641.6458	499.9677	325.0775	209.8744	222.0133	371.1353	530.3712	614.6497	652.1881	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	932.9783	905.4425	809.9161	679.9568	507.4882	325.6242	209.9217	222.1021	374.0528	570.0578	771.9758	935.4164	(97)
Space heating kWh													
	193.3904	135.6525	80.7789	27.5839	5.5952	0.0000	0.0000	0.0000	0.0000	29.5268	113.2748	210.7218	(98a)
Space heating requirement - total per year (kWh/year)												796.5245	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	193.3904	135.6525	80.7789	27.5839	5.5952	0.0000	0.0000	0.0000	0.0000	29.5268	113.2748	210.7218	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												796.5245	
Space heating per m2											(98c) / (4) =	9.1871	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement													
	193.3904	135.6525	80.7789	27.5839	5.5952	0.0000	0.0000	0.0000	0.0000	29.5268	113.2748	210.7218	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	290.0857	203.4788	121.1684	41.3758	8.3928	0.0000	0.0000	0.0000	0.0000	44.2902	169.9122	316.0827	
Space heating requirement													
	290.0857	203.4788	121.1684	41.3758	8.3928	0.0000	0.0000	0.0000	0.0000	44.2902	169.9122	316.0827	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)

Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year	
Space heating fuel - community heating	1194.7867 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	11.9479 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)	
mechanical ventilation fans (SFP = 0.1292)	33.4924 (330a)
Total electricity for the above, kWh/year	33.4924 (331)
Electricity for lighting (calculated in Appendix L)	216.3282 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4517.3614 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1194.7867	6.5500	78.2585	(340a)
Space heating total			78.2585	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			341.5636	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1419.2767	0.1579	50.2948	(367)
Electrical energy for heat distribution (space & water)	11.9479	0.0000	7.7017	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			213.0809	(373)
Space and water heating			213.0809	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			115.2479	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1419.2767	1.5844	504.7916	(467)
Electrical energy for heat distribution (space & water)	11.9479	0.0000	81.7089	(472)
Overall CO2 factor for heat network			0.4247	(486)
Total CO2 associated with community systems			2260.6131	(473)
Space and water heating			2260.6131	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1616.7779	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - East

Current energy efficiency rating: B 88
Current environmental impact rating: A 99

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£71	£71	£0
Community scheme	£453	£453	£0
Space heating	£192	£192	£0
Water heating	£270	£270	£0
Lighting	£62	£62	£0
Generated (PV)	-£182	-£182	£0
Total cost of fuels	£342	£342	£0
Total cost of uses	£342	£342	£0
Delivered energy	52 kWh/m²	52 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	19 kWh/m²	19 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5778 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day)	126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	706.5297	768.1759	833.8294	897.3119	933.0604	910.4848	872.9142	823.2320	769.6084	706.4837	673.4276	678.8029	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area	0.9560	0.9306	0.8713	0.7540	0.5919	0.4261	0.3068	0.3399	0.5376	0.7983	0.9267	0.9634	(86)
MIT	20.3751	20.5139	20.7132	20.8892	20.9738	20.9964	20.9995	20.9992	20.9878	20.8726	20.5928	20.3248	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9485	0.9194	0.8526	0.7244	0.5538	0.3829	0.2608	0.2913	0.4890	0.7654	0.9131	0.9570	(89)
MIT 2	19.6185	19.7890	20.0283	20.2283	20.3157	20.3359	20.3382	20.3380	20.3294	20.2150	19.8890	19.5562	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8552	20.0157	20.2426	20.4350	20.5216	20.5425	20.5450	20.5448	20.5354	20.4207	20.1091	19.7966	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8552	20.0157	20.2426	20.4350	20.5216	20.5425	20.5450	20.5448	20.5354	20.4207	20.1091	19.7966	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9421	0.9134	0.8497	0.7288	0.5645	0.3963	0.2752	0.3065	0.5036	0.7697	0.9078	0.9508	(94)
Useful gains	665.6232	701.6258	708.4743	654.0033	526.6868	360.8043	240.2441	252.3055	387.5770	543.7723	611.3326	645.4182	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	947.7957	921.0206	837.3507	702.8419	537.5093	362.0852	240.3757	252.5470	392.1155	598.3872	792.6626	950.3189	(97)
Space heating kWh	209.9363	147.4333	95.8841	35.1638	8.0519	0.0000	0.0000	0.0000	0.0000	40.6336	130.5576	226.8461	(98a)
Space heating requirement - total per year (kWh/year)												894.5067	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	209.9363	147.4333	95.8841	35.1638	8.0519	0.0000	0.0000	0.0000	0.0000	40.6336	130.5576	226.8461	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												894.5067	
Space heating per m2										(98c) / (4) =		10.3173	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	209.9363	147.4333	95.8841	35.1638	8.0519	0.0000	0.0000	0.0000	0.0000	40.6336	130.5576	226.8461	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	314.9045	221.1499	143.8261	52.7457	12.0779	0.0000	0.0000	0.0000	0.0000	60.9503	195.8364	340.2692	
Space heating requirement													
	314.9045	221.1499	143.8261	52.7457	12.0779	0.0000	0.0000	0.0000	0.0000	60.9503	195.8364	340.2692	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1341.7601	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)

Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	13.4176	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4760.8608	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1341.7601	4.4400	59.5741	(340a)
Space heating total			59.5741	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			268.1652	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.7330	(357)
SAP value	88.1177	
SAP rating (Section 12)	88	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1458.4696	0.1574	56.3147	(367)
Electrical energy for heat distribution (space & water)	13.4176	0.0000	7.9275	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			219.3265	(373)
Space and water heating			219.3265	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			133.7516	(383)
CO2 emissions per m2			1.5400	(384)
EI value			98.6391	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5778	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	23.7835	0.7600	0.7000	0.7700	65.5876	(80)
West	1.7600	23.7835	0.7600	0.7000	0.7700	15.4324	(80)

Solar gains	81.0200	140.8292	228.1692	335.8028	395.8111	434.4066	405.9044	355.9037	279.8628	176.2264	99.5150	67.0100	(83)
Total gains	720.6439	778.1231	846.4545	918.7565	943.6137	950.5115	903.3528	856.6161	798.7845	727.4075	689.5188	690.7928	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area													
	0.9490	0.9223	0.8511	0.7238	0.5575	0.3709	0.2629	0.2914	0.4979	0.7588	0.9119	0.9578	(86)
MIT	20.4239	20.5524	20.7578	20.9126	20.9814	20.9984	20.9998	20.9997	20.9920	20.9064	20.6460	20.3721	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house													
	0.9403	0.9100	0.8301	0.6925	0.5185	0.3289	0.2184	0.2445	0.4500	0.7224	0.8959	0.9504	(89)
MIT 2	19.6790	19.8360	20.0804	20.2532	20.3229	20.3374	20.3383	20.3382	20.3327	20.2506	19.9528	19.6153	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9120	20.0601	20.2923	20.4594	20.5289	20.5441	20.5452	20.5451	20.5389	20.4558	20.1696	19.8520	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9120	20.0601	20.2923	20.4594	20.5289	20.5441	20.5452	20.5451	20.5389	20.4558	20.1696	19.8520	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9339	0.9042	0.8286	0.6984	0.5298	0.3420	0.2323	0.2592	0.4646	0.7291	0.8914	0.9441	(94)
Useful gains	673.0450	703.5786	701.3423	641.6458	499.9677	325.0775	209.8744	222.0133	371.1353	530.3712	614.6497	652.1881	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	932.9783	905.4425	809.9161	679.9568	507.4882	325.6242	209.9217	222.1021	374.0528	570.0578	771.9758	935.4164	(97)
Space heating kWh													
	193.3904	135.6525	80.7789	27.5839	5.5952	0.0000	0.0000	0.0000	0.0000	29.5268	113.2748	210.7218	(98a)
Space heating requirement - total per year (kWh/year)												796.5245	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	193.3904	135.6525	80.7789	27.5839	5.5952	0.0000	0.0000	0.0000	0.0000	29.5268	113.2748	210.7218	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												796.5245	
Space heating per m2											(98c) / (4) =	9.1871	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement

	193.3904	135.6525	80.7789	27.5839	5.5952	0.0000	0.0000	0.0000	0.0000	29.5268	113.2748	210.7218 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	290.0857	203.4788	121.1684	41.3758	8.3928	0.0000	0.0000	0.0000	0.0000	44.2902	169.9122	316.0827
Space heating requirement												
	290.0857	203.4788	121.1684	41.3758	8.3928	0.0000	0.0000	0.0000	0.0000	44.2902	169.9122	316.0827 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388
Water heating fuel												
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446 (331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year	
Space heating fuel - community heating	1194.7867 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	11.9479 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)	
mechanical ventilation fans (SFP = 0.1292)	33.4924 (330a)
Total electricity for the above, kWh/year	33.4924 (331)
Electricity for lighting (calculated in Appendix L)	216.3282 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4517.3614 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1194.7867	6.5500	78.2585	(340a)
Space heating total			78.2585	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			341.5636	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1419.2767	0.1579	50.2948	(367)
Electrical energy for heat distribution (space & water)	11.9479	0.0000	7.7017	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			213.0809	(373)
Space and water heating			213.0809	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			115.2479	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)

Space and Water heating from Heat pump	1419.2767	1.5844	504.7916 (467)
Electrical energy for heat distribution (space & water)	11.9479	0.0000	81.7089 (472)
Overall CO2 factor for heat network			0.4247 (486)
Total CO2 associated with community systems			2260.6131 (473)
Space and water heating			2260.6131 (476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673 (478)
Energy for lighting	216.3282	1.5338	331.8115 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405
PV Unit electricity exported	-520.7528	0.4449	-231.6735
Total			-1026.3140 (480)
Total Primary energy kWh/year			1616.7779 (483)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.45	**TER**	9.61
Environmental	99 A	**% DER < TER**			84.91
CO_2 Emissions (t/year)	0.1	**DFEE**	15.58	**TFEE**	20.32
Compliance Check	See BREL	**% DFEE < TFEE**			23.36
% DPER < TPER	62.12	**DPER**	19.36	**TPER**	51.11

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation		0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674 (64)
12Total per year (kWh/year)												2752 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.4800	46.7521	0.7600	0.7000	0.7700	128.9280	(78)
South	1.7600	46.7521	0.7600	0.7000	0.7700	30.3360	(78)

Solar gains	159.2640	260.8334	332.2555	375.5208	391.3159	376.5883	367.9497	357.3302	347.0801	281.3333	188.7822	137.6188 (83)
Total gains	744.4365	860.2459	906.4019	930.5548	919.0271	886.5871	859.0415	849.4522	853.7929	804.0864	742.5297	711.1599 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area	0.9461	0.8976	0.8368	0.7349	0.5999	0.4373	0.3118	0.3295	0.4876	0.7321	0.8977	0.9559	(86)
MIT	20.4278	20.6186	20.7717	20.9025	20.9720	20.9959	20.9995	20.9993	20.9924	20.9178	20.6706	20.3719	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9372	0.8831	0.8156	0.7048	0.5615	0.3930	0.2650	0.2823	0.4425	0.6968	0.8807	0.9484	(89)
MIT 2	19.6832	19.9141	20.0948	20.2421	20.3142	20.3356	20.3381	20.3380	20.3329	20.2609	19.9805	19.6144	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9161	20.1345	20.3066	20.4487	20.5200	20.5421	20.5450	20.5449	20.5392	20.4664	20.1963	19.8514	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9161	20.1345	20.3066	20.4487	20.5200	20.5421	20.5450	20.5449	20.5392	20.4664	20.1963	19.8514	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9308	0.8782	0.8146	0.7100	0.5722	0.4067	0.2797	0.2971	0.4563	0.7039	0.8767	0.9420	(94)
Useful gains	692.9219	755.4617	738.3117	660.6947	525.8565	360.6021	240.2312	252.3463	389.5505	565.9756	650.9548	669.9285	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	951.5082	928.2545	841.2502	703.6749	537.4102	362.0614	240.3742	252.5519	392.3487	601.1687	797.9747	953.6570	(97)
Space heating kWh	192.3882	116.1167	76.5862	30.9458	8.5960	0.0000	0.0000	0.0000	0.0000	26.1837	105.8543	211.0940	(98a)
Space heating requirement - total per year (kWh/year)												767.7650	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	192.3882	116.1167	76.5862	30.9458	8.5960	0.0000	0.0000	0.0000	0.0000	26.1837	105.8543	211.0940	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												767.7650	
Space heating per m2											(98c) / (4) =	8.8554	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	192.3882	116.1167	76.5862	30.9458	8.5960	0.0000	0.0000	0.0000	0.0000	26.1837	105.8543	211.0940	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	288.5824	174.1751	114.8794	46.4187	12.8940	0.0000	0.0000	0.0000	0.0000	39.2755	158.7815	316.6411	
Space heating requirement	288.5824	174.1751	114.8794	46.4187	12.8940	0.0000	0.0000	0.0000	0.0000	39.2755	158.7815	316.6411	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1151.6476	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												11.5165	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4570.7483	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1407.7730	0.1578	48.4676	(367)
Electrical energy for heat distribution (space & water)	11.5165	0.0000	7.6332	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			211.1851	(373)
Space and water heating			211.1851	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			125.6102	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.4500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1407.7730	1.5842	486.5170	(467)
Electrical energy for heat distribution (space & water)	11.5165	0.0000	81.0236	(472)
Overall CO2 factor for heat network			0.4246	(486)
Total CO2 associated with community systems			2241.6532	(473)
Space and water heating			2241.6532	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1678.7099	(483)
Dwelling Primary energy Rate (DPER)			19.3600	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
500mm mineral wool	43.3500		43.3500	0.1100	4.7685			(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2577			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.7700	0.0600	0.4062
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	19.4300	0.1200	2.3316
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1426 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 30.4003 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	70.6867	70.4833	70.2839	69.3475	69.1723	68.3567	68.3567	68.2057	68.6709	69.1723	69.5267	69.8973	(39)
Average = Sum(39)m / 12 =												69.3467	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8153	0.8130	0.8107	0.7999	0.7978	0.7884	0.7884	0.7867	0.7921	0.7978	0.8019	0.8062	(40)
HLP (average)												0.7998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	9.2400	46.7521	0.6300	0.7000	0.7700	132.0215	(78)

Solar gains	132.0215	216.2172	275.4223	311.2870	324.3803	312.1719	305.0110	296.2079	287.7111	233.2105	156.4905	114.0787	(83)
Total gains	710.8586	809.2943	843.2333	859.9856	845.7561	812.8353	786.7674	778.9946	785.0885	749.6283	703.9027	681.2845	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1394	59.3101	59.4783	60.2815	60.4342	61.1552	61.1552	61.2906	60.8754	60.4342	60.1261	59.8073	
alpha	4.9426	4.9540	4.9652	5.0188	5.0289	5.0770	5.0770	5.0860	5.0584	5.0289	5.0084	4.9872	
util living area	0.9659	0.9380	0.9005	0.8234	0.7037	0.5273	0.3805	0.4004	0.5840	0.8165	0.9347	0.9711	(86)
MIT	20.1244	20.3335	20.5388	20.7669	20.9142	20.9841	20.9975	20.9967	20.9727	20.8089	20.4512	20.0889	(87)
Th 2	20.2401	20.2421	20.2441	20.2535	20.2552	20.2634	20.2634	20.2649	20.2602	20.2552	20.2517	20.2480	(88)
util rest of house	0.9595	0.9272	0.8835	0.7950	0.6602	0.4704	0.3176	0.3375	0.5277	0.7825	0.9216	0.9656	(89)
MIT 2	19.2284	19.4886	19.7407	20.0167	20.1789	20.2525	20.2622	20.2633	20.2402	20.0695	19.6452	19.1902	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.5087	19.7529	19.9904	20.2514	20.4089	20.4813	20.4922	20.4927	20.4693	20.3008	19.8973	19.4713	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5087	19.7529	19.9904	20.2514	20.4089	20.4813	20.4922	20.4927	20.4693	20.3008	19.8973	19.4713	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9520	0.9191	0.8772	0.7949	0.6696	0.4875	0.3373	0.3571	0.5439	0.7848	0.9145	0.9587	(94)
Useful gains	676.7692	743.8477	739.6465	683.6260	566.2766	396.2528	265.3406	278.1739	427.0395	588.2853	643.6976	653.1148	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1075.0532	1046.8810	948.1569	787.1899	602.4176	402.0296	266.0579	279.1447	437.3860	671.0251	889.7559	1067.4218	(97)
Space heating kWh	296.3233	203.6384	155.1317	74.5660	26.8889	0.0000	0.0000	0.0000	0.0000	61.5584	177.1620	308.2444	(98a)
Space heating requirement - total per year (kWh/year)												1303.5131	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	296.3233	203.6384	155.1317	74.5660	26.8889	0.0000	0.0000	0.0000	0.0000	61.5584	177.1620	308.2444	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1303.5131	
Space heating per m2											(98c) / (4) =	15.0348	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	296.3233	203.6384	155.1317	74.5660	26.8889	0.0000	0.0000	0.0000	0.0000	61.5584	177.1620	308.2444	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	321.0436	220.6266	168.0734	80.7866	29.1321	0.0000	0.0000	0.0000	0.0000	66.6939	191.9415	333.9593	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.5935	84.0277	83.2958	82.1155	80.8263	79.8000	79.8000	79.8000	79.8000	81.7821	83.7044	84.7054	(217)
Fuel for water heating, kWh/month	276.2401	245.8338	263.5263	235.5729	232.2840	212.3443	209.9929	218.2535	220.5242	239.5008	248.2237	272.9661	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1412.2569	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2875.2626	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3740.8248	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1412.2569	0.2100	296.5740	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2875.2626	0.2100	603.8051	(264)
Space and water heating			900.3791	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			833.4774	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.6100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1412.2569	1.1300	1595.8503	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2875.2626	1.1300	3249.0467	(278)
Space and water heating			4844.8971	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4431.1241	(286)
Target Primary Energy Rate (TPER)			51.1100	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.45	**TER**	9.61
Environmental	99 A	**% DER < TER**			84.91
CO_2 Emissions (t/year)	0.1	**DFEE**	15.58	**TFEE**	20.32
Compliance Check	See BREL	**% DFEE < TFEE**			23.36
% DPER < TPER	62.12	**DPER**	19.36	**TPER**	51.11

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		3 * 10 =	30.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1412 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			3.0000 (17)
Infiltration rate			0.2912 (18)
Number of sides sheltered			3 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2257 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2878	0.2821	0.2765	0.2483	0.2426	0.2144	0.2144	0.2088	0.2257	0.2426	0.2539	0.2652	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5414	0.5398	0.5382	0.5308	0.5294	0.5230	0.5230	0.5218	0.5255	0.5294	0.5322	0.5352	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15049.3300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							173.5794	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9510	37.8383	37.7278	37.2089	37.1118	36.6599	36.6599	36.5762	36.8339	37.1118	37.3082	37.5135	(38)
Heat transfer coeff	63.8337	63.7210	63.6105	63.0916	62.9945	62.5426	62.5426	62.4589	62.7167	62.9945	63.1909	63.3963	(39)
Average = Sum(39)m / 12 =												63.0912	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7363	0.7350	0.7337	0.7277	0.7266	0.7214	0.7214	0.7204	0.7234	0.7266	0.7288	0.7312	(40)
HLP (average)												0.7277	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)

Total per year (kWh/year) = Sum(64)m = 907.7436 (64)
12Total per year (kWh/year) 908 (64)
Electric shower(s)

54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 614.3496 (64a)
Heat gains from water heating, kWh/month

37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.4800	46.7521	0.7600	0.7000	0.7700	128.9280	(78)
South	1.7600	46.7521	0.7600	0.7000	0.7700	30.3360	(78)

Solar gains	159.2640	260.8334	332.2555	375.5208	391.3159	376.5883	367.9497	357.3302	347.0801	281.3333	188.7822	137.6188	(83)
Total gains	637.4924	754.5582	803.6151	834.7633	827.3506	799.2566	774.6819	763.1120	765.0602	710.5054	642.2718	605.1675	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.4884	65.6043	65.7182	66.2587	66.3608	66.8404	66.8404	66.9299	66.6548	66.3608	66.1546	65.9403	
alpha	5.3659	5.3736	5.3812	5.4172	5.4241	5.4560	5.4560	5.4620	5.4437	5.4241	5.4103	5.3960	
util living area	0.9735	0.9409	0.8952	0.8041	0.6724	0.4950	0.3544	0.3754	0.5543	0.8082	0.9429	0.9790	(86)

MIT	20.1937	20.4278	20.6323	20.8328	20.9464	20.9916	20.9989	20.9984	20.9842	20.8531	20.5053	20.1433	(87)
Th 2	20.3089	20.3101	20.3112	20.3164	20.3174	20.3220	20.3220	20.3228	20.3202	20.3174	20.3154	20.3133	(88)
util rest of house	0.9685	0.9309	0.8783	0.7759	0.6315	0.4446	0.3002	0.3206	0.5034	0.7753	0.9315	0.9749	(89)
MIT 2	19.5767	19.8038	19.9983	20.1847	20.2805	20.3175	20.3216	20.3222	20.3112	20.2061	19.8858	19.5311	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.7697	19.9990	20.1966	20.3874	20.4888	20.5283	20.5334	20.5337	20.5218	20.4085	20.0796	19.7226	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7697	19.9990	20.1966	20.3874	20.4888	20.5283	20.5334	20.5337	20.5218	20.4085	20.0796	19.7226	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9639	0.9258	0.8753	0.7790	0.6421	0.4601	0.3171	0.3377	0.5187	0.7799	0.9270	0.9708	(94)
Useful gains	614.4871	698.5517	703.3759	650.2525	531.2199	367.7440	245.6856	257.7300	396.8557	554.1354	595.3842	587.4739	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	987.4877	962.1243	871.2488	724.7604	553.6465	370.7738	246.0071	258.1895	402.7510	617.8827	820.1926	984.0751	(97)
Space heating kWh	277.5124	177.1208	124.8974	53.6457	16.6853	0.0000	0.0000	0.0000	0.0000	47.4280	161.8620	295.0714	(98a)
Space heating requirement - total per year (kWh/year)												1154.2231	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	277.5124	177.1208	124.8974	53.6457	16.6853	0.0000	0.0000	0.0000	0.0000	47.4280	161.8620	295.0714	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1154.2231	
Space heating per m2											(98c) / (4) =	13.3128	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	587.9004	462.8152	474.6877	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9585	0.9826	0.9796	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	563.5018	454.7850	465.0002	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	870.0817	844.3908	833.6307	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	220.7375	289.8667	274.2611	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	55.1844	72.4667	68.5653	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												196.2163	(107)
Energy for space heating												13.3128	(99)
Energy for space cooling												2.2632	(108)
Total												15.5760	(109)
Fabric Energy Efficiency (DFEE)												15.6	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
500mm mineral wool	43.3500		43.3500	0.1100	4.7685			(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2577			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.7700	0.0600	0.4062
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	19.4300	0.1200	2.3316
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1426 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.4003 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	70.6867	70.4833	70.2839	69.3475	69.1723	68.3567	68.3567	68.2057	68.6709	69.1723	69.5267	69.8973	(39)
Average = Sum(39)m / 12 =												69.3467	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8153	0.8130	0.8107	0.7999	0.7978	0.7884	0.7884	0.7867	0.7921	0.7978	0.8019	0.8062	(40)
HLP (average)												0.7998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												64.3029	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains													
	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	9.2400	46.7521	0.6300	0.7000	0.7700	132.0215	(78)

Solar gains	132.0215	216.2172	275.4223	311.2870	324.3803	312.1719	305.0110	296.2079	287.7111	233.2105	156.4905	114.0787	(83)
Total gains	610.2499	709.9420	746.7820	770.5294	760.4149	734.8402	711.7431	701.9897	705.6912	662.3826	609.9801	581.6275	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1394	59.3101	59.4783	60.2815	60.4342	61.1552	61.1552	61.2906	60.8754	60.4342	60.1261	59.8073	
alpha	4.9426	4.9540	4.9652	5.0188	5.0289	5.0770	5.0770	5.0860	5.0584	5.0289	5.0084	4.9872	
util living area													
	0.9811	0.9609	0.9323	0.8673	0.7575	0.5773	0.4195	0.4428	0.6391	0.8666	0.9607	0.9846	(86)
MIT	19.9686	20.1971	20.4269	20.6959	20.8802	20.9763	20.9961	20.9948	20.9593	20.7411	20.3232	19.9308	(87)
Th 2	20.2401	20.2421	20.2441	20.2535	20.2552	20.2634	20.2634	20.2649	20.2602	20.2552	20.2517	20.2480	(88)
util rest of house													
	0.9773	0.9535	0.9194	0.8427	0.7155	0.5170	0.3507	0.3739	0.5806	0.8376	0.9520	0.9814	(89)
MIT 2	19.2998	19.5246	19.7482	20.0078	20.1702	20.2505	20.2619	20.2629	20.2364	20.0538	19.6579	19.2690	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.5090	19.7350	19.9605	20.2230	20.3923	20.4775	20.4916	20.4918	20.4626	20.2688	19.8660	19.4760	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5090	19.7350	19.9605	20.2230	20.3923	20.4775	20.4916	20.4918	20.4626	20.2688	19.8660	19.4760	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9727	0.9476	0.9139	0.8416	0.7236	0.5349	0.3722	0.3954	0.5971	0.8381	0.9466	0.9774	(94)
Useful gains	593.6124	672.7560	682.4963	648.4996	550.2507	393.0524	264.8858	277.5370	421.3479	555.1662	577.4050	568.4821	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1075.0735	1045.6195	946.0557	785.2245	601.2667	401.7671	266.0149	279.0851	436.9231	668.8110	887.5804	1067.7512	(97)
Space heating kWh													
	358.2071	250.5643	196.0881	98.4419	37.9559	0.0000	0.0000	0.0000	0.0000	84.5517	223.3263	371.4562	(98a)
Space heating requirement - total per year (kWh/year)												1620.5916	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	358.2071	250.5643	196.0881	98.4419	37.9559	0.0000	0.0000	0.0000	0.0000	84.5517	223.3263	371.4562	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1620.5916	
Space heating per m2										(98c) / (4) =		18.6919	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	642.5530	505.8396	518.3630	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9103	0.9561	0.9502	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	584.9004	483.6362	492.5523	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	794.7898	770.8260	762.1891	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	151.1203	213.6691	200.6098	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	37.7801	53.4173	50.1525	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												141.3498	(107)
Energy for space heating												18.6919	(99)
Energy for space cooling												1.6303	(108)
Total												20.3223	(109)
Fabric Energy Efficiency (TFEE)												20.3	(109)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.45	**TER**	9.61
Environmental	99 A	**% DER < TER**			84.91
CO_2 Emissions (t/year)	0.1	**DFEE**	15.58	**TFEE**	20.32
Compliance Check	See BREL	**% DFEE < TFEE**			23.36
% DPER < TPER	62.12	**DPER**	19.36	**TPER**	51.11

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation		0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674 (64)
12Total per year (kWh/year)												2752 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.4800	46.7521	0.7600	0.7000	0.7700	128.9280	(78)
South	1.7600	46.7521	0.7600	0.7000	0.7700	30.3360	(78)

Solar gains	159.2640	260.8334	332.2555	375.5208	391.3159	376.5883	367.9497	357.3302	347.0801	281.3333	188.7822	137.6188 (83)
Total gains	744.4365	860.2459	906.4019	930.5548	919.0271	886.5871	859.0415	849.4522	853.7929	804.0864	742.5297	711.1599 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area	0.9461	0.8976	0.8368	0.7349	0.5999	0.4373	0.3118	0.3295	0.4876	0.7321	0.8977	0.9559	(86)
MIT	20.4278	20.6186	20.7717	20.9025	20.9720	20.9959	20.9995	20.9993	20.9924	20.9178	20.6706	20.3719	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9372	0.8831	0.8156	0.7048	0.5615	0.3930	0.2650	0.2823	0.4425	0.6968	0.8807	0.9484	(89)
MIT 2	19.6832	19.9141	20.0948	20.2421	20.3142	20.3356	20.3381	20.3380	20.3329	20.2609	19.9805	19.6144	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9161	20.1345	20.3066	20.4487	20.5200	20.5421	20.5450	20.5449	20.5392	20.4664	20.1963	19.8514	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9161	20.1345	20.3066	20.4487	20.5200	20.5421	20.5450	20.5449	20.5392	20.4664	20.1963	19.8514	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9308	0.8782	0.8146	0.7100	0.5722	0.4067	0.2797	0.2971	0.4563	0.7039	0.8767	0.9420	(94)
Useful gains	692.9219	755.4617	738.3117	660.6947	525.8565	360.6021	240.2312	252.3463	389.5505	565.9756	650.9548	669.9285	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	951.5082	928.2545	841.2502	703.6749	537.4102	362.0614	240.3742	252.5519	392.3487	601.1687	797.9747	953.6570	(97)
Space heating kWh	192.3882	116.1167	76.5862	30.9458	8.5960	0.0000	0.0000	0.0000	0.0000	26.1837	105.8543	211.0940	(98a)
Space heating requirement - total per year (kWh/year)												767.7650	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	192.3882	116.1167	76.5862	30.9458	8.5960	0.0000	0.0000	0.0000	0.0000	26.1837	105.8543	211.0940	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												767.7650	
Space heating per m2											(98c) / (4) =	8.8554	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	192.3882	116.1167	76.5862	30.9458	8.5960	0.0000	0.0000	0.0000	0.0000	26.1837	105.8543	211.0940	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	288.5824	174.1751	114.8794	46.4187	12.8940	0.0000	0.0000	0.0000	0.0000	39.2755	158.7815	316.6411	
Space heating requirement	288.5824	174.1751	114.8794	46.4187	12.8940	0.0000	0.0000	0.0000	0.0000	39.2755	158.7815	316.6411	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1151.6476	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												11.5165	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4570.7483	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1407.7730	0.1578	48.4676	(367)
Electrical energy for heat distribution (space & water)	11.5165	0.0000	7.6332	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			211.1851	(373)
Space and water heating			211.1851	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			125.6102	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.4500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1407.7730	1.5842	486.5170	(467)
Electrical energy for heat distribution (space & water)	11.5165	0.0000	81.0236	(472)
Overall CO2 factor for heat network			0.4246	(486)
Total CO2 associated with community systems			2241.6532	(473)
Space and water heating			2241.6532	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1678.7099	(483)
Dwelling Primary energy Rate (DPER)			19.3600	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
500mm mineral wool	43.3500		43.3500	0.1100	4.7685			(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2577			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.7700	0.0600	0.4062
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	19.4300	0.1200	2.3316
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1426 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 30.4003 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	70.6867	70.4833	70.2839	69.3475	69.1723	68.3567	68.3567	68.2057	68.6709	69.1723	69.5267	69.8973	(39)
Average = Sum(39)m / 12 =												69.3467	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8153	0.8130	0.8107	0.7999	0.7978	0.7884	0.7884	0.7867	0.7921	0.7978	0.8019	0.8062	(40)
HLP (average)												0.7998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	9.2400	46.7521	0.6300	0.7000	0.7700	132.0215	(78)

Solar gains	132.0215	216.2172	275.4223	311.2870	324.3803	312.1719	305.0110	296.2079	287.7111	233.2105	156.4905	114.0787	(83)
Total gains	710.8586	809.2943	843.2333	859.9856	845.7561	812.8353	786.7674	778.9946	785.0885	749.6283	703.9027	681.2845	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1394	59.3101	59.4783	60.2815	60.4342	61.1552	61.1552	61.2906	60.8754	60.4342	60.1261	59.8073	
alpha	4.9426	4.9540	4.9652	5.0188	5.0289	5.0770	5.0770	5.0860	5.0584	5.0289	5.0084	4.9872	
util living area	0.9659	0.9380	0.9005	0.8234	0.7037	0.5273	0.3805	0.4004	0.5840	0.8165	0.9347	0.9711	(86)
MIT	20.1244	20.3335	20.5388	20.7669	20.9142	20.9841	20.9975	20.9967	20.9727	20.8089	20.4512	20.0889	(87)
Th 2	20.2401	20.2421	20.2441	20.2535	20.2552	20.2634	20.2634	20.2649	20.2602	20.2552	20.2517	20.2480	(88)
util rest of house	0.9595	0.9272	0.8835	0.7950	0.6602	0.4704	0.3176	0.3375	0.5277	0.7825	0.9216	0.9656	(89)
MIT 2	19.2284	19.4886	19.7407	20.0167	20.1789	20.2525	20.2622	20.2633	20.2402	20.0695	19.6452	19.1902	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.5087	19.7529	19.9904	20.2514	20.4089	20.4813	20.4922	20.4927	20.4693	20.3008	19.8973	19.4713	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5087	19.7529	19.9904	20.2514	20.4089	20.4813	20.4922	20.4927	20.4693	20.3008	19.8973	19.4713	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9520	0.9191	0.8772	0.7949	0.6696	0.4875	0.3373	0.3571	0.5439	0.7848	0.9145	0.9587	(94)
Useful gains	676.7692	743.8477	739.6465	683.6260	566.2766	396.2528	265.3406	278.1739	427.0395	588.2853	643.6976	653.1148	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1075.0532	1046.8810	948.1569	787.1899	602.4176	402.0296	266.0579	279.1447	437.3860	671.0251	889.7559	1067.4218	(97)
Space heating kWh	296.3233	203.6384	155.1317	74.5660	26.8889	0.0000	0.0000	0.0000	0.0000	61.5584	177.1620	308.2444	(98a)
Space heating requirement - total per year (kWh/year)												1303.5131	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	296.3233	203.6384	155.1317	74.5660	26.8889	0.0000	0.0000	0.0000	0.0000	61.5584	177.1620	308.2444	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1303.5131	
Space heating per m2											(98c) / (4) =	15.0348	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	296.3233	203.6384	155.1317	74.5660	26.8889	0.0000	0.0000	0.0000	0.0000	61.5584	177.1620	308.2444	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	321.0436	220.6266	168.0734	80.7866	29.1321	0.0000	0.0000	0.0000	0.0000	66.6939	191.9415	333.9593	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.5935	84.0277	83.2958	82.1155	80.8263	79.8000	79.8000	79.8000	79.8000	81.7821	83.7044	84.7054	(217)
Fuel for water heating, kWh/month	276.2401	245.8338	263.5263	235.5729	232.2840	212.3443	209.9929	218.2535	220.5242	239.5008	248.2237	272.9661	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1412.2569	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2875.2626	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3740.8248	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1412.2569	0.2100	296.5740	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2875.2626	0.2100	603.8051	(264)
Space and water heating			900.3791	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			833.4774	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.6100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1412.2569	1.1300	1595.8503	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2875.2626	1.1300	3249.0467	(278)
Space and water heating			4844.8971	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4431.1241	(286)
Target Primary Energy Rate (TPER)			51.1100	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.45	**TER**	9.61
Environmental	99 A	**% DER < TER**			84.91
CO_2 Emissions (t/year)	0.1	**DFEE**	15.58	**TFEE**	20.32
Compliance Check	See BREL	**% DFEE < TFEE**			23.36
% DPER < TPER	62.12	**DPER**	19.36	**TPER**	51.11

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.4800	46.7521	0.7600	0.7000	0.7700	128.9280	(78)
South	1.7600	46.7521	0.7600	0.7000	0.7700	30.3360	(78)

Solar gains	159.2640	260.8334	332.2555	375.5208	391.3159	376.5883	367.9497	357.3302	347.0801	281.3333	188.7822	137.6188	(83)
Total gains	798.8879	898.1273	950.5408	958.4745	939.1186	892.6932	865.3981	858.0426	866.0018	832.5145	778.7860	761.4015	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area													
	0.9299	0.8827	0.8152	0.7192	0.5885	0.4344	0.3095	0.3262	0.4810	0.7135	0.8811	0.9426	(86)
MIT	20.4983	20.6561	20.8016	20.9124	20.9745	20.9960	20.9995	20.9993	20.9929	20.9276	20.7063	20.4411	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house													
	0.9191	0.8668	0.7928	0.6888	0.5505	0.3904	0.2631	0.2795	0.4364	0.6780	0.8624	0.9334	(89)
MIT 2	19.7689	19.9582	20.1284	20.2523	20.3164	20.3357	20.3381	20.3380	20.3333	20.2705	20.0219	19.6993	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9971	20.1765	20.3390	20.4588	20.5222	20.5422	20.5450	20.5449	20.5396	20.4761	20.2360	19.9313	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9971	20.1765	20.3390	20.4588	20.5222	20.5422	20.5450	20.5449	20.5396	20.4761	20.2360	19.9313	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9129	0.8626	0.7929	0.6945	0.5612	0.4040	0.2776	0.2941	0.4501	0.6856	0.8592	0.9269	(94)
Useful gains	729.3312	774.7406	753.6451	665.6715	527.0270	360.6567	240.2373	252.3582	389.7573	570.7745	669.1621	705.7609	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	956.4430	930.8181	843.2285	704.2908	537.5498	362.0678	240.3749	252.5534	392.3731	601.7604	800.3911	958.5283	(97)
Space heating kWh													
	168.9712	104.8841	66.6501	27.8059	7.8290	0.0000	0.0000	0.0000	0.0000	23.0535	94.4848	188.0590	(98a)
Space heating requirement - total per year (kWh/year)												681.7376	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	168.9712	104.8841	66.6501	27.8059	7.8290	0.0000	0.0000	0.0000	0.0000	23.0535	94.4848	188.0590	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												681.7376	
Space heating per m2											(98c) / (4) =	7.8632	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	168.9712	104.8841	66.6501	27.8059	7.8290	0.0000	0.0000	0.0000	0.0000	23.0535	94.4848	188.0590	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	253.4568	157.3262	99.9751	41.7088	11.7435	0.0000	0.0000	0.0000	0.0000	34.5802	141.7272	282.0885	
Space heating requirement													
	253.4568	157.3262	99.9751	41.7088	11.7435	0.0000	0.0000	0.0000	0.0000	34.5802	141.7272	282.0885	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1022.6064	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												10.2261	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4441.7072	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1022.6064	4.4400	45.4037	(340a)
Space heating total			45.4037	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			253.9948	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.6943 (357)
SAP value		88.7455
SAP rating (Section 12)		89 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1373.3620	0.1578	43.0348	(367)
Electrical energy for heat distribution (space & water)	10.2261	0.0000	7.4295	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			205.5486	(373)
Space and water heating			205.5486	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			119.9737	(383)
CO2 emissions per m2			1.3800	(384)
EI value			98.7793	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			3.0000 (17)
Infiltration rate			0.1500 (18)
Number of sides sheltered			3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7750 (20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)

Average = Sum(39)m / 12 = 60.9312

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)											Total = Sum(45)m =	2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)

Total per year (kWh/year) = Sum(64)m = 2751.6674 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.4800	54.0600	0.7600	0.7000	0.7700	149.0811	(78)
South	1.7600	54.0600	0.7600	0.7000	0.7700	35.0779	(78)

Solar gains	184.1590	267.3147	335.0854	384.8681	389.5564	404.1002	386.5845	379.8122	369.8751	303.9017	214.8392	160.2075	(83)
Total gains	823.7829	904.6086	953.3707	967.8218	937.3591	920.2051	884.0330	880.5246	888.7968	855.0828	804.8430	783.9902	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area													
	0.9168	0.8730	0.7971	0.6958	0.5609	0.3829	0.2687	0.2835	0.4495	0.6724	0.8570	0.9316	(86)
MIT	20.5542	20.6840	20.8299	20.9279	20.9809	20.9981	20.9998	20.9997	20.9951	20.9484	20.7573	20.4977	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house													
	0.9043	0.8560	0.7730	0.6643	0.5217	0.3397	0.2232	0.2379	0.4055	0.6349	0.8356	0.9209	(89)
MIT 2	19.8368	19.9914	20.1607	20.2688	20.3224	20.3372	20.3383	20.3383	20.3350	20.2915	20.0811	19.7686	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0612	20.2080	20.3700	20.4749	20.5284	20.5439	20.5452	20.5452	20.5415	20.4970	20.2926	19.9967	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0612	20.2080	20.3700	20.4749	20.5284	20.5439	20.5452	20.5452	20.5415	20.4970	20.2926	19.9967	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8986	0.8524	0.7742	0.6709	0.5331	0.3531	0.2374	0.2522	0.4191	0.6441	0.8340	0.9147	(94)
Useful gains	740.2354	771.1201	738.0723	649.3392	499.7104	324.9675	209.8679	222.0269	372.4583	550.7793	671.2212	717.1093	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	942.0703	914.4575	814.6519	680.9030	507.4577	325.6112	209.9208	222.1038	374.2089	572.5701	779.4704	944.2317	(97)
Space heating kWh													
	150.1652	96.3227	56.9753	22.7259	5.7640	0.0000	0.0000	0.0000	0.0000	16.2124	77.9394	168.9791	(98a)
Space heating requirement - total per year (kWh/year)												595.0839	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	150.1652	96.3227	56.9753	22.7259	5.7640	0.0000	0.0000	0.0000	0.0000	16.2124	77.9394	168.9791	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												595.0839	
Space heating per m2											(98c) / (4) =	6.8637	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	150.1652	96.3227	56.9753	22.7259	5.7640	0.0000	0.0000	0.0000	0.0000	16.2124	77.9394	168.9791	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	225.2477	144.4841	85.4629	34.0889	8.6460	0.0000	0.0000	0.0000	0.0000	24.3186	116.9091	253.4686	
Space heating requirement													
	225.2477	144.4841	85.4629	34.0889	8.6460	0.0000	0.0000	0.0000	0.0000	24.3186	116.9091	253.4686	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)

Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year		
Space heating fuel - community heating	892.6258	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4127.5010	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	8.9263	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4215.2005	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	892.6258	6.5500	58.4670	(340a)
Space heating total			58.4670	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			321.7720	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1338.7005	0.1582	37.6535	(367)
Electrical energy for heat distribution (space & water)	8.9263	0.0000	7.2277	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			199.9655	(373)
Space and water heating			199.9655	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			102.1325	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1338.7005	1.5856	377.4164	(467)
Electrical energy for heat distribution (space & water)	8.9263	0.0000	76.9323	(472)
Overall CO2 factor for heat network			0.4240	(486)
Total CO2 associated with community systems			2128.4613	(473)
Space and water heating			2128.4613	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1484.6261	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - North

Current energy efficiency rating: B 89
Current environmental impact rating: A 99

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Energy Environmental
Typical annual savings efficiency impact
Recommended measures
(none)
Total Savings £0 0.00 kg/m²

Potential energy efficiency rating: B 89
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£71	£71	£0
Community scheme	£433	£433	£0
Space heating	£172	£172	£0
Water heating	£270	£270	£0
Lighting	£62	£62	£0
Generated (PV)	-£182	-£182	£0
Total cost of fuels	£322	£322	£0
Total cost of uses	£322	£322	£0
Delivered energy	49 kWh/m²	49 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	17 kWh/m²	17 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5778 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day)	126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.4800	46.7521	0.7600	0.7000	0.7700	128.9280	(78)
South	1.7600	46.7521	0.7600	0.7000	0.7700	30.3360	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	159.2640	260.8334	332.2555	375.5208	391.3159	376.5883	367.9497	357.3302	347.0801	281.3333	188.7822	137.6188	(83)
Total gains	798.8879	898.1273	950.5408	958.4745	939.1186	892.6932	865.3981	858.0426	866.0018	832.5145	778.7860	761.4015	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area	0.9299	0.8827	0.8152	0.7192	0.5885	0.4344	0.3095	0.3262	0.4810	0.7135	0.8811	0.9426	(86)
MIT	20.4983	20.6561	20.8016	20.9124	20.9745	20.9960	20.9995	20.9993	20.9929	20.9276	20.7063	20.4411	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9191	0.8668	0.7928	0.6888	0.5505	0.3904	0.2631	0.2795	0.4364	0.6780	0.8624	0.9334	(89)
MIT 2	19.7689	19.9582	20.1284	20.2523	20.3164	20.3357	20.3381	20.3380	20.3333	20.2705	20.0219	19.6993	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9971	20.1765	20.3390	20.4588	20.5222	20.5422	20.5450	20.5449	20.5396	20.4761	20.2360	19.9313	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9971	20.1765	20.3390	20.4588	20.5222	20.5422	20.5450	20.5449	20.5396	20.4761	20.2360	19.9313	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9129	0.8626	0.7929	0.6945	0.5612	0.4040	0.2776	0.2941	0.4501	0.6856	0.8592	0.9269	(94)
Useful gains	729.3312	774.7406	753.6451	665.6715	527.0270	360.6567	240.2373	252.3582	389.7573	570.7745	669.1621	705.7609	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	956.4430	930.8181	843.2285	704.2908	537.5498	362.0678	240.3749	252.5534	392.3731	601.7604	800.3911	958.5283	(97)
Space heating kWh	168.9712	104.8841	66.6501	27.8059	7.8290	0.0000	0.0000	0.0000	0.0000	23.0535	94.4848	188.0590	(98a)
Space heating requirement - total per year (kWh/year)												681.7376	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	168.9712	104.8841	66.6501	27.8059	7.8290	0.0000	0.0000	0.0000	0.0000	23.0535	94.4848	188.0590	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												681.7376	
Space heating per m2										(98c) / (4) =		7.8632	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	168.9712	104.8841	66.6501	27.8059	7.8290	0.0000	0.0000	0.0000	0.0000	23.0535	94.4848	188.0590	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	253.4568	157.3262	99.9751	41.7088	11.7435	0.0000	0.0000	0.0000	0.0000	34.5802	141.7272	282.0885	
Space heating requirement													
	253.4568	157.3262	99.9751	41.7088	11.7435	0.0000	0.0000	0.0000	0.0000	34.5802	141.7272	282.0885	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1022.6064	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)

Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	10.2261	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4441.7072	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1022.6064	4.4400	45.4037	(340a)
Space heating total			45.4037	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			253.9948	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.6943	(357)
SAP value	88.7455	
SAP rating (Section 12)	89	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1373.3620	0.1578	43.0348	(367)
Electrical energy for heat distribution (space & water)	10.2261	0.0000	7.4295	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			205.5486	(373)
Space and water heating			205.5486	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			119.9737	(383)
CO2 emissions per m2			1.3800	(384)
EI value			98.7793	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 86.7000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5778	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.4800	54.0600	0.7600	0.7000	0.7700	149.0811	(78)
South	1.7600	54.0600	0.7600	0.7000	0.7700	35.0779	(78)

Solar gains	184.1590	267.3147	335.0854	384.8681	389.5564	404.1002	386.5845	379.8122	369.8751	303.9017	214.8392	160.2075	(83)
Total gains	823.7829	904.6086	953.3707	967.8218	937.3591	920.2051	884.0330	880.5246	888.7968	855.0828	804.8430	783.9902	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area													
	0.9168	0.8730	0.7971	0.6958	0.5609	0.3829	0.2687	0.2835	0.4495	0.6724	0.8570	0.9316	(86)
MIT	20.5542	20.6840	20.8299	20.9279	20.9809	20.9981	20.9998	20.9997	20.9951	20.9484	20.7573	20.4977	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house													
	0.9043	0.8560	0.7730	0.6643	0.5217	0.3397	0.2232	0.2379	0.4055	0.6349	0.8356	0.9209	(89)
MIT 2	19.8368	19.9914	20.1607	20.2688	20.3224	20.3372	20.3383	20.3383	20.3350	20.2915	20.0811	19.7686	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0612	20.2080	20.3700	20.4749	20.5284	20.5439	20.5452	20.5452	20.5415	20.4970	20.2926	19.9967	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0612	20.2080	20.3700	20.4749	20.5284	20.5439	20.5452	20.5452	20.5415	20.4970	20.2926	19.9967	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8986	0.8524	0.7742	0.6709	0.5331	0.3531	0.2374	0.2522	0.4191	0.6441	0.8340	0.9147	(94)
Useful gains	740.2354	771.1201	738.0723	649.3392	499.7104	324.9675	209.8679	222.0269	372.4583	550.7793	671.2212	717.1093	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	942.0703	914.4575	814.6519	680.9030	507.4577	325.6112	209.9208	222.1038	374.2089	572.5701	779.4704	944.2317	(97)
Space heating kWh													
	150.1652	96.3227	56.9753	22.7259	5.7640	0.0000	0.0000	0.0000	0.0000	16.2124	77.9394	168.9791	(98a)
Space heating requirement - total per year (kWh/year)												595.0839	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	150.1652	96.3227	56.9753	22.7259	5.7640	0.0000	0.0000	0.0000	0.0000	16.2124	77.9394	168.9791	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												595.0839	
Space heating per m2											(98c) / (4) =	6.8637	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

```
Space heating requirement
              150.1652    96.3227    56.9753    22.7259     5.7640     0.0000     0.0000     0.0000     0.0000    16.2124    77.9394   168.9791 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50
307a          225.2477   144.4841    85.4629    34.0889     8.6460     0.0000     0.0000     0.0000     0.0000    24.3186   116.9091   253.4686
Space heating requirement
              225.2477   144.4841    85.4629    34.0889     8.6460     0.0000     0.0000     0.0000     0.0000    24.3186   116.9091   253.4686 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)                                                    0.0000 (308)
Space heating fuel for secondary/supplementary system
                0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (309)

Water heating
Annual water heating requirement
              273.1943   241.6777   256.7410   225.4866   218.4626   196.7075   193.9297   201.6421   203.8882   227.5485   242.2299   270.1592 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50
310a          409.7914   362.5166   385.1115   338.2299   327.6940   295.0613   290.8946   302.4632   305.8322   341.3227   363.3448   405.2388
Water heating fuel
              409.7914   362.5166   385.1115   338.2299   327.6940   295.0613   290.8946   302.4632   305.8322   341.3227   363.3448   405.2388 (310)
Cooling System Energy Efficiency Ratio                                                                                                     0.0000 (314)
Space coolin      0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (315)
Pumps and Fa      2.8446     2.5693     2.8446     2.7528     2.8446     2.7528     2.8446     2.8446     2.7528     2.8446     2.7528     2.8446 (331)
Lighting         26.8046    21.5036    19.3616    14.1852    10.9570     8.9520     9.9954    12.9924    16.8758    22.1419    25.0093    27.5496 (332)
Electricity generated by PVs (Appendix M) (negative quantity)
(333a)m         -18.1436   -27.2619   -46.0013   -59.8009   -68.1805   -68.0662   -66.0788   -60.1130   -49.0438   -35.3423   -20.8689   -15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(334a)m           0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(335a)m           0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)
(333b)m          -5.8549   -12.7033   -31.2438   -57.7722   -81.0600   -93.0525   -88.4113   -71.1286   -45.3050   -21.6541    -8.1615    -4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(334b)m           0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(335b)m           0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (335b)
Annual totals kWh/year
Space heating fuel - community heating                                                                                                   892.6258 (307)
Space heating fuel - secondary                                                                                                             0.0000 (309)
Water heating fuel - community heating                                                                                                  4127.5010 (310)
Efficiency of water heater                                                                                                                 0.0000 (311)
Electricity used for heat distribution                                                                                                     8.9263 (313)
Space cooling fuel                                                                                                                         0.0000 (321)

Electricity for pumps and fans:
    (MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)
   mechanical ventilation fans (SFP =       0.1292)                                                                                        33.4924 (330a)
Total electricity for the above, kWh/year                                                                                                 33.4924 (331)
Electricity for lighting (calculated in Appendix L)                                                                                      216.3282 (332)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation                                                                                                                          -1054.7470 (333)
Wind generation                                                                                                                            0.0000 (334)
Hydro-electric generation (Appendix N)                                                                                                     0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)                                                                                             0.0000 (335)
Appendix Q - special features
Energy saved or generated                                                                                                                 -0.0000 (336)
Energy used                                                                                                                                0.0000 (337)
Total delivered energy for all uses                                                                                                     4215.2005 (338)


------------------------------------------------------------------------------------------------------------------------
10b. Fuel costs - using BEDF prices (577)
------------------------------------------------------------------------------------------------------------------------
                                                                                Fuel            Fuel price            Fuel cost
                                                                             kWh/year                p/kWh              £/year
Space heating from Heat pump                                                892.6258               6.5500             58.4670 (340a)
Space heating total                                                                                                   58.4670 (340)
Total CO2 associated with community systems                                                                            0.0000 (473)
Space heating - secondary                                                      0.0000               0.0000              0.0000 (341)
Water heating from Heat pump                                                4127.5010               6.5500            270.3513 (342a)
Water heating total                                                                                                  270.3513 (342)
Energy for instantaneous electric shower(s)                                    0.0000              28.4300              0.0000 (347a)
Pumps, fans and electric keep-hot                                             33.4924              28.4300              9.5219 (349)
Energy for lighting                                                          216.3282              28.4300             61.5021 (350)
Additional standing charges                                                                                          104.0000 (351)

 Energy saving/generation technologies
PV Unit electricity used in dwelling                                        -533.9942              28.4300           -151.8146
PV Unit electricity exported                                                -520.7528               5.8100            -30.2557
Total                                                                                                               -182.0703 (352)
Total energy cost                                                                                                    321.7720 (355)


------------------------------------------------------------------------------------------------------------------------
12b. Carbon dioxide emissions - Community heating scheme
------------------------------------------------------------------------------------------------------------------------
                                                                              Energy       Emission factor          Emissions
                                                                           kWh/year           kg CO2/kWh        kg CO2/year
Efficiency of heat source Heat pump                                                                                375.0000 (367)
Space and Water heating from Heat pump                                    1338.7005               0.1582             37.6535 (367)
Electrical energy for heat distribution (space & water)                      8.9263               0.0000              7.2277 (372)
Overall CO2 factor for heat network                                                                                  0.0398 (386)
Total CO2 associated with community systems                                                                        199.9655 (373)
Space and water heating                                                                                            199.9655 (376)
Pumps, fans and electric keep-hot                                            33.4924               0.1387              4.6458 (378)
Energy for lighting                                                         216.3282               0.1443             31.2229 (379)

 Energy saving/generation technologies
PV Unit electricity used in dwelling                                        -533.9942               0.1321            -70.5455
PV Unit electricity exported                                                -520.7528               0.1213            -63.1561
Total                                                                                                              -133.7016 (380)
Total CO2, kg/year                                                                                                 102.1325 (383)


------------------------------------------------------------------------------------------------------------------------
13b. Primary energy - Community heating scheme
------------------------------------------------------------------------------------------------------------------------
                                                                              Energy Primary energy factor        Primary energy
                                                                           kWh/year           kg CO2/kWh             kWh/year
Efficiency of heat source Heat pump                                                                                375.0000 (467a)
```

Space and Water heating from Heat pump	1338.7005	1.5856	377.4164	(467)
Electrical energy for heat distribution (space & water)	8.9263	0.0000	76.9323	(472)
Overall CO2 factor for heat network			0.4240	(486)
Total CO2 associated with community systems			2128.4613	(473)
Space and water heating			2128.4613	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1484.6261	(483)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.51	**TER**	9.81
Environmental	99 A	**% DER < TER**			84.61
CO_2 Emissions (t/year)	0.11	**DFEE**	16.83	**TFEE**	21.47
Compliance Check	See BREL	**% DFEE < TFEE**			21.62
% DPER < TPER	61.79	**DPER**	19.94	**TPER**	52.18

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

---

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
12Total per year (kWh/year)												2752	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.4800	36.7938	0.7600	0.7000	0.7700	101.4662	(79)
Southwest	1.7600	36.7938	0.7600	0.7000	0.7700	23.8744	(79)

Solar gains	125.3406	213.5015	292.1220	361.9533	405.4179	402.4861	388.0396	355.6131	316.3064	235.9646	150.1292	107.2655	(83)
Total gains	710.5132	812.9140	866.2684	916.9873	933.1290	912.4849	879.1314	847.7351	823.0191	758.7177	703.8768	680.8066	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area	0.9550	0.9153	0.8561	0.7427	0.5919	0.4252	0.3047	0.3302	0.5048	0.7625	0.9144	0.9630	(86)
MIT	20.3808	20.5672	20.7408	20.8973	20.9738	20.9964	20.9995	20.9993	20.9910	20.8992	20.6286	20.3277	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9473	0.9024	0.8362	0.7127	0.5537	0.3821	0.2590	0.2829	0.4585	0.7280	0.8993	0.9565	(89)
MIT 2	19.6255	19.8530	20.0599	20.2367	20.3157	20.3360	20.3382	20.3380	20.3319	20.2423	19.9313	19.5599	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8618	20.0764	20.2729	20.4433	20.5216	20.5426	20.5450	20.5449	20.5380	20.4478	20.1495	19.8001	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8618	20.0764	20.2729	20.4433	20.5216	20.5426	20.5450	20.5449	20.5380	20.4478	20.1495	19.8001	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9410	0.8968	0.8341	0.7176	0.5644	0.3954	0.2733	0.2977	0.4726	0.7340	0.8945	0.9503	(94)
Useful gains	668.5655	729.0359	722.5585	658.0693	526.6907	360.8199	240.2496	252.3439	388.9516	556.8723	629.5989	646.9675	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	948.1962	924.7156	839.1990	703.3488	537.5098	362.0871	240.3764	252.5516	392.2780	600.0368	795.1194	950.5300	(97)
Space heating kWh	208.0452	131.4967	86.7805	32.6012	8.0494	0.0000	0.0000	0.0000	0.0000	32.1143	119.1747	225.8504	(98a)
Space heating requirement - total per year (kWh/year)												844.1127	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	208.0452	131.4967	86.7805	32.6012	8.0494	0.0000	0.0000	0.0000	0.0000	32.1143	119.1747	225.8504	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												844.1127	
Space heating per m2											(98c) / (4) =	9.7360	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	208.0452	131.4967	86.7805	32.6012	8.0494	0.0000	0.0000	0.0000	0.0000	32.1143	119.1747	225.8504	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	312.0679	197.2451	130.1708	48.9018	12.0741	0.0000	0.0000	0.0000	0.0000	48.1715	178.7621	338.7757	
Space heating requirement	312.0679	197.2451	130.1708	48.9018	12.0741	0.0000	0.0000	0.0000	0.0000	48.1715	178.7621	338.7757	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1266.1690	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												12.6617	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4685.2698	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1438.3120	0.1577	53.2517	(367)
Electrical energy for heat distribution (space & water)	12.6617	0.0000	7.8126	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			216.1486	(373)
Space and water heating			216.1486	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			130.5738	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.5100	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1438.3120	1.5838	534.7689	(467)
Electrical energy for heat distribution (space & water)	12.6617	0.0000	82.8331	(472)
Overall CO2 factor for heat network			0.4249	(486)
Total CO2 associated with community systems			2291.7145	(473)
Space and water heating			2291.7145	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1728.7712	(483)
Dwelling Primary energy Rate (DPER)			19.9400	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
500mm mineral wool	43.3500		43.3500	0.1100	4.7685			(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2577			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.7700	0.0600	0.4062
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	19.4300	0.1200	2.3316
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1426 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 30.4003 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	70.6867	70.4833	70.2839	69.3475	69.1723	68.3567	68.3567	68.2057	68.6709	69.1723	69.5267	69.8973	(39)
Average = Sum(39)m / 12 =												69.3467	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8153	0.8130	0.8107	0.7999	0.7978	0.7884	0.7884	0.7867	0.7921	0.7978	0.8019	0.8062	(40)
HLP (average)												0.7998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	9.2400	36.7938	0.6300	0.7000	0.7700	103.9008	(79)

Solar gains	103.9008	176.9815	242.1538	300.0403	336.0701	333.6398	321.6644	294.7845	262.2013	195.6022	124.4492	88.9174 (83)
Total gains	682.7380	770.0586	809.9648	848.7388	857.4458	834.3032	803.4208	777.5712	759.5787	712.0200	671.8614	656.1232 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1394	59.3101	59.4783	60.2815	60.4342	61.1552	61.1552	61.2906	60.8754	60.4342	60.1261	59.8073	
alpha	4.9426	4.9540	4.9652	5.0188	5.0289	5.0770	5.0770	5.0860	5.0584	5.0289	5.0084	4.9872	
util living area	0.9707	0.9477	0.9121	0.8291	0.6966	0.5148	0.3728	0.4011	0.6009	0.8384	0.9444	0.9750	(86)
MIT	20.0821	20.2816	20.5023	20.7589	20.9180	20.9857	20.9977	20.9967	20.9690	20.7819	20.4095	20.0500	(87)
Th 2	20.2401	20.2421	20.2441	20.2535	20.2552	20.2634	20.2634	20.2649	20.2602	20.2552	20.2517	20.2480	(88)
util rest of house	0.9651	0.9383	0.8964	0.8010	0.6531	0.4589	0.3111	0.3381	0.5438	0.8063	0.9328	0.9702	(89)
MIT 2	19.1757	19.4253	19.6977	20.0080	20.1825	20.2536	20.2623	20.2633	20.2374	20.0410	19.5949	19.1416	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.4593	19.6931	19.9494	20.2429	20.4126	20.4826	20.4923	20.4927	20.4662	20.2727	19.8497	19.4258	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4593	19.6931	19.9494	20.2429	20.4126	20.4826	20.4923	20.4927	20.4662	20.2727	19.8497	19.4258	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9580	0.9303	0.8896	0.8006	0.6626	0.4758	0.3304	0.3577	0.5601	0.8072	0.9255	0.9636	(94)
Useful gains	654.0764	716.3622	720.5416	679.5205	568.1433	396.9341	265.4160	278.1646	425.4125	574.7119	621.8118	632.2537	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1071.5579	1042.6677	945.2733	786.6009	602.6702	402.1174	266.0678	279.1434	437.1736	669.0861	886.4447	1064.2401	(97)
Space heating kWh	310.6062	219.2773	167.2004	77.0979	25.6881	0.0000	0.0000	0.0000	0.0000	70.2144	190.5357	321.3979	(98a)
Space heating requirement - total per year (kWh/year)												1382.0179	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	310.6062	219.2773	167.2004	77.0979	25.6881	0.0000	0.0000	0.0000	0.0000	70.2144	190.5357	321.3979	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1382.0179	
Space heating per m2											(98c) / (4) =	15.9402	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.3000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	310.6062	219.2773	167.2004	77.0979	25.6881	0.0000	0.0000	0.0000	0.0000	70.2144	190.5357	321.3979	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	336.5181	237.5702	181.1489	83.5297	27.8311	0.0000	0.0000	0.0000	0.0000	76.0719	206.4309	348.2101	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.6988	84.1939	83.4572	82.1734	80.7854	79.8000	79.8000	79.8000	79.8000	81.9929	83.8660	84.7985	(217)
Fuel for water heating, kWh/month	275.8967	245.3487	263.0165	235.4069	232.4013	212.3443	209.9929	218.2535	220.5242	238.8851	247.7455	272.6665	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1497.3108	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2872.4821	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3823.0982	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1497.3108	0.2100	314.4353	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2872.4821	0.2100	603.2212	(264)
Space and water heating			917.6565	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			850.7548	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.8100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1497.3108	1.1300	1691.9612	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2872.4821	1.1300	3245.9047	(278)
Space and water heating			4937.8660	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4524.0930	(286)
Target Primary Energy Rate (TPER)			52.1800	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.51	**TER**	9.81
Environmental	99 A	**% DER < TER**			84.61
CO_2 Emissions (t/year)	0.11	**DFEE**	16.83	**TFEE**	21.47
Compliance Check	See BREL	**% DFEE < TFEE**			21.62
% DPER < TPER	61.79	**DPER**	19.94	**TPER**	52.18

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2257	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2878	0.2821	0.2765	0.2483	0.2426	0.2144	0.2144	0.2088	0.2257	0.2426	0.2539	0.2652	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5414	0.5398	0.5382	0.5308	0.5294	0.5230	0.5230	0.5218	0.5255	0.5294	0.5322	0.5352	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15049.3300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							173.5794	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9510	37.8383	37.7278	37.2089	37.1118	36.6599	36.6599	36.5762	36.8339	37.1118	37.3082	37.5135	(38)
Heat transfer coeff	63.8337	63.7210	63.6105	63.0916	62.9945	62.5426	62.5426	62.4589	62.7167	62.9945	63.1909	63.3963	(39)
Average = Sum(39)m / 12 =												63.0912	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7363	0.7350	0.7337	0.7277	0.7266	0.7214	0.7214	0.7204	0.7234	0.7266	0.7288	0.7312	(40)
HLP (average)												0.7277	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
									Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)											908	(64)

Electric shower(s)

54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 614.3496 (64a)

Heat gains from water heating, kWh/month

37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.4800	36.7938	0.7600	0.7000	0.7700	101.4662	(79)
Southwest	1.7600	36.7938	0.7600	0.7000	0.7700	23.8744	(79)

Solar gains	125.3406	213.5015	292.1220	361.9533	405.4179	402.4861	388.0396	355.6131	316.3064	235.9646	150.1292	107.2655	(83)
Total gains	603.5690	707.2263	763.4817	821.1958	841.4525	825.1544	794.7718	761.3949	734.2864	665.1367	603.6188	574.8142	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.4884	65.6043	65.7182	66.2587	66.3608	66.8404	66.8404	66.9299	66.6548	66.3608	66.1546	65.9403	
alpha	5.3659	5.3736	5.3812	5.4172	5.4241	5.4560	5.4560	5.4620	5.4437	5.4241	5.4103	5.3960	
util living area	0.9789	0.9536	0.9111	0.8118	0.6633	0.4802	0.3456	0.3762	0.5753	0.8379	0.9548	0.9832	(86)

MIT	20.1398	20.3634	20.5893	20.8244	20.9498	20.9927	20.9990	20.9984	20.9812	20.8224	20.4522	20.0938	(87)
Th 2	20.3089	20.3101	20.3112	20.3164	20.3174	20.3220	20.3220	20.3228	20.3202	20.3174	20.3154	20.3133	(88)
util rest of house	0.9749	0.9453	0.8960	0.7840	0.6225	0.4311	0.2926	0.3214	0.5232	0.8073	0.9453	0.9798	(89)
MIT 2	19.5241	19.7425	19.9589	20.1777	20.2829	20.3181	20.3216	20.3222	20.3094	20.1809	19.8357	19.4826	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.7167	19.9367	20.1561	20.3800	20.4915	20.5291	20.5335	20.5337	20.5196	20.3816	20.0285	19.6738	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7167	19.9367	20.1561	20.3800	20.4915	20.5291	20.5335	20.5337	20.5196	20.3816	20.0285	19.6738	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9706	0.9401	0.8923	0.7867	0.6332	0.4462	0.3092	0.3385	0.5387	0.8103	0.9407	0.9761	(94)
Useful gains	585.8437	664.8886	681.2266	646.0468	532.8057	368.2094	245.7290	257.7242	395.5638	538.9862	567.8191	561.0597	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	984.1056	958.1546	868.6711	724.2909	553.8166	370.8231	246.0120	258.1889	402.6140	616.1862	816.9650	980.9784	(97)
Space heating kWh	296.3069	197.0748	139.4587	56.3358	15.6321	0.0000	0.0000	0.0000	0.0000	57.4367	179.3850	312.4195	(98a)
Space heating requirement - total per year (kWh/year)												1254.0494	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	296.3069	197.0748	139.4587	56.3358	15.6321	0.0000	0.0000	0.0000	0.0000	57.4367	179.3850	312.4195	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1254.0494	
Space heating per m2											(98c) / (4) =	14.4642	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	587.9004	462.8152	474.6877	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9638	0.9846	0.9794	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	566.6015	455.6986	464.8990	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	900.3518	867.8724	831.6237	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	240.3002	306.6573	272.8432	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	60.0751	76.6643	68.2108	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												204.9502	(107)
Energy for space heating												14.4642	(99)
Energy for space cooling												2.3639	(108)
Total												16.8281	(109)
Fabric Energy Efficiency (DFEE)												16.8	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
500mm mineral wool	43.3500		43.3500	0.1100	4.7685			(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2577			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.7700	0.0600	0.4062
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	19.4300	0.1200	2.3316
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1426 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.4003 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	70.6867	70.4833	70.2839	69.3475	69.1723	68.3567	68.3567	68.2057	68.6709	69.1723	69.5267	69.8973	(39)
Average = Sum(39)m / 12 =												69.3467	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8153	0.8130	0.8107	0.7999	0.7978	0.7884	0.7884	0.7867	0.7921	0.7978	0.8019	0.8062	(40)
HLP (average)												0.7998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												64.3029	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)

Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)

Water heating gains (Table 5)

49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)

Total internal gains

478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	9.2400	36.7938	0.6300	0.7000	0.7700	103.9008	(79)

Solar gains	103.9008	176.9815	242.1538	300.0403	336.0701	333.6398	321.6644	294.7845	262.2013	195.6022	124.4492	88.9174	(83)
Total gains	582.1292	670.7063	713.5134	759.2827	772.1047	756.3081	728.3966	700.5663	680.1814	624.7743	577.9388	556.4662	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1394	59.3101	59.4783	60.2815	60.4342	61.1552	61.1552	61.2906	60.8754	60.4342	60.1261	59.8073	
alpha	4.9426	4.9540	4.9652	5.0188	5.0289	5.0770	5.0770	5.0860	5.0584	5.0289	5.0084	4.9872	
util living area													
	0.9844	0.9684	0.9420	0.8726	0.7500	0.5627	0.4102	0.4437	0.6584	0.8870	0.9679	0.9872	(86)
MIT	19.9231	20.1391	20.3841	20.6857	20.8856	20.9788	20.9964	20.9948	20.9536	20.7057	20.2759	19.8894	(87)
Th 2	20.2401	20.2421	20.2441	20.2535	20.2552	20.2634	20.2634	20.2649	20.2602	20.2552	20.2517	20.2480	(88)
util rest of house													
	0.9811	0.9622	0.9305	0.8486	0.7076	0.5034	0.3428	0.3746	0.5994	0.8607	0.9605	0.9845	(89)
MIT 2	19.2551	19.4686	19.7079	19.9989	20.1743	20.2519	20.2621	20.2628	20.2329	20.0234	19.6125	19.2281	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.4640	19.6783	19.9194	20.2137	20.3968	20.4793	20.4918	20.4918	20.4583	20.2368	19.8200	19.4349	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4640	19.6783	19.9194	20.2137	20.3968	20.4793	20.4918	20.4918	20.4583	20.2368	19.8200	19.4349	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9770	0.9566	0.9249	0.8472	0.7161	0.5211	0.3638	0.3961	0.6157	0.8599	0.9554	0.9808	(94)
Useful gains	568.7601	641.6131	659.8980	643.2727	552.8896	394.1222	265.0121	277.5211	418.8090	537.2692	552.1555	545.8082	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1071.8938	1041.6259	943.1713	784.5789	601.5786	401.8887	266.0298	279.0832	436.6314	666.6019	884.3787	1064.8812	(97)
Space heating kWh													
	374.3315	268.8086	210.7554	101.7405	36.2246	0.0000	0.0000	0.0000	0.0000	96.2236	239.2007	386.1903	(98a)
Space heating requirement - total per year (kWh/year)												1713.4751	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	374.3315	268.8086	210.7554	101.7405	36.2246	0.0000	0.0000	0.0000	0.0000	96.2236	239.2007	386.1903	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1713.4751	
Space heating per m2											(98c) / (4) =	19.7633	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	642.5530	505.8396	518.3630	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9188	0.9600	0.9498	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	590.3591	485.5956	492.3483	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	819.8821	790.2910	760.5254	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	165.2566	226.6934	199.5237	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	41.3142	56.6734	49.8809	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												147.8684	(107)
Energy for space heating												19.7633	(99)
Energy for space cooling												1.7055	(108)
Total												21.4688	(109)
Fabric Energy Efficiency (TFEE)												21.5	(109)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.51	**TER**	9.81
Environmental	99 A	**% DER < TER**			84.61
CO_2 Emissions (t/year)	0.11	**DFEE**	16.83	**TFEE**	21.47
Compliance Check	See BREL	**% DFEE < TFEE**			21.62
% DPER < TPER	61.79	**DPER**	19.94	**TPER**	52.18

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
12Total per year (kWh/year)												2752	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.4800	36.7938	0.7600	0.7000	0.7700	101.4662	(79)
Southwest	1.7600	36.7938	0.7600	0.7000	0.7700	23.8744	(79)

Solar gains	125.3406	213.5015	292.1220	361.9533	405.4179	402.4861	388.0396	355.6131	316.3064	235.9646	150.1292	107.2655	(83)
Total gains	710.5132	812.9140	866.2684	916.9873	933.1290	912.4849	879.1314	847.7351	823.0191	758.7177	703.8768	680.8066	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area	0.9550	0.9153	0.8561	0.7427	0.5919	0.4252	0.3047	0.3302	0.5048	0.7625	0.9144	0.9630	(86)
MIT	20.3808	20.5672	20.7408	20.8973	20.9738	20.9964	20.9995	20.9993	20.9910	20.8992	20.6286	20.3277	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9473	0.9024	0.8362	0.7127	0.5537	0.3821	0.2590	0.2829	0.4585	0.7280	0.8993	0.9565	(89)
MIT 2	19.6255	19.8530	20.0599	20.2367	20.3157	20.3360	20.3382	20.3380	20.3319	20.2423	19.9313	19.5599	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8618	20.0764	20.2729	20.4433	20.5216	20.5426	20.5450	20.5449	20.5380	20.4478	20.1495	19.8001	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8618	20.0764	20.2729	20.4433	20.5216	20.5426	20.5450	20.5449	20.5380	20.4478	20.1495	19.8001	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9410	0.8968	0.8341	0.7176	0.5644	0.3954	0.2733	0.2977	0.4726	0.7340	0.8945	0.9503	(94)
Useful gains	668.5655	729.0359	722.5585	658.0693	526.6907	360.8199	240.2496	252.3439	388.9516	556.8723	629.5989	646.9675	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	948.1962	924.7156	839.1990	703.3488	537.5098	362.0871	240.3764	252.5516	392.2780	600.0368	795.1194	950.5300	(97)
Space heating kWh	208.0452	131.4967	86.7805	32.6012	8.0494	0.0000	0.0000	0.0000	0.0000	32.1143	119.1747	225.8504	(98a)
Space heating requirement - total per year (kWh/year)												844.1127	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	208.0452	131.4967	86.7805	32.6012	8.0494	0.0000	0.0000	0.0000	0.0000	32.1143	119.1747	225.8504	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												844.1127	
Space heating per m2											(98c) / (4) =	9.7360	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	208.0452	131.4967	86.7805	32.6012	8.0494	0.0000	0.0000	0.0000	0.0000	32.1143	119.1747	225.8504	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	312.0679	197.2451	130.1708	48.9018	12.0741	0.0000	0.0000	0.0000	0.0000	48.1715	178.7621	338.7757	
Space heating requirement	312.0679	197.2451	130.1708	48.9018	12.0741	0.0000	0.0000	0.0000	0.0000	48.1715	178.7621	338.7757	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1266.1690	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												12.6617	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4685.2698	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1438.3120	0.1577	53.2517	(367)
Electrical energy for heat distribution (space & water)	12.6617	0.0000	7.8126	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			216.1486	(373)
Space and water heating			216.1486	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			130.5738	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.5100	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1438.3120	1.5838	534.7689	(467)
Electrical energy for heat distribution (space & water)	12.6617	0.0000	82.8331	(472)
Overall CO2 factor for heat network			0.4249	(486)
Total CO2 associated with community systems			2291.7145	(473)
Space and water heating			2291.7145	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1728.7712	(483)
Dwelling Primary energy Rate (DPER)			19.9400	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
500mm mineral wool	43.3500		43.3500	0.1100	4.7685			(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2577			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.7700	0.0600	0.4062
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	19.4300	0.1200	2.3316
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1426 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 30.4003 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	70.6867	70.4833	70.2839	69.3475	69.1723	68.3567	68.3567	68.2057	68.6709	69.1723	69.5267	69.8973	(39)
Average = Sum(39)m / 12 =												69.3467	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8153	0.8130	0.8107	0.7999	0.7978	0.7884	0.7884	0.7867	0.7921	0.7978	0.8019	0.8062	(40)
HLP (average)												0.7998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	9.2400	36.7938	0.6300	0.7000	0.7700	103.9008	(79)

Solar gains	103.9008	176.9815	242.1538	300.0403	336.0701	333.6398	321.6644	294.7845	262.2013	195.6022	124.4492	88.9174 (83)
Total gains	682.7380	770.0586	809.9648	848.7388	857.4458	834.3032	803.4208	777.5712	759.5787	712.0200	671.8614	656.1232 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1394	59.3101	59.4783	60.2815	60.4342	61.1552	61.1552	61.2906	60.8754	60.4342	60.1261	59.8073	
alpha	4.9426	4.9540	4.9652	5.0188	5.0289	5.0770	5.0770	5.0860	5.0584	5.0289	5.0084	4.9872	
util living area	0.9707	0.9477	0.9121	0.8291	0.6966	0.5148	0.3728	0.4011	0.6009	0.8384	0.9444	0.9750	(86)
MIT	20.0821	20.2816	20.5023	20.7589	20.9180	20.9857	20.9977	20.9967	20.9690	20.7819	20.4095	20.0500	(87)
Th 2	20.2401	20.2421	20.2441	20.2535	20.2552	20.2634	20.2634	20.2649	20.2602	20.2552	20.2517	20.2480	(88)
util rest of house	0.9651	0.9383	0.8964	0.8010	0.6531	0.4589	0.3111	0.3381	0.5438	0.8063	0.9328	0.9702	(89)
MIT 2	19.1757	19.4253	19.6977	20.0080	20.1825	20.2536	20.2623	20.2633	20.2374	20.0410	19.5949	19.1416	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.4593	19.6931	19.9494	20.2429	20.4126	20.4826	20.4923	20.4927	20.4662	20.2727	19.8497	19.4258	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4593	19.6931	19.9494	20.2429	20.4126	20.4826	20.4923	20.4927	20.4662	20.2727	19.8497	19.4258	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9580	0.9303	0.8896	0.8006	0.6626	0.4758	0.3304	0.3577	0.5601	0.8072	0.9255	0.9636	(94)
Useful gains	654.0764	716.3622	720.5416	679.5205	568.1433	396.9341	265.4160	278.1646	425.4125	574.7119	621.8118	632.2537	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1071.5579	1042.6677	945.2733	786.6009	602.6702	402.1174	266.0678	279.1434	437.1736	669.0861	886.4447	1064.2401	(97)
Space heating kWh	310.6062	219.2773	167.2004	77.0979	25.6881	0.0000	0.0000	0.0000	0.0000	70.2144	190.5357	321.3979	(98a)
Space heating requirement - total per year (kWh/year)												1382.0179	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	310.6062	219.2773	167.2004	77.0979	25.6881	0.0000	0.0000	0.0000	0.0000	70.2144	190.5357	321.3979	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1382.0179	
Space heating per m2											(98c) / (4) =	15.9402	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.3000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	310.6062	219.2773	167.2004	77.0979	25.6881	0.0000	0.0000	0.0000	0.0000	70.2144	190.5357	321.3979	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	336.5181	237.5702	181.1489	83.5297	27.8311	0.0000	0.0000	0.0000	0.0000	76.0719	206.4309	348.2101	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.6988	84.1939	83.4572	82.1734	80.7854	79.8000	79.8000	79.8000	79.8000	81.9929	83.8660	84.7985	(217)
Fuel for water heating, kWh/month	275.8967	245.3487	263.0165	235.4069	232.4013	212.3443	209.9929	218.2535	220.5242	238.8851	247.7455	272.6665	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1497.3108	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2872.4821	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3823.0982	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1497.3108	0.2100	314.4353	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2872.4821	0.2100	603.2212	(264)
Space and water heating			917.6565	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			850.7548	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.8100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1497.3108	1.1300	1691.9612	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2872.4821	1.1300	3245.9047	(278)
Space and water heating			4937.8660	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4524.0930	(286)
Target Primary Energy Rate (TPER)			52.1800	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.51	**TER**	9.81
Environmental	99 A	**% DER < TER**			84.61
CO_2 Emissions (t/year)	0.11	**DFEE**	16.83	**TFEE**	21.47
Compliance Check	See BREL	**% DFEE < TFEE**			21.62
% DPER < TPER	61.79	**DPER**	19.94	**TPER**	52.18

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.4800	36.7938	0.7600	0.7000	0.7700	101.4662	(79)
Southwest	1.7600	36.7938	0.7600	0.7000	0.7700	23.8744	(79)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	125.3406	213.5015	292.1220	361.9533	405.4179	402.4861	388.0396	355.6131	316.3064	235.9646	150.1292	107.2655	(83)
Total gains	764.9645	850.7953	910.4073	944.9070	953.2205	918.5910	885.4880	856.3255	835.2281	787.1458	740.1330	731.0482	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area													
	0.9402	0.9013	0.8349	0.7268	0.5807	0.4225	0.3025	0.3269	0.4979	0.7434	0.8988	0.9509	(86)
MIT	20.4551	20.6087	20.7746	20.9077	20.9761	20.9965	20.9996	20.9993	20.9916	20.9113	20.6681	20.3999	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house													
	0.9307	0.8870	0.8136	0.6966	0.5430	0.3795	0.2571	0.2801	0.4520	0.7083	0.8819	0.9427	(89)
MIT 2	19.7165	19.9024	20.0981	20.2475	20.3178	20.3360	20.3382	20.3380	20.3323	20.2544	19.9776	19.6488	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9476	20.1234	20.3097	20.4540	20.5237	20.5426	20.5451	20.5449	20.5385	20.4599	20.1936	19.8838	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9476	20.1234	20.3097	20.4540	20.5237	20.5426	20.5451	20.5449	20.5385	20.4599	20.1936	19.8838	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9243	0.8820	0.8126	0.7020	0.5537	0.3928	0.2713	0.2947	0.4660	0.7150	0.8778	0.9362	(94)
Useful gains	707.0412	750.3949	739.7868	663.3222	527.7788	360.8663	240.2549	252.3559	389.2035	562.7978	649.6896	684.4426	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	953.4247	927.5780	841.4413	704.0005	537.6394	362.0925	240.3770	252.5531	392.3078	600.7750	797.8061	955.6319	(97)
Space heating kWh													
	183.3093	119.0671	75.6310	29.2884	7.3363	0.0000	0.0000	0.0000	0.0000	28.2550	106.6439	201.7648	(98a)
Space heating requirement - total per year (kWh/year)												751.2958	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	183.3093	119.0671	75.6310	29.2884	7.3363	0.0000	0.0000	0.0000	0.0000	28.2550	106.6439	201.7648	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												751.2958	
Space heating per m2											(98c) / (4) =	8.6655	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	183.3093	119.0671	75.6310	29.2884	7.3363	0.0000	0.0000	0.0000	0.0000	28.2550	106.6439	201.7648	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	274.9640	178.6006	113.4465	43.9326	11.0044	0.0000	0.0000	0.0000	0.0000	42.3825	159.9658	302.6473	
Space heating requirement													
	274.9640	178.6006	113.4465	43.9326	11.0044	0.0000	0.0000	0.0000	0.0000	42.3825	159.9658	302.6473	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1126.9438	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												11.2694	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4546.0445	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1126.9438	4.4400	50.0363	(340a)
Space heating total			50.0363	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			258.6273	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7070 (357)
SAP value		88.5403
SAP rating (Section 12)		89 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1401.1853	0.1577	47.3968	(367)
Electrical energy for heat distribution (space & water)	11.2694	0.0000	7.5930	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			210.0741	(373)
Space and water heating			210.0741	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			124.4992	(383)
CO2 emissions per m2			1.4400	(384)
EI value			98.7333	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			3.0000 (17)
Infiltration rate			0.1500 (18)
Number of sides sheltered			3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7750 (20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)

Average = Sum(39)m / 12 = 60.9312

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)											Total = Sum(45)m =	2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)

Total per year (kWh/year) = Sum(64)m = 2751.6674 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.4800	42.9509	0.7600	0.7000	0.7700	118.4456	(79)
Southwest	1.7600	42.9509	0.7600	0.7000	0.7700	27.8696	(79)

Solar gains	146.3152	221.4792	299.2755	377.4295	409.9363	437.9421	413.7339	384.4230	342.7809	258.3726	172.6085	125.9735	(83)
Total gains	785.9390	858.7730	917.5608	960.3832	957.7390	954.0470	911.1824	885.1354	861.7026	809.5538	762.6124	749.7563	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area													
	0.9295	0.8919	0.8153	0.7000	0.5499	0.3695	0.2607	0.2821	0.4631	0.7021	0.8780	0.9420	(86)
MIT	20.5091	20.6405	20.8084	20.9258	20.9826	20.9984	20.9998	20.9997	20.9944	20.9363	20.7206	20.4537	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house													
	0.9184	0.8765	0.7921	0.6684	0.5113	0.3277	0.2165	0.2366	0.4180	0.6646	0.8585	0.9325	(89)
MIT 2	19.7826	19.9406	20.1370	20.2666	20.3239	20.3374	20.3383	20.3383	20.3345	20.2800	20.0393	19.7152	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0098	20.1595	20.3470	20.4728	20.5299	20.5442	20.5452	20.5452	20.5409	20.4853	20.2524	19.9462	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0098	20.1595	20.3470	20.4728	20.5299	20.5442	20.5452	20.5452	20.5409	20.4853	20.2524	19.9462	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9123	0.8720	0.7924	0.6750	0.5226	0.3407	0.2303	0.2508	0.4319	0.6731	0.8557	0.9262	(94)
Useful gains	717.0123	748.8157	727.0961	648.2715	500.5182	325.0890	209.8768	222.0292	372.1380	544.9254	652.5697	694.4020	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	938.9391	911.5022	813.2487	680.7722	507.5535	325.6256	209.9219	222.1041	374.1712	571.8565	777.0205	941.1555	(97)
Space heating kWh													
	165.1136	109.3254	64.0975	23.4005	5.2342	0.0000	0.0000	0.0000	0.0000	20.0368	89.6046	183.5846	(98a)
Space heating requirement - total per year (kWh/year)												660.3972	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	165.1136	109.3254	64.0975	23.4005	5.2342	0.0000	0.0000	0.0000	0.0000	20.0368	89.6046	183.5846	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												660.3972	
Space heating per m2											(98c) / (4) =	7.6170	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	165.1136	109.3254	64.0975	23.4005	5.2342	0.0000	0.0000	0.0000	0.0000	20.0368	89.6046	183.5846	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	247.6704	163.9881	96.1463	35.1008	7.8514	0.0000	0.0000	0.0000	0.0000	30.0551	134.4069	275.3769	
Space heating requirement													
	247.6704	163.9881	96.1463	35.1008	7.8514	0.0000	0.0000	0.0000	0.0000	30.0551	134.4069	275.3769	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)

Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year		
Space heating fuel - community heating	990.5959	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4127.5010	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	9.9060	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4313.1706	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	990.5959	6.5500	64.8840	(340a)
Space heating total			64.8840	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			328.1891	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1364.8258	0.1581	41.7717	(367)
Electrical energy for heat distribution (space & water)	9.9060	0.0000	7.3821	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			204.2381	(373)
Space and water heating			204.2381	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			106.4052	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1364.8258	1.5854	418.7869	(467)
Electrical energy for heat distribution (space & water)	9.9060	0.0000	78.4837	(472)
Overall CO2 factor for heat network			0.4243	(486)
Total CO2 associated with community systems			2171.3832	(473)
Space and water heating			2171.3832	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1527.5481	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Northeast

Current energy efficiency rating: B 89
Current environmental impact rating: A 99

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 89
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£71	£71	£0
Community scheme	£439	£439	£0
Space heating	£178	£178	£0
Water heating	£270	£270	£0
Lighting	£62	£62	£0
Generated (PV)	-£182	-£182	£0
Total cost of fuels	£328	£328	£0
Total cost of uses	£328	£328	£0
Delivered energy	50 kWh/m²	50 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	18 kWh/m²	18 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5778 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day)	126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.4800	36.7938	0.7600	0.7000	0.7700	101.4662	(79)
Southwest	1.7600	36.7938	0.7600	0.7000	0.7700	23.8744	(79)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	125.3406	213.5015	292.1220	361.9533	405.4179	402.4861	388.0396	355.6131	316.3064	235.9646	150.1292	107.2655	(83)
Total gains	764.9645	850.7953	910.4073	944.9070	953.2205	918.5910	885.4880	856.3255	835.2281	787.1458	740.1330	731.0482	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area	0.9402	0.9013	0.8349	0.7268	0.5807	0.4225	0.3025	0.3269	0.4979	0.7434	0.8988	0.9509	(86)
MIT	20.4551	20.6087	20.7746	20.9077	20.9761	20.9965	20.9996	20.9993	20.9916	20.9113	20.6681	20.3999	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9307	0.8870	0.8136	0.6966	0.5430	0.3795	0.2571	0.2801	0.4520	0.7083	0.8819	0.9427	(89)
MIT 2	19.7165	19.9024	20.0981	20.2475	20.3178	20.3360	20.3382	20.3380	20.3323	20.2544	19.9776	19.6488	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9476	20.1234	20.3097	20.4540	20.5237	20.5426	20.5451	20.5449	20.5385	20.4599	20.1936	19.8838	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9476	20.1234	20.3097	20.4540	20.5237	20.5426	20.5451	20.5449	20.5385	20.4599	20.1936	19.8838	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9243	0.8820	0.8126	0.7020	0.5537	0.3928	0.2713	0.2947	0.4660	0.7150	0.8778	0.9362	(94)
Useful gains	707.0412	750.3949	739.7868	663.3222	527.7788	360.8663	240.2549	252.3559	389.2035	562.7978	649.6896	684.4426	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	953.4247	927.5780	841.4413	704.0005	537.6394	362.0925	240.3770	252.5531	392.3078	600.7750	797.8061	955.6319	(97)
Space heating kWh	183.3093	119.0671	75.6310	29.2884	7.3363	0.0000	0.0000	0.0000	0.0000	28.2550	106.6439	201.7648	(98a)
Space heating requirement - total per year (kWh/year)												751.2958	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	183.3093	119.0671	75.6310	29.2884	7.3363	0.0000	0.0000	0.0000	0.0000	28.2550	106.6439	201.7648	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												751.2958	
Space heating per m2											(98c) / (4) =	8.6655	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	183.3093	119.0671	75.6310	29.2884	7.3363	0.0000	0.0000	0.0000	0.0000	28.2550	106.6439	201.7648	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	274.9640	178.6006	113.4465	43.9326	11.0044	0.0000	0.0000	0.0000	0.0000	42.3825	159.9658	302.6473	
Space heating requirement	274.9640	178.6006	113.4465	43.9326	11.0044	0.0000	0.0000	0.0000	0.0000	42.3825	159.9658	302.6473	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1126.9438	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)

Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	11.2694	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4546.0445	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1126.9438	4.4400	50.0363	(340a)
Space heating total			50.0363	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			258.6273	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.7070	(357)
SAP value	88.5403	
SAP rating (Section 12)	89	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1401.1853	0.1577	47.3968	(367)
Electrical energy for heat distribution (space & water)	11.2694	0.0000	7.5930	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			210.0741	(373)
Space and water heating			210.0741	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			124.4992	(383)
CO2 emissions per m2			1.4400	(384)
EI value			98.7333	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 86.7000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5778	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.4800	42.9509	0.7600	0.7000	0.7700	118.4456	(79)
Southwest	1.7600	42.9509	0.7600	0.7000	0.7700	27.8696	(79)

Solar gains	146.3152	221.4792	299.2755	377.4295	409.9363	437.9421	413.7339	384.4230	342.7809	258.3726	172.6085	125.9735	(83)
Total gains	785.9390	858.7730	917.5608	960.3832	957.7390	954.0470	911.1824	885.1354	861.7026	809.5538	762.6124	749.7563	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area													
	0.9295	0.8919	0.8153	0.7000	0.5499	0.3695	0.2607	0.2821	0.4631	0.7021	0.8780	0.9420	(86)
MIT	20.5091	20.6405	20.8084	20.9258	20.9826	20.9984	20.9998	20.9997	20.9944	20.9363	20.7206	20.4537	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house													
	0.9184	0.8765	0.7921	0.6684	0.5113	0.3277	0.2165	0.2366	0.4180	0.6646	0.8585	0.9325	(89)
MIT 2	19.7826	19.9406	20.1370	20.2666	20.3239	20.3374	20.3383	20.3383	20.3345	20.2800	20.0393	19.7152	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0098	20.1595	20.3470	20.4728	20.5299	20.5442	20.5452	20.5452	20.5409	20.4853	20.2524	19.9462	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0098	20.1595	20.3470	20.4728	20.5299	20.5442	20.5452	20.5452	20.5409	20.4853	20.2524	19.9462	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9123	0.8720	0.7924	0.6750	0.5226	0.3407	0.2303	0.2508	0.4319	0.6731	0.8557	0.9262	(94)
Useful gains	717.0123	748.8157	727.0961	648.2715	500.5182	325.0890	209.8768	222.0292	372.1380	544.9254	652.5697	694.4020	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	938.9391	911.5022	813.2487	680.7722	507.5535	325.6256	209.9219	222.1041	374.1712	571.8565	777.0205	941.1555	(97)
Space heating kWh													
	165.1136	109.3254	64.0975	23.4005	5.2342	0.0000	0.0000	0.0000	0.0000	20.0368	89.6046	183.5846	(98a)
Space heating requirement - total per year (kWh/year)												660.3972	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	165.1136	109.3254	64.0975	23.4005	5.2342	0.0000	0.0000	0.0000	0.0000	20.0368	89.6046	183.5846	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												660.3972	
Space heating per m2										(98c) / (4) =		7.6170	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement

	165.1136	109.3254	64.0975	23.4005	5.2342	0.0000	0.0000	0.0000	0.0000	20.0368	89.6046	183.5846 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	247.6704	163.9881	96.1463	35.1008	7.8514	0.0000	0.0000	0.0000	0.0000	30.0551	134.4069	275.3769
Space heating requirement												
	247.6704	163.9881	96.1463	35.1008	7.8514	0.0000	0.0000	0.0000	0.0000	30.0551	134.4069	275.3769 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388
Water heating fuel												
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446 (331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year

Space heating fuel - community heating	990.5959 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	9.9060 (313)
Space cooling fuel	0.0000 (321)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)	
mechanical ventilation fans (SFP = 0.1292)	33.4924 (330a)
Total electricity for the above, kWh/year	33.4924 (331)
Electricity for lighting (calculated in Appendix L)	216.3282 (332)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4313.1706 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	990.5959	6.5500	64.8840	(340a)
Space heating total			64.8840	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			328.1891	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1364.8258	0.1581	41.7717	(367)
Electrical energy for heat distribution (space & water)	9.9060	0.0000	7.3821	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			204.2381	(373)
Space and water heating			204.2381	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			106.4052	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)

Space and Water heating from Heat pump	1364.8258	1.5854	418.7869	(467)
Electrical energy for heat distribution (space & water)	9.9060	0.0000	78.4837	(472)
Overall CO2 factor for heat network			0.4243	(486)
Total CO2 associated with community systems			2171.3832	(473)
Space and water heating			2171.3832	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1527.5481	(483)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.51	**TER**	9.81
Environmental	99 A	**% DER < TER**			84.61
CO_2 Emissions (t/year)	0.11	**DFEE**	16.83	**TFEE**	21.47
Compliance Check	See BREL	**% DFEE < TFEE**			21.62
% DPER < TPER	61.79	**DPER**	19.94	**TPER**	52.18

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674 (64)
12Total per year (kWh/year)												2752 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.4800	36.7938	0.7600	0.7000	0.7700	101.4662	(77)
Southeast	1.7600	36.7938	0.7600	0.7000	0.7700	23.8744	(77)

Solar gains	125.3406	213.5015	292.1220	361.9533	405.4179	402.4861	388.0396	355.6131	316.3064	235.9646	150.1292	107.2655 (83)
Total gains	710.5132	812.9140	866.2684	916.9873	933.1290	912.4849	879.1314	847.7351	823.0191	758.7177	703.8768	680.8066 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area	0.9550	0.9153	0.8561	0.7427	0.5919	0.4252	0.3047	0.3302	0.5048	0.7625	0.9144	0.9630	(86)
MIT	20.3808	20.5672	20.7408	20.8973	20.9738	20.9964	20.9995	20.9993	20.9910	20.8992	20.6286	20.3277	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9473	0.9024	0.8362	0.7127	0.5537	0.3821	0.2590	0.2829	0.4585	0.7280	0.8993	0.9565	(89)
MIT 2	19.6255	19.8530	20.0599	20.2367	20.3157	20.3360	20.3382	20.3380	20.3319	20.2423	19.9313	19.5599	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8618	20.0764	20.2729	20.4433	20.5216	20.5426	20.5450	20.5449	20.5380	20.4478	20.1495	19.8001	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8618	20.0764	20.2729	20.4433	20.5216	20.5426	20.5450	20.5449	20.5380	20.4478	20.1495	19.8001	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9410	0.8968	0.8341	0.7176	0.5644	0.3954	0.2733	0.2977	0.4726	0.7340	0.8945	0.9503	(94)
Useful gains	668.5655	729.0359	722.5585	658.0693	526.6907	360.8199	240.2496	252.3439	388.9516	556.8723	629.5989	646.9675	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	948.1962	924.7156	839.1990	703.3488	537.5098	362.0871	240.3764	252.5516	392.2780	600.0368	795.1194	950.5300	(97)
Space heating kWh	208.0452	131.4967	86.7805	32.6012	8.0494	0.0000	0.0000	0.0000	0.0000	32.1143	119.1747	225.8504	(98a)
Space heating requirement - total per year (kWh/year)												844.1127	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	208.0452	131.4967	86.7805	32.6012	8.0494	0.0000	0.0000	0.0000	0.0000	32.1143	119.1747	225.8504	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												844.1127	
Space heating per m2											(98c) / (4) =	9.7360	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	208.0452	131.4967	86.7805	32.6012	8.0494	0.0000	0.0000	0.0000	0.0000	32.1143	119.1747	225.8504	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	312.0679	197.2451	130.1708	48.9018	12.0741	0.0000	0.0000	0.0000	0.0000	48.1715	178.7621	338.7757	
Space heating requirement	312.0679	197.2451	130.1708	48.9018	12.0741	0.0000	0.0000	0.0000	0.0000	48.1715	178.7621	338.7757	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1266.1690	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												12.6617	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4685.2698	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1438.3120	0.1577	53.2517	(367)
Electrical energy for heat distribution (space & water)	12.6617	0.0000	7.8126	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			216.1486	(373)
Space and water heating			216.1486	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			130.5738	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.5100	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1438.3120	1.5838	534.7689	(467)
Electrical energy for heat distribution (space & water)	12.6617	0.0000	82.8331	(472)
Overall CO2 factor for heat network			0.4249	(486)
Total CO2 associated with community systems			2291.7145	(473)
Space and water heating			2291.7145	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1728.7712	(483)
Dwelling Primary energy Rate (DPER)			19.9400	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
500mm mineral wool	43.3500		43.3500	0.1100	4.7685			(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2577			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.7700	0.0600	0.4062
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	19.4300	0.1200	2.3316
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1426 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 30.4003 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	70.6867	70.4833	70.2839	69.3475	69.1723	68.3567	68.3567	68.2057	68.6709	69.1723	69.5267	69.8973	(39)
Average = Sum(39)m / 12 =												69.3467	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8153	0.8130	0.8107	0.7999	0.7978	0.7884	0.7884	0.7867	0.7921	0.7978	0.8019	0.8062	(40)
HLP (average)												0.7998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.2400	36.7938	0.6300	0.7000	0.7700	103.9008	(77)

Solar gains	103.9008	176.9815	242.1538	300.0403	336.0701	333.6398	321.6644	294.7845	262.2013	195.6022	124.4492	88.9174	(83)
Total gains	682.7380	770.0586	809.9648	848.7388	857.4458	834.3032	803.4208	777.5712	759.5787	712.0200	671.8614	656.1232	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1394	59.3101	59.4783	60.2815	60.4342	61.1552	61.1552	61.2906	60.8754	60.4342	60.1261	59.8073	
alpha	4.9426	4.9540	4.9652	5.0188	5.0289	5.0770	5.0770	5.0860	5.0584	5.0289	5.0084	4.9872	
util living area	0.9707	0.9477	0.9121	0.8291	0.6966	0.5148	0.3728	0.4011	0.6009	0.8384	0.9444	0.9750	(86)
MIT	20.0821	20.2816	20.5023	20.7589	20.9180	20.9857	20.9977	20.9967	20.9690	20.7819	20.4095	20.0500	(87)
Th 2	20.2401	20.2421	20.2441	20.2535	20.2552	20.2634	20.2634	20.2649	20.2602	20.2552	20.2517	20.2480	(88)
util rest of house	0.9651	0.9383	0.8964	0.8010	0.6531	0.4589	0.3111	0.3381	0.5438	0.8063	0.9328	0.9702	(89)
MIT 2	19.1757	19.4253	19.6977	20.0080	20.1825	20.2536	20.2623	20.2633	20.2374	20.0410	19.5949	19.1416	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.4593	19.6931	19.9494	20.2429	20.4126	20.4826	20.4923	20.4927	20.4662	20.2727	19.8497	19.4258	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4593	19.6931	19.9494	20.2429	20.4126	20.4826	20.4923	20.4927	20.4662	20.2727	19.8497	19.4258	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9580	0.9303	0.8896	0.8006	0.6626	0.4758	0.3304	0.3577	0.5601	0.8072	0.9255	0.9636	(94)
Useful gains	654.0764	716.3622	720.5416	679.5205	568.1433	396.9341	265.4160	278.1646	425.4125	574.7119	621.8118	632.2537	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1071.5579	1042.6677	945.2733	786.6009	602.6702	402.1174	266.0678	279.1434	437.1736	669.0861	886.4447	1064.2401	(97)
Space heating kWh	310.6062	219.2773	167.2004	77.0979	25.6881	0.0000	0.0000	0.0000	0.0000	70.2144	190.5357	321.3979	(98a)
Space heating requirement - total per year (kWh/year)												1382.0179	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	310.6062	219.2773	167.2004	77.0979	25.6881	0.0000	0.0000	0.0000	0.0000	70.2144	190.5357	321.3979	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1382.0179	
Space heating per m2											(98c) / (4) =	15.9402	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	310.6062	219.2773	167.2004	77.0979	25.6881	0.0000	0.0000	0.0000	0.0000	70.2144	190.5357	321.3979	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	336.5181	237.5702	181.1489	83.5297	27.8311	0.0000	0.0000	0.0000	0.0000	76.0719	206.4309	348.2101	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.6988	84.1939	83.4572	82.1734	80.7854	79.8000	79.8000	79.8000	79.8000	81.9929	83.8660	84.7985	(217)
Fuel for water heating, kWh/month	275.8967	245.3487	263.0165	235.4069	232.4013	212.3443	209.9929	218.2535	220.5242	238.8851	247.7455	272.6665	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1497.3108	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2872.4821	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3823.0982	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1497.3108	0.2100	314.4353	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2872.4821	0.2100	603.2212	(264)
Space and water heating			917.6565	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			850.7548	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.8100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1497.3108	1.1300	1691.9612	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2872.4821	1.1300	3245.9047	(278)
Space and water heating			4937.8660	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4524.0930	(286)
Target Primary Energy Rate (TPER)			52.1800	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.51	**TER**	9.81
Environmental	99 A	**% DER < TER**			84.61
CO_2 Emissions (t/year)	0.11	**DFEE**	16.83	**TFEE**	21.47
Compliance Check	See BREL	**% DFEE < TFEE**			21.62
% DPER < TPER	61.79	**DPER**	19.94	**TPER**	52.18

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		3 * 10 =	30.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1412	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.2912	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2257	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2878	0.2821	0.2765	0.2483	0.2426	0.2144	0.2144	0.2088	0.2257	0.2426	0.2539	0.2652	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5414	0.5398	0.5382	0.5308	0.5294	0.5230	0.5230	0.5218	0.5255	0.5294	0.5322	0.5352	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15049.3300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							173.5794	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9510	37.8383	37.7278	37.2089	37.1118	36.6599	36.6599	36.5762	36.8339	37.1118	37.3082	37.5135	(38)
Heat transfer coeff	63.8337	63.7210	63.6105	63.0916	62.9945	62.5426	62.5426	62.4589	62.7167	62.9945	63.1909	63.3963	(39)
Average = Sum(39)m / 12 =												63.0912	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7363	0.7350	0.7337	0.7277	0.7266	0.7214	0.7214	0.7204	0.7234	0.7266	0.7288	0.7312	(40)
HLP (average)												0.7277	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =					614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.4800	36.7938	0.7600	0.7000	0.7700	101.4662	(77)
Southeast	1.7600	36.7938	0.7600	0.7000	0.7700	23.8744	(77)

Solar gains	125.3406	213.5015	292.1220	361.9533	405.4179	402.4861	388.0396	355.6131	316.3064	235.9646	150.1292	107.2655	(83)
Total gains	603.5690	707.2263	763.4817	821.1958	841.4525	825.1544	794.7718	761.3949	734.2864	665.1367	603.6188	574.8142	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.4884	65.6043	65.7182	66.2587	66.3608	66.8404	66.8404	66.9299	66.6548	66.3608	66.1546	65.9403	
alpha	5.3659	5.3736	5.3812	5.4172	5.4241	5.4560	5.4560	5.4620	5.4437	5.4241	5.4103	5.3960	
util living area	0.9789	0.9536	0.9111	0.8118	0.6633	0.4802	0.3456	0.3762	0.5753	0.8379	0.9548	0.9832	(86)

MIT	20.1398	20.3634	20.5893	20.8244	20.9498	20.9927	20.9990	20.9984	20.9812	20.8224	20.4522	20.0938	(87)
Th 2	20.3089	20.3101	20.3112	20.3164	20.3174	20.3220	20.3220	20.3228	20.3202	20.3174	20.3154	20.3133	(88)
util rest of house	0.9749	0.9453	0.8960	0.7840	0.6225	0.4311	0.2926	0.3214	0.5232	0.8073	0.9453	0.9798	(89)
MIT 2	19.5241	19.7425	19.9589	20.1777	20.2829	20.3181	20.3216	20.3222	20.3094	20.1809	19.8357	19.4826	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.7167	19.9367	20.1561	20.3800	20.4915	20.5291	20.5335	20.5337	20.5196	20.3816	20.0285	19.6738	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7167	19.9367	20.1561	20.3800	20.4915	20.5291	20.5335	20.5337	20.5196	20.3816	20.0285	19.6738	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9706	0.9401	0.8923	0.7867	0.6332	0.4462	0.3092	0.3385	0.5387	0.8103	0.9407	0.9761	(94)
Useful gains	585.8437	664.8886	681.2266	646.0468	532.8057	368.2094	245.7290	257.7242	395.5638	538.9862	567.8191	561.0597	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	984.1056	958.1546	868.6711	724.2909	553.8166	370.8231	246.0120	258.1889	402.6140	616.1862	816.9650	980.9784	(97)
Space heating kWh	296.3069	197.0748	139.4587	56.3358	15.6321	0.0000	0.0000	0.0000	0.0000	57.4367	179.3850	312.4195	(98a)
Space heating requirement - total per year (kWh/year)												1254.0494	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	296.3069	197.0748	139.4587	56.3358	15.6321	0.0000	0.0000	0.0000	0.0000	57.4367	179.3850	312.4195	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1254.0494	
Space heating per m2											(98c) / (4) =	14.4642	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	587.9004	462.8152	474.6877	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9638	0.9846	0.9794	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	566.6015	455.6986	464.8990	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	900.3518	867.8724	831.6237	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	240.3002	306.6573	272.8432	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	60.0751	76.6643	68.2108	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												204.9502	(107)
Energy for space heating												14.4642	(99)
Energy for space cooling												2.3639	(108)
Total												16.8281	(109)
Fabric Energy Efficiency (DFEE)												16.8	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
500mm mineral wool	43.3500		43.3500	0.1100	4.7685			(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2577			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.7700	0.0600	0.4062
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	19.4300	0.1200	2.3316
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1426 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.4003 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	70.6867	70.4833	70.2839	69.3475	69.1723	68.3567	68.3567	68.2057	68.6709	69.1723	69.5267	69.8973	(39)
Average = Sum(39)m / 12 =												69.3467	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8153	0.8130	0.8107	0.7999	0.7978	0.7884	0.7884	0.7867	0.7921	0.7978	0.8019	0.8062	(40)
HLP (average)												0.7998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												64.3029	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains													
	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.2400	36.7938	0.6300	0.7000	0.7700	103.9008	(77)

Solar gains	103.9008	176.9815	242.1538	300.0403	336.0701	333.6398	321.6644	294.7845	262.2013	195.6022	124.4492	88.9174	(83)
Total gains	582.1292	670.7063	713.5134	759.2827	772.1047	756.3081	728.3966	700.5663	680.1814	624.7743	577.9388	556.4662	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1394	59.3101	59.4783	60.2815	60.4342	61.1552	61.1552	61.2906	60.8754	60.4342	60.1261	59.8073	
alpha	4.9426	4.9540	4.9652	5.0188	5.0289	5.0770	5.0770	5.0860	5.0584	5.0289	5.0084	4.9872	
util living area													
	0.9844	0.9684	0.9420	0.8726	0.7500	0.5627	0.4102	0.4437	0.6584	0.8870	0.9679	0.9872	(86)
MIT	19.9231	20.1391	20.3841	20.6857	20.8856	20.9788	20.9964	20.9948	20.9536	20.7057	20.2759	19.8894	(87)
Th 2	20.2401	20.2421	20.2441	20.2535	20.2552	20.2634	20.2634	20.2649	20.2602	20.2552	20.2517	20.2480	(88)
util rest of house													
	0.9811	0.9622	0.9305	0.8486	0.7076	0.5034	0.3428	0.3746	0.5994	0.8607	0.9605	0.9845	(89)
MIT 2	19.2551	19.4686	19.7079	19.9989	20.1743	20.2519	20.2621	20.2628	20.2329	20.0234	19.6125	19.2281	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.4640	19.6783	19.9194	20.2137	20.3968	20.4793	20.4918	20.4918	20.4583	20.2368	19.8200	19.4349	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4640	19.6783	19.9194	20.2137	20.3968	20.4793	20.4918	20.4918	20.4583	20.2368	19.8200	19.4349	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9770	0.9566	0.9249	0.8472	0.7161	0.5211	0.3638	0.3961	0.6157	0.8599	0.9554	0.9808	(94)
Useful gains	568.7601	641.6131	659.8980	643.2727	552.8896	394.1222	265.0121	277.5211	418.8090	537.2692	552.1555	545.8082	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1071.8938	1041.6259	943.1713	784.5789	601.5786	401.8887	266.0298	279.0832	436.6314	666.6019	884.3787	1064.8812	(97)
Space heating kWh													
	374.3315	268.8086	210.7554	101.7405	36.2246	0.0000	0.0000	0.0000	0.0000	96.2236	239.2007	386.1903	(98a)
Space heating requirement - total per year (kWh/year)												1713.4751	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	374.3315	268.8086	210.7554	101.7405	36.2246	0.0000	0.0000	0.0000	0.0000	96.2236	239.2007	386.1903	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1713.4751	
Space heating per m2											(98c) / (4) =	19.7633	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	642.5530	505.8396	518.3630	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9188	0.9600	0.9498	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	590.3591	485.5956	492.3483	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	819.8821	790.2910	760.5254	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	165.2566	226.6934	199.5237	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	41.3142	56.6734	49.8809	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												147.8684	(107)
Energy for space heating												19.7633	(99)
Energy for space cooling												1.7055	(108)
Total												21.4688	(109)
Fabric Energy Efficiency (TFEE)												21.5	(109)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.51	**TER**	9.81
Environmental	99 A	**% DER < TER**			84.61
CO_2 Emissions (t/year)	0.11	**DFEE**	16.83	**TFEE**	21.47
Compliance Check	See BREL	**% DFEE < TFEE**			21.62
% DPER < TPER	61.79	**DPER**	19.94	**TPER**	52.18

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674 (64)
12Total per year (kWh/year)												2752 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.4800	36.7938	0.7600	0.7000	0.7700	101.4662	(77)
Southeast	1.7600	36.7938	0.7600	0.7000	0.7700	23.8744	(77)

Solar gains	125.3406	213.5015	292.1220	361.9533	405.4179	402.4861	388.0396	355.6131	316.3064	235.9646	150.1292	107.2655 (83)
Total gains	710.5132	812.9140	866.2684	916.9873	933.1290	912.4849	879.1314	847.7351	823.0191	758.7177	703.8768	680.8066 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area	0.9550	0.9153	0.8561	0.7427	0.5919	0.4252	0.3047	0.3302	0.5048	0.7625	0.9144	0.9630	(86)
MIT	20.3808	20.5672	20.7408	20.8973	20.9738	20.9964	20.9995	20.9993	20.9910	20.8992	20.6286	20.3277	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9473	0.9024	0.8362	0.7127	0.5537	0.3821	0.2590	0.2829	0.4585	0.7280	0.8993	0.9565	(89)
MIT 2	19.6255	19.8530	20.0599	20.2367	20.3157	20.3360	20.3382	20.3380	20.3319	20.2423	19.9313	19.5599	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8618	20.0764	20.2729	20.4433	20.5216	20.5426	20.5450	20.5449	20.5380	20.4478	20.1495	19.8001	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8618	20.0764	20.2729	20.4433	20.5216	20.5426	20.5450	20.5449	20.5380	20.4478	20.1495	19.8001	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9410	0.8968	0.8341	0.7176	0.5644	0.3954	0.2733	0.2977	0.4726	0.7340	0.8945	0.9503	(94)
Useful gains	668.5655	729.0359	722.5585	658.0693	526.6907	360.8199	240.2496	252.3439	388.9516	556.8723	629.5989	646.9675	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	948.1962	924.7156	839.1990	703.3488	537.5098	362.0871	240.3764	252.5516	392.2780	600.0368	795.1194	950.5300	(97)
Space heating kWh	208.0452	131.4967	86.7805	32.6012	8.0494	0.0000	0.0000	0.0000	0.0000	32.1143	119.1747	225.8504	(98a)
Space heating requirement - total per year (kWh/year)												844.1127	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	208.0452	131.4967	86.7805	32.6012	8.0494	0.0000	0.0000	0.0000	0.0000	32.1143	119.1747	225.8504	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												844.1127	
Space heating per m2											(98c) / (4) =	9.7360	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	208.0452	131.4967	86.7805	32.6012	8.0494	0.0000	0.0000	0.0000	0.0000	32.1143	119.1747	225.8504	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	312.0679	197.2451	130.1708	48.9018	12.0741	0.0000	0.0000	0.0000	0.0000	48.1715	178.7621	338.7757	
Space heating requirement	312.0679	197.2451	130.1708	48.9018	12.0741	0.0000	0.0000	0.0000	0.0000	48.1715	178.7621	338.7757	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1266.1690	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												12.6617	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4685.2698	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1438.3120	0.1577	53.2517	(367)
Electrical energy for heat distribution (space & water)	12.6617	0.0000	7.8126	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			216.1486	(373)
Space and water heating			216.1486	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			130.5738	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.5100	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1438.3120	1.5838	534.7689	(467)
Electrical energy for heat distribution (space & water)	12.6617	0.0000	82.8331	(472)
Overall CO2 factor for heat network			0.4249	(486)
Total CO2 associated with community systems			2291.7145	(473)
Space and water heating			2291.7145	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1728.7712	(483)
Dwelling Primary energy Rate (DPER)			19.9400	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
500mm mineral wool	43.3500		43.3500	0.1100	4.7685			(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2577			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.7700	0.0600	0.4062
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	19.4300	0.1200	2.3316
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1426 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 30.4003 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	70.6867	70.4833	70.2839	69.3475	69.1723	68.3567	68.3567	68.2057	68.6709	69.1723	69.5267	69.8973	(39)
Average = Sum(39)m / 12 =												69.3467	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8153	0.8130	0.8107	0.7999	0.7978	0.7884	0.7884	0.7867	0.7921	0.7978	0.8019	0.8062	(40)
HLP (average)												0.7998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.2400	36.7938	0.6300	0.7000	0.7700	103.9008	(77)

Solar gains	103.9008	176.9815	242.1538	300.0403	336.0701	333.6398	321.6644	294.7845	262.2013	195.6022	124.4492	88.9174	(83)
Total gains	682.7380	770.0586	809.9648	848.7388	857.4458	834.3032	803.4208	777.5712	759.5787	712.0200	671.8614	656.1232	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1394	59.3101	59.4783	60.2815	60.4342	61.1552	61.1552	61.2906	60.8754	60.4342	60.1261	59.8073	
alpha	4.9426	4.9540	4.9652	5.0188	5.0289	5.0770	5.0770	5.0860	5.0584	5.0289	5.0084	4.9872	
util living area	0.9707	0.9477	0.9121	0.8291	0.6966	0.5148	0.3728	0.4011	0.6009	0.8384	0.9444	0.9750	(86)
MIT	20.0821	20.2816	20.5023	20.7589	20.9180	20.9857	20.9977	20.9967	20.9690	20.7819	20.4095	20.0500	(87)
Th 2	20.2401	20.2421	20.2441	20.2535	20.2552	20.2634	20.2634	20.2649	20.2602	20.2552	20.2517	20.2480	(88)
util rest of house	0.9651	0.9383	0.8964	0.8010	0.6531	0.4589	0.3111	0.3381	0.5438	0.8063	0.9328	0.9702	(89)
MIT 2	19.1757	19.4253	19.6977	20.0080	20.1825	20.2536	20.2623	20.2633	20.2374	20.0410	19.5949	19.1416	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.4593	19.6931	19.9494	20.2429	20.4126	20.4826	20.4923	20.4927	20.4662	20.2727	19.8497	19.4258	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4593	19.6931	19.9494	20.2429	20.4126	20.4826	20.4923	20.4927	20.4662	20.2727	19.8497	19.4258	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9580	0.9303	0.8896	0.8006	0.6626	0.4758	0.3304	0.3577	0.5601	0.8072	0.9255	0.9636	(94)
Useful gains	654.0764	716.3622	720.5416	679.5205	568.1433	396.9341	265.4160	278.1646	425.4125	574.7119	621.8118	632.2537	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1071.5579	1042.6677	945.2733	786.6009	602.6702	402.1174	266.0678	279.1434	437.1736	669.0861	886.4447	1064.2401	(97)
Space heating kWh	310.6062	219.2773	167.2004	77.0979	25.6881	0.0000	0.0000	0.0000	0.0000	70.2144	190.5357	321.3979	(98a)
Space heating requirement - total per year (kWh/year)												1382.0179	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	310.6062	219.2773	167.2004	77.0979	25.6881	0.0000	0.0000	0.0000	0.0000	70.2144	190.5357	321.3979	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1382.0179	
Space heating per m2											(98c) / (4) =	15.9402	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	310.6062	219.2773	167.2004	77.0979	25.6881	0.0000	0.0000	0.0000	0.0000	70.2144	190.5357	321.3979	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	336.5181	237.5702	181.1489	83.5297	27.8311	0.0000	0.0000	0.0000	0.0000	76.0719	206.4309	348.2101	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.6988	84.1939	83.4572	82.1734	80.7854	79.8000	79.8000	79.8000	79.8000	81.9929	83.8660	84.7985	(217)
Fuel for water heating, kWh/month	275.8967	245.3487	263.0165	235.4069	232.4013	212.3443	209.9929	218.2535	220.5242	238.8851	247.7455	272.6665	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1497.3108	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2872.4821	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3823.0982	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1497.3108	0.2100	314.4353	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2872.4821	0.2100	603.2212	(264)
Space and water heating			917.6565	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			850.7548	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.8100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1497.3108	1.1300	1691.9612	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2872.4821	1.1300	3245.9047	(278)
Space and water heating			4937.8660	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4524.0930	(286)
Target Primary Energy Rate (TPER)			52.1800	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.51	**TER**	9.81
Environmental	99 A	**% DER < TER**			84.61
CO_2 Emissions (t/year)	0.11	**DFEE**	16.83	**TFEE**	21.47
Compliance Check	See BREL	**% DFEE < TFEE**			21.62
% DPER < TPER	61.79	**DPER**	19.94	**TPER**	52.18

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.4800	36.7938	0.7600	0.7000	0.7700	101.4662	(77)
Southeast	1.7600	36.7938	0.7600	0.7000	0.7700	23.8744	(77)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	125.3406	213.5015	292.1220	361.9533	405.4179	402.4861	388.0396	355.6131	316.3064	235.9646	150.1292	107.2655	(83)
Total gains	764.9645	850.7953	910.4073	944.9070	953.2205	918.5910	885.4880	856.3255	835.2281	787.1458	740.1330	731.0482	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area													
	0.9402	0.9013	0.8349	0.7268	0.5807	0.4225	0.3025	0.3269	0.4979	0.7434	0.8988	0.9509	(86)
MIT	20.4551	20.6087	20.7746	20.9077	20.9761	20.9965	20.9996	20.9993	20.9916	20.9113	20.6681	20.3999	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house													
	0.9307	0.8870	0.8136	0.6966	0.5430	0.3795	0.2571	0.2801	0.4520	0.7083	0.8819	0.9427	(89)
MIT 2	19.7165	19.9024	20.0981	20.2475	20.3178	20.3360	20.3382	20.3380	20.3323	20.2544	19.9776	19.6488	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9476	20.1234	20.3097	20.4540	20.5237	20.5426	20.5451	20.5449	20.5385	20.4599	20.1936	19.8838	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9476	20.1234	20.3097	20.4540	20.5237	20.5426	20.5451	20.5449	20.5385	20.4599	20.1936	19.8838	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9243	0.8820	0.8126	0.7020	0.5537	0.3928	0.2713	0.2947	0.4660	0.7150	0.8778	0.9362	(94)
Useful gains	707.0412	750.3949	739.7868	663.3222	527.7788	360.8663	240.2549	252.3559	389.2035	562.7978	649.6896	684.4426	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	953.4247	927.5780	841.4413	704.0005	537.6394	362.0925	240.3770	252.5531	392.3078	600.7750	797.8061	955.6319	(97)
Space heating kWh													
	183.3093	119.0671	75.6310	29.2884	7.3363	0.0000	0.0000	0.0000	0.0000	28.2550	106.6439	201.7648	(98a)
Space heating requirement - total per year (kWh/year)												751.2958	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	183.3093	119.0671	75.6310	29.2884	7.3363	0.0000	0.0000	0.0000	0.0000	28.2550	106.6439	201.7648	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												751.2958	
Space heating per m2											(98c) / (4) =	8.6655	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	183.3093	119.0671	75.6310	29.2884	7.3363	0.0000	0.0000	0.0000	0.0000	28.2550	106.6439	201.7648	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	274.9640	178.6006	113.4465	43.9326	11.0044	0.0000	0.0000	0.0000	0.0000	42.3825	159.9658	302.6473	
Space heating requirement													
	274.9640	178.6006	113.4465	43.9326	11.0044	0.0000	0.0000	0.0000	0.0000	42.3825	159.9658	302.6473	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1126.9438	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												11.2694	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4546.0445	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1126.9438	4.4400	50.0363	(340a)
Space heating total			50.0363	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			258.6273	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7070 (357)
SAP value		88.5403
SAP rating (Section 12)		89 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1401.1853	0.1577	47.3968	(367)
Electrical energy for heat distribution (space & water)	11.2694	0.0000	7.5930	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			210.0741	(373)
Space and water heating			210.0741	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			124.4992	(383)
CO2 emissions per m2			1.4400	(384)
EI value			98.7333	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			3.0000 (17)
Infiltration rate			0.1500 (18)
Number of sides sheltered			3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7750 (20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)

Average = Sum(39)m / 12 = 60.9312

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)											Total = Sum(45)m =	2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)

Total per year (kWh/year) = Sum(64)m = 2751.6674 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.4800	42.9509	0.7600	0.7000	0.7700	118.4456	(77)
Southeast	1.7600	42.9509	0.7600	0.7000	0.7700	27.8696	(77)

Solar gains	146.3152	221.4792	299.2755	377.4295	409.9363	437.9421	413.7339	384.4230	342.7809	258.3726	172.6085	125.9735	(83)
Total gains	785.9390	858.7730	917.5608	960.3832	957.7390	954.0470	911.1824	885.1354	861.7026	809.5538	762.6124	749.7563	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area													
	0.9295	0.8919	0.8153	0.7000	0.5499	0.3695	0.2607	0.2821	0.4631	0.7021	0.8780	0.9420	(86)
MIT	20.5091	20.6405	20.8084	20.9258	20.9826	20.9984	20.9998	20.9997	20.9944	20.9363	20.7206	20.4537	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house													
	0.9184	0.8765	0.7921	0.6684	0.5113	0.3277	0.2165	0.2366	0.4180	0.6646	0.8585	0.9325	(89)
MIT 2	19.7826	19.9406	20.1370	20.2666	20.3239	20.3374	20.3383	20.3383	20.3345	20.2800	20.0393	19.7152	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0098	20.1595	20.3470	20.4728	20.5299	20.5442	20.5452	20.5452	20.5409	20.4853	20.2524	19.9462	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0098	20.1595	20.3470	20.4728	20.5299	20.5442	20.5452	20.5452	20.5409	20.4853	20.2524	19.9462	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9123	0.8720	0.7924	0.6750	0.5226	0.3407	0.2303	0.2508	0.4319	0.6731	0.8557	0.9262	(94)
Useful gains	717.0123	748.8157	727.0961	648.2715	500.5182	325.0890	209.8768	222.0292	372.1380	544.9254	652.5697	694.4020	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	938.9391	911.5022	813.2487	680.7722	507.5535	325.6256	209.9219	222.1041	374.1712	571.8565	777.0205	941.1555	(97)
Space heating kWh													
	165.1136	109.3254	64.0975	23.4005	5.2342	0.0000	0.0000	0.0000	0.0000	20.0368	89.6046	183.5846	(98a)
Space heating requirement - total per year (kWh/year)												660.3972	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	165.1136	109.3254	64.0975	23.4005	5.2342	0.0000	0.0000	0.0000	0.0000	20.0368	89.6046	183.5846	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												660.3972	
Space heating per m2											(98c) / (4) =	7.6170	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	165.1136	109.3254	64.0975	23.4005	5.2342	0.0000	0.0000	0.0000	0.0000	20.0368	89.6046	183.5846	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	247.6704	163.9881	96.1463	35.1008	7.8514	0.0000	0.0000	0.0000	0.0000	30.0551	134.4069	275.3769	
Space heating requirement													
	247.6704	163.9881	96.1463	35.1008	7.8514	0.0000	0.0000	0.0000	0.0000	30.0551	134.4069	275.3769	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)

Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year		
Space heating fuel - community heating	990.5959	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4127.5010	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	9.9060	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4313.1706	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	990.5959	6.5500	64.8840	(340a)
Space heating total			64.8840	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			328.1891	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1364.8258	0.1581	41.7717	(367)
Electrical energy for heat distribution (space & water)	9.9060	0.0000	7.3821	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			204.2381	(373)
Space and water heating			204.2381	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			106.4052	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1364.8258	1.5854	418.7869	(467)
Electrical energy for heat distribution (space & water)	9.9060	0.0000	78.4837	(472)
Overall CO2 factor for heat network			0.4243	(486)
Total CO2 associated with community systems			2171.3832	(473)
Space and water heating			2171.3832	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1527.5481	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Northwest

Current energy efficiency rating: B 89
Current environmental impact rating: A 99

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 89
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£71	£71	£0
Community scheme	£439	£439	£0
Space heating	£178	£178	£0
Water heating	£270	£270	£0
Lighting	£62	£62	£0
Generated (PV)	-£182	-£182	£0
Total cost of fuels	£328	£328	£0
Total cost of uses	£328	£328	£0
Delivered energy	50 kWh/m²	50 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	18 kWh/m²	18 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5778 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day)	126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.4800	36.7938	0.7600	0.7000	0.7700	101.4662	(77)
Southeast	1.7600	36.7938	0.7600	0.7000	0.7700	23.8744	(77)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	125.3406	213.5015	292.1220	361.9533	405.4179	402.4861	388.0396	355.6131	316.3064	235.9646	150.1292	107.2655	(83)
Total gains	764.9645	850.7953	910.4073	944.9070	953.2205	918.5910	885.4880	856.3255	835.2281	787.1458	740.1330	731.0482	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area	0.9402	0.9013	0.8349	0.7268	0.5807	0.4225	0.3025	0.3269	0.4979	0.7434	0.8988	0.9509	(86)
MIT	20.4551	20.6087	20.7746	20.9077	20.9761	20.9965	20.9996	20.9993	20.9916	20.9113	20.6681	20.3999	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9307	0.8870	0.8136	0.6966	0.5430	0.3795	0.2571	0.2801	0.4520	0.7083	0.8819	0.9427	(89)
MIT 2	19.7165	19.9024	20.0981	20.2475	20.3178	20.3360	20.3382	20.3380	20.3323	20.2544	19.9776	19.6488	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9476	20.1234	20.3097	20.4540	20.5237	20.5426	20.5451	20.5449	20.5385	20.4599	20.1936	19.8838	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9476	20.1234	20.3097	20.4540	20.5237	20.5426	20.5451	20.5449	20.5385	20.4599	20.1936	19.8838	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9243	0.8820	0.8126	0.7020	0.5537	0.3928	0.2713	0.2947	0.4660	0.7150	0.8778	0.9362	(94)
Useful gains	707.0412	750.3949	739.7868	663.3222	527.7788	360.8663	240.2549	252.3559	389.2035	562.7978	649.6896	684.4426	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	953.4247	927.5780	841.4413	704.0005	537.6394	362.0925	240.3770	252.5531	392.3078	600.7750	797.8061	955.6319	(97)
Space heating kWh	183.3093	119.0671	75.6310	29.2884	7.3363	0.0000	0.0000	0.0000	0.0000	28.2550	106.6439	201.7648	(98a)
Space heating requirement - total per year (kWh/year)												751.2958	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	183.3093	119.0671	75.6310	29.2884	7.3363	0.0000	0.0000	0.0000	0.0000	28.2550	106.6439	201.7648	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												751.2958	
Space heating per m2											(98c) / (4) =	8.6655	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	183.3093	119.0671	75.6310	29.2884	7.3363	0.0000	0.0000	0.0000	0.0000	28.2550	106.6439	201.7648	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	274.9640	178.6006	113.4465	43.9326	11.0044	0.0000	0.0000	0.0000	0.0000	42.3825	159.9658	302.6473	
Space heating requirement													
	274.9640	178.6006	113.4465	43.9326	11.0044	0.0000	0.0000	0.0000	0.0000	42.3825	159.9658	302.6473	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1126.9438	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)

Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	11.2694	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4546.0445	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1126.9438	4.4400	50.0363	(340a)
Space heating total			50.0363	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			258.6273	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.7070	(357)
SAP value	88.5403	
SAP rating (Section 12)	89	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1401.1853	0.1577	47.3968	(367)
Electrical energy for heat distribution (space & water)	11.2694	0.0000	7.5930	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			210.0741	(373)
Space and water heating			210.0741	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			124.4992	(383)
CO2 emissions per m2			1.4400	(384)
EI value			98.7333	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 86.7000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5778	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.4800	42.9509	0.7600	0.7000	0.7700	118.4456	(77)
Southeast	1.7600	42.9509	0.7600	0.7000	0.7700	27.8696	(77)

Solar gains	146.3152	221.4792	299.2755	377.4295	409.9363	437.9421	413.7339	384.4230	342.7809	258.3726	172.6085	125.9735	(83)
Total gains	785.9390	858.7730	917.5608	960.3832	957.7390	954.0470	911.1824	885.1354	861.7026	809.5538	762.6124	749.7563	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area													
	0.9295	0.8919	0.8153	0.7000	0.5499	0.3695	0.2607	0.2821	0.4631	0.7021	0.8780	0.9420	(86)
MIT	20.5091	20.6405	20.8084	20.9258	20.9826	20.9984	20.9998	20.9997	20.9944	20.9363	20.7206	20.4537	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house													
	0.9184	0.8765	0.7921	0.6684	0.5113	0.3277	0.2165	0.2366	0.4180	0.6646	0.8585	0.9325	(89)
MIT 2	19.7826	19.9406	20.1370	20.2666	20.3239	20.3374	20.3383	20.3383	20.3345	20.2800	20.0393	19.7152	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0098	20.1595	20.3470	20.4728	20.5299	20.5442	20.5452	20.5452	20.5409	20.4853	20.2524	19.9462	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0098	20.1595	20.3470	20.4728	20.5299	20.5442	20.5452	20.5452	20.5409	20.4853	20.2524	19.9462	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9123	0.8720	0.7924	0.6750	0.5226	0.3407	0.2303	0.2508	0.4319	0.6731	0.8557	0.9262	(94)
Useful gains	717.0123	748.8157	727.0961	648.2715	500.5182	325.0890	209.8768	222.0292	372.1380	544.9254	652.5697	694.4020	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	938.9391	911.5022	813.2487	680.7722	507.5535	325.6256	209.9219	222.1041	374.1712	571.8565	777.0205	941.1555	(97)
Space heating kWh													
	165.1136	109.3254	64.0975	23.4005	5.2342	0.0000	0.0000	0.0000	0.0000	20.0368	89.6046	183.5846	(98a)
Space heating requirement - total per year (kWh/year)												660.3972	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	165.1136	109.3254	64.0975	23.4005	5.2342	0.0000	0.0000	0.0000	0.0000	20.0368	89.6046	183.5846	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												660.3972	
Space heating per m2										(98c) / (4) =		7.6170	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement

	165.1136	109.3254	64.0975	23.4005	5.2342	0.0000	0.0000	0.0000	0.0000	20.0368	89.6046	183.5846 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	247.6704	163.9881	96.1463	35.1008	7.8514	0.0000	0.0000	0.0000	0.0000	30.0551	134.4069	275.3769
Space heating requirement												
	247.6704	163.9881	96.1463	35.1008	7.8514	0.0000	0.0000	0.0000	0.0000	30.0551	134.4069	275.3769 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388
Water heating fuel												
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446 (331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year

Space heating fuel - community heating	990.5959 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	9.9060 (313)
Space cooling fuel	0.0000 (321)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)	
mechanical ventilation fans (SFP = 0.1292)	33.4924 (330a)
Total electricity for the above, kWh/year	33.4924 (331)
Electricity for lighting (calculated in Appendix L)	216.3282 (332)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4313.1706 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	990.5959	6.5500	64.8840	(340a)
Space heating total			64.8840	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			328.1891	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1364.8258	0.1581	41.7717	(367)
Electrical energy for heat distribution (space & water)	9.9060	0.0000	7.3821	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			204.2381	(373)
Space and water heating			204.2381	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			106.4052	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)

Space and Water heating from Heat pump	1364.8258	1.5854	418.7869	(467)
Electrical energy for heat distribution (space & water)	9.9060	0.0000	78.4837	(472)
Overall CO2 factor for heat network			0.4243	(486)
Total CO2 associated with community systems			2171.3832	(473)
Space and water heating			2171.3832	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1527.5481	(483)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.74	**TER**	10.63
Environmental	99 A	**% DER < TER**			83.63
CO_2 Emissions (t/year)	0.12	**DFEE**	20.64	**TFEE**	25.22
Compliance Check	See BREL	**% DFEE < TFEE**			18.15
% DPER < TPER	60.58	**DPER**	22.29	**TPER**	56.56

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers
67.4410 66.4275 64.9507 62.1249 60.0396 57.7140 56.3922 57.8579 59.4646 61.9615 64.8480 67.1826 (42a)
Hot water usage for baths
29.1251 28.6925 28.0834 26.9603 26.1193 25.1868 24.6831 25.2880 25.9466 26.9444 28.0906 29.0266 (42b)
Hot water usage for other uses
41.0293 39.5373 38.0453 36.5534 35.0614 33.5694 33.5694 35.0614 36.5534 38.0453 39.5373 41.0293 (42c)
Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
12Total per year (kWh/year)												2752	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.4800	10.6334	0.7600	0.7000	0.7700	29.3237	(74)
North	1.7600	10.6334	0.7600	0.7000	0.7700	6.8997	(74)

Solar gains	36.2234	69.2247	117.6297	188.9434	254.5240	272.4755	254.3907	201.8266	141.4290	82.4029	44.6862	30.1976	(83)
Total gains	621.3959	668.6372	691.7761	743.9773	782.2352	782.4743	745.4825	693.9486	648.1418	605.1561	598.4337	603.7387	(84)

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7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area	0.9741	0.9591	0.9306	0.8440	0.6868	0.4932	0.3589	0.4024	0.6270	0.8667	0.9529	0.9777	(86)
MIT	20.2469	20.3795	20.5621	20.8003	20.9463	20.9926	20.9989	20.9980	20.9743	20.8006	20.4945	20.2084	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9692	0.9517	0.9181	0.8189	0.6468	0.4441	0.3053	0.3452	0.5737	0.8394	0.9431	0.9735	(89)
MIT 2	19.4595	19.6251	19.8507	20.1328	20.2905	20.3333	20.3379	20.3374	20.3190	20.1382	19.7706	19.4111	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.7058	19.8611	20.0733	20.3416	20.4956	20.5395	20.5447	20.5440	20.5240	20.3454	19.9971	19.6605	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7058	19.8611	20.0733	20.3416	20.4956	20.5395	20.5447	20.5440	20.5240	20.3454	19.9971	19.6605	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9637	0.9455	0.9125	0.8190	0.6565	0.4591	0.3220	0.3630	0.5890	0.8397	0.9373	0.9682	(94)
Useful gains	598.8242	632.2240	631.2543	609.3286	513.5613	359.2390	240.0565	251.9272	381.7450	508.1716	560.9158	584.5483	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	938.6960	911.5977	827.0348	697.1485	535.9274	361.9005	240.3530	252.5015	391.4206	593.7994	785.8338	942.0271	(97)
Space heating kWh	252.8646	187.7392	145.6607	63.2303	16.6404	0.0000	0.0000	0.0000	0.0000	63.7071	161.9410	265.9643	(98a)
Space heating requirement - total per year (kWh/year)												1157.7476	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	252.8646	187.7392	145.6607	63.2303	16.6404	0.0000	0.0000	0.0000	0.0000	63.7071	161.9410	265.9643	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1157.7476	
Space heating per m2											(98c) / (4) =	13.3535	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	252.8646	187.7392	145.6607	63.2303	16.6404	0.0000	0.0000	0.0000	0.0000	63.7071	161.9410	265.9643	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	379.2969	281.6088	218.4911	94.8455	24.9605	0.0000	0.0000	0.0000	0.0000	95.5606	242.9115	398.9464	
Space heating requirement	379.2969	281.6088	218.4911	94.8455	24.9605	0.0000	0.0000	0.0000	0.0000	95.5606	242.9115	398.9464	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1736.6214	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												17.3662	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5155.7222	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1563.7660	0.1566	72.4997	(367)
Electrical energy for heat distribution (space & water)	17.3662	0.0000	8.5344	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			236.1184	(373)
Space and water heating			236.1184	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			150.5435	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.7400	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1563.7660	1.5796	731.5066	(467)
Electrical energy for heat distribution (space & water)	17.3662	0.0000	90.2107	(472)
Overall CO2 factor for heat network			0.4256	(486)
Total CO2 associated with community systems			2495.8299	(473)
Space and water heating			2495.8299	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1932.8866	(483)
Dwelling Primary energy Rate (DPER)			22.2900	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
500mm mineral wool	43.3500		43.3500	0.1100	4.7685			(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2577			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.7700	0.0600	0.4062
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	19.4300	0.1200	2.3316
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1426 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 30.4003 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	70.6867	70.4833	70.2839	69.3475	69.1723	68.3567	68.3567	68.2057	68.6709	69.1723	69.5267	69.8973	(39)
Average = Sum(39)m / 12 =												69.3467	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8153	0.8130	0.8107	0.7999	0.7978	0.7884	0.7884	0.7867	0.7921	0.7978	0.8019	0.8062	(40)
HLP (average)												0.7998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.2400	10.6334	0.6300	0.7000	0.7700	30.0273	(74)

Solar gains	30.0273	57.3836	97.5088	156.6241	210.9870	225.8679	210.8765	167.3036	117.2372	68.3077	37.0425	25.0322	(83)
Total gains	608.8644	650.4608	665.3198	705.3227	732.3628	726.5312	692.6329	650.0903	614.6146	584.7255	584.4547	592.2379	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1394	59.3101	59.4783	60.2815	60.4342	61.1552	61.1552	61.2906	60.8754	60.4342	60.1261	59.8073	
alpha	4.9426	4.9540	4.9652	5.0188	5.0289	5.0770	5.0770	5.0860	5.0584	5.0289	5.0084	4.9872	
util living area	0.9813	0.9719	0.9547	0.8972	0.7758	0.5830	0.4307	0.4764	0.7112	0.9075	0.9665	0.9834	(86)
MIT	19.9664	20.1084	20.3184	20.6327	20.8662	20.9752	20.9956	20.9928	20.9345	20.6638	20.2856	19.9482	(87)
Th 2	20.2401	20.2421	20.2441	20.2535	20.2552	20.2634	20.2634	20.2649	20.2602	20.2552	20.2517	20.2480	(88)
util rest of house	0.9775	0.9662	0.9452	0.8761	0.7346	0.5224	0.3602	0.4030	0.6521	0.8843	0.9589	0.9800	(89)
MIT 2	19.0307	19.2112	19.4762	19.8666	20.1323	20.2460	20.2613	20.2612	20.2093	19.9106	19.4435	19.0136	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.3234	19.4919	19.7397	20.1062	20.3619	20.4741	20.4910	20.4901	20.4362	20.1462	19.7069	19.3059	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3234	19.4919	19.7397	20.1062	20.3619	20.4741	20.4910	20.4901	20.4362	20.1462	19.7069	19.3059	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9717	0.9594	0.9377	0.8715	0.7409	0.5402	0.3822	0.4258	0.6668	0.8804	0.9520	0.9746	(94)
Useful gains	591.6155	624.0264	623.8706	614.6961	542.5868	392.4398	264.6991	276.7981	409.8470	514.8206	556.4167	577.2215	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1061.9535	1028.4821	930.5354	777.1241	599.1619	401.5358	265.9737	278.9653	435.1099	660.3311	876.5192	1055.8633	(97)
Space heating kWh	349.9314	271.7942	228.1587	116.9482	42.0919	0.0000	0.0000	0.0000	0.0000	108.2598	230.4738	356.1095	(98a)
Space heating requirement - total per year (kWh/year)												1703.7675	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	349.9314	271.7942	228.1587	116.9482	42.0919	0.0000	0.0000	0.0000	0.0000	108.2598	230.4738	356.1095	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1703.7675	
Space heating per m2											(98c) / (4) =	19.6513	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	349.9314	271.7942	228.1587	116.9482	42.0919	0.0000	0.0000	0.0000	0.0000	108.2598	230.4738	356.1095	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	379.1240	294.4683	247.1925	126.7044	45.6033	0.0000	0.0000	0.0000	0.0000	117.2912	249.7008	385.8174	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9632	84.6761	84.1466	82.9683	81.3092	79.8000	79.8000	79.8000	79.8000	82.7868	84.2928	85.0249	(217)
Fuel for water heating, kWh/month	275.0381	243.9515	260.8617	233.1516	230.9043	212.3443	209.9929	218.2535	220.5242	236.5943	246.4910	271.9403	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1845.9019	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2860.0476	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4159.2549	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1845.9019	0.2100	387.6394	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2860.0476	0.2100	600.6100	(264)
Space and water heating			988.2494	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			921.3477	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.6300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1845.9019	1.1300	2085.8692	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2860.0476	1.1300	3231.8538	(278)
Space and water heating			5317.7230	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4903.9501	(286)
Target Primary Energy Rate (TPER)			56.5600	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.74	**TER**	10.63
Environmental	99 A	**% DER < TER**			83.63
CO_2 Emissions (t/year)	0.12	**DFEE**	20.64	**TFEE**	25.22
Compliance Check	See BREL	**% DFEE < TFEE**			18.15
% DPER < TPER	60.58	**DPER**	22.29	**TPER**	56.56

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		3 * 10 =	30.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1412	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.2912	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2257	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2878	0.2821	0.2765	0.2483	0.2426	0.2144	0.2144	0.2088	0.2257	0.2426	0.2539	0.2652	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5414	0.5398	0.5382	0.5308	0.5294	0.5230	0.5230	0.5218	0.5255	0.5294	0.5322	0.5352	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15049.3300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							173.5794	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9510	37.8383	37.7278	37.2089	37.1118	36.6599	36.6599	36.5762	36.8339	37.1118	37.3082	37.5135	(38)
Heat transfer coeff	63.8337	63.7210	63.6105	63.0916	62.9945	62.5426	62.5426	62.4589	62.7167	62.9945	63.1909	63.3963	(39)
Average = Sum(39)m / 12 =												63.0912	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7363	0.7350	0.7337	0.7277	0.7266	0.7214	0.7214	0.7204	0.7234	0.7266	0.7288	0.7312	(40)
HLP (average)												0.7277	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
									Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)											908	(64)

Electric shower(s)

54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 614.3496 (64a)

Heat gains from water heating, kWh/month

37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.4800	10.6334	0.7600	0.7000	0.7700	29.3237	(74)
North	1.7600	10.6334	0.7600	0.7000	0.7700	6.8997	(74)

Solar gains	36.2234	69.2247	117.6297	188.9434	254.5240	272.4755	254.3907	201.8266	141.4290	82.4029	44.6862	30.1976	(83)
Total gains	514.4518	562.9495	588.9893	648.1858	690.5587	695.1438	661.1229	607.6084	559.4090	511.5750	498.1758	497.7463	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.4884	65.6043	65.7182	66.2587	66.3608	66.8404	66.8404	66.9299	66.6548	66.3608	66.1546	65.9403	
alpha	5.3659	5.3736	5.3812	5.4172	5.4241	5.4560	5.4560	5.4620	5.4437	5.4241	5.4103	5.3960	
util living area	0.9895	0.9817	0.9657	0.9043	0.7675	0.5634	0.4142	0.4687	0.7200	0.9280	0.9793	0.9911	(86)

MIT	19.9917	20.1429	20.3595	20.6784	20.8987	20.9844	20.9975	20.9954	20.9456	20.6726	20.2917	19.9636	(87)
Th 2	20.3089	20.3101	20.3112	20.3164	20.3174	20.3220	20.3220	20.3228	20.3202	20.3174	20.3154	20.3133	(88)
util rest of house	0.9873	0.9779	0.9584	0.8850	0.7282	0.5080	0.3513	0.4016	0.6645	0.9093	0.9744	0.9893	(89)
MIT 2	19.3785	19.5287	19.7423	20.0504	20.2448	20.3134	20.3211	20.3210	20.2868	20.0507	19.6812	19.3542	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.5703	19.7209	19.9354	20.2468	20.4494	20.5233	20.5327	20.5319	20.4929	20.2452	19.8721	19.5448	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5703	19.7209	19.9354	20.2468	20.4494	20.5233	20.5327	20.5319	20.4929	20.2452	19.8721	19.5448	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9844	0.9740	0.9538	0.8829	0.7362	0.5248	0.3710	0.4225	0.6792	0.9071	0.9705	0.9867	(94)
Useful gains	506.4411	548.3030	561.7612	572.2706	508.3558	364.7795	245.2573	256.6883	379.9569	464.0243	483.4931	491.1179	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	974.7605	944.4003	854.6301	715.8910	551.1614	370.4595	245.9598	258.0755	400.9402	607.5956	807.0840	972.8054	(97)
Space heating kWh	348.4296	266.1774	217.8945	103.4067	31.8473	0.0000	0.0000	0.0000	0.0000	106.8170	232.9854	358.3755	(98a)
Space heating requirement - total per year (kWh/year)												1665.9335	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	348.4296	266.1774	217.8945	103.4067	31.8473	0.0000	0.0000	0.0000	0.0000	106.8170	232.9854	358.3755	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1665.9335	
Space heating per m2											(98c) / (4) =	19.2149	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	587.9004	462.8152	474.6877	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9272	0.9644	0.9448	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	545.1102	446.3183	448.4984	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	748.3914	711.6595	651.8733	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	146.3625	197.4138	151.3109	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	36.5906	49.3535	37.8277	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												123.7718	(107)
Energy for space heating												19.2149	(99)
Energy for space cooling												1.4276	(108)
Total												20.6425	(109)
Fabric Energy Efficiency (DFEE)												20.6	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
500mm mineral wool	43.3500		43.3500	0.1100	4.7685			(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2577			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.7700	0.0600	0.4062
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	19.4300	0.1200	2.3316
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1426 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.4003 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	70.6867	70.4833	70.2839	69.3475	69.1723	68.3567	68.3567	68.2057	68.6709	69.1723	69.5267	69.8973	(39)
Average = Sum(39)m / 12 =												69.3467	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8153	0.8130	0.8107	0.7999	0.7978	0.7884	0.7884	0.7867	0.7921	0.7978	0.8019	0.8062	(40)
HLP (average)												0.7998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												64.3029	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
133.8049 148.1412 133.8049 138.2651 133.8049 138.2651 133.8049 133.8049 138.2651 133.8049 138.2651 133.8049 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
232.8739 235.2904 229.2009 216.2371 199.8726 184.4922 174.2172 171.8007 177.8902 190.8540 207.2186 222.5989 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
35.8890 35.8890 35.8890 35.8890 35.8890 35.8890 35.8890 35.8890 35.8890 35.8890 35.8890 35.8890 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-103.1122 -103.1122 -103.1122 -103.1122 -103.1122 -103.1122 -103.1122 -103.1122 -103.1122 -103.1122 -103.1122 -103.1122 (71)
Water heating gains (Table 5)
49.8825 48.6262 46.6867 43.0732 40.6901 38.2439 37.0430 38.5091 40.1577 42.8460 46.3389 49.4778 (72)
Total internal gains
478.2284 493.7248 471.3597 459.2424 436.0346 422.6682 406.7322 405.7818 417.9801 429.1721 453.4896 467.5487 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.2400	10.6334	0.6300	0.7000	0.7700	30.0273	(74)

Solar gains 30.0273 57.3836 97.5088 156.6241 210.9870 225.8679 210.8765 167.3036 117.2372 68.3077 37.0425 25.0322 (83)
Total gains 508.2557 551.1084 568.8684 615.8666 647.0217 648.5361 617.6087 573.0854 535.2172 497.4798 490.5321 492.5809 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1394	59.3101	59.4783	60.2815	60.4342	61.1552	61.1552	61.2906	60.8754	60.4342	60.1261	59.8073	
alpha	4.9426	4.9540	4.9652	5.0188	5.0289	5.0770	5.0770	5.0860	5.0584	5.0289	5.0084	4.9872	
util living area	0.9911	0.9854	0.9748	0.9333	0.8317	0.6418	0.4804	0.5356	0.7803	0.9459	0.9832	0.9923	(86)
MIT	19.8002	19.9503	20.1753	20.5295	20.8127	20.9621	20.9928	20.9878	20.8997	20.5568	20.1387	19.7818	(87)
Th 2	20.2401	20.2421	20.2441	20.2535	20.2552	20.2634	20.2634	20.2649	20.2602	20.2552	20.2517	20.2480	(88)
util rest of house	0.9892	0.9823	0.9690	0.9178	0.7948	0.5786	0.4030	0.4552	0.7240	0.9302	0.9790	0.9907	(89)
MIT 2	19.1338	19.2841	19.5079	19.8581	20.1172	20.2422	20.2606	20.2599	20.1969	19.8899	19.4792	19.1217	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.3422	19.4925	19.7167	20.0681	20.3347	20.4674	20.4897	20.4876	20.4167	20.0985	19.6855	19.3282	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3422	19.4925	19.7167	20.0681	20.3347	20.4674	20.4897	20.4876	20.4167	20.0985	19.6855	19.3282	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9862	0.9784	0.9641	0.9133	0.7991	0.5967	0.4271	0.4800	0.7368	0.9263	0.9750	0.9880	(94)
Useful gains	501.2614	539.1906	548.4547	562.4971	517.0222	386.9723	263.7730	275.0868	394.3348	460.8021	478.2782	486.6916	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1063.2863	1028.5284	928.9198	774.4794	597.2835	401.0730	265.8840	278.7999	433.7745	657.0319	875.0298	1057.4212	(97)
Space heating kWh	418.1465	328.8350	283.0661	152.6272	59.7144	0.0000	0.0000	0.0000	0.0000	145.9950	285.6612	424.6228	(98a)
Space heating requirement - total per year (kWh/year)												2098.6681	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	418.1465	328.8350	283.0661	152.6272	59.7144	0.0000	0.0000	0.0000	0.0000	145.9950	285.6612	424.6228	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2098.6681	
Space heating per m2											(98c) / (4) =	24.2061	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	642.5530	505.8396	518.3630	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8658	0.9248	0.8964	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	556.3343	467.7954	464.6470	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	693.9149	660.7987	611.5218	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	99.0581	143.5945	109.2748	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	24.7645	35.8986	27.3187	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												87.9818	(107)
Energy for space heating												24.2061	(99)
Energy for space cooling												1.0148	(108)
Total												25.2209	(109)
Fabric Energy Efficiency (TFEE)												25.2	(109)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.74	**TER**	10.63
Environmental	99 A	**% DER < TER**			83.63
CO_2 Emissions (t/year)	0.12	**DFEE**	20.64	**TFEE**	25.22
Compliance Check	See BREL	**% DFEE < TFEE**			18.15
% DPER < TPER	60.58	**DPER**	22.29	**TPER**	56.56

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers
67.4410 66.4275 64.9507 62.1249 60.0396 57.7140 56.3922 57.8579 59.4646 61.9615 64.8480 67.1826 (42a)
Hot water usage for baths
29.1251 28.6925 28.0834 26.9603 26.1193 25.1868 24.6831 25.2880 25.9466 26.9444 28.0906 29.0266 (42b)
Hot water usage for other uses
41.0293 39.5373 38.0453 36.5534 35.0614 33.5694 33.5694 35.0614 36.5534 38.0453 39.5373 41.0293 (42c)
Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
12Total per year (kWh/year)												2752	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.4800	10.6334	0.7600	0.7000	0.7700	29.3237	(74)
North	1.7600	10.6334	0.7600	0.7000	0.7700	6.8997	(74)

Solar gains	36.2234	69.2247	117.6297	188.9434	254.5240	272.4755	254.3907	201.8266	141.4290	82.4029	44.6862	30.1976	(83)
Total gains	621.3959	668.6372	691.7761	743.9773	782.2352	782.4743	745.4825	693.9486	648.1418	605.1561	598.4337	603.7387	(84)

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7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area	0.9741	0.9591	0.9306	0.8440	0.6868	0.4932	0.3589	0.4024	0.6270	0.8667	0.9529	0.9777	(86)
MIT	20.2469	20.3795	20.5621	20.8003	20.9463	20.9926	20.9989	20.9980	20.9743	20.8006	20.4945	20.2084	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9692	0.9517	0.9181	0.8189	0.6468	0.4441	0.3053	0.3452	0.5737	0.8394	0.9431	0.9735	(89)
MIT 2	19.4595	19.6251	19.8507	20.1328	20.2905	20.3333	20.3379	20.3374	20.3190	20.1382	19.7706	19.4111	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.7058	19.8611	20.0733	20.3416	20.4956	20.5395	20.5447	20.5440	20.5240	20.3454	19.9971	19.6605	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7058	19.8611	20.0733	20.3416	20.4956	20.5395	20.5447	20.5440	20.5240	20.3454	19.9971	19.6605	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9637	0.9455	0.9125	0.8190	0.6565	0.4591	0.3220	0.3630	0.5890	0.8397	0.9373	0.9682	(94)
Useful gains	598.8242	632.2240	631.2543	609.3286	513.5613	359.2390	240.0565	251.9272	381.7450	508.1716	560.9158	584.5483	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	938.6960	911.5977	827.0348	697.1485	535.9274	361.9005	240.3530	252.5015	391.4206	593.7994	785.8338	942.0271	(97)
Space heating kWh	252.8646	187.7392	145.6607	63.2303	16.6404	0.0000	0.0000	0.0000	0.0000	63.7071	161.9410	265.9643	(98a)
Space heating requirement - total per year (kWh/year)												1157.7476	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	252.8646	187.7392	145.6607	63.2303	16.6404	0.0000	0.0000	0.0000	0.0000	63.7071	161.9410	265.9643	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1157.7476	
Space heating per m2											(98c) / (4) =	13.3535	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	252.8646	187.7392	145.6607	63.2303	16.6404	0.0000	0.0000	0.0000	0.0000	63.7071	161.9410	265.9643	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	379.2969	281.6088	218.4911	94.8455	24.9605	0.0000	0.0000	0.0000	0.0000	95.5606	242.9115	398.9464	
Space heating requirement	379.2969	281.6088	218.4911	94.8455	24.9605	0.0000	0.0000	0.0000	0.0000	95.5606	242.9115	398.9464	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1736.6214	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												17.3662	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5155.7222	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1563.7660	0.1566	72.4997	(367)
Electrical energy for heat distribution (space & water)	17.3662	0.0000	8.5344	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			236.1184	(373)
Space and water heating			236.1184	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			150.5435	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.7400	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1563.7660	1.5796	731.5066	(467)
Electrical energy for heat distribution (space & water)	17.3662	0.0000	90.2107	(472)
Overall CO2 factor for heat network			0.4256	(486)
Total CO2 associated with community systems			2495.8299	(473)
Space and water heating			2495.8299	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1932.8866	(483)
Dwelling Primary energy Rate (DPER)			22.2900	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
500mm mineral wool	43.3500		43.3500	0.1100	4.7685			(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2577			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.7700	0.0600	0.4062
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	19.4300	0.1200	2.3316
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1426 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 30.4003 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	70.6867	70.4833	70.2839	69.3475	69.1723	68.3567	68.3567	68.2057	68.6709	69.1723	69.5267	69.8973	(39)
Average = Sum(39)m / 12 =												69.3467	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8153	0.8130	0.8107	0.7999	0.7978	0.7884	0.7884	0.7867	0.7921	0.7978	0.8019	0.8062	(40)
HLP (average)												0.7998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.2400	10.6334	0.6300	0.7000	0.7700	30.0273	(74)

Solar gains	30.0273	57.3836	97.5088	156.6241	210.9870	225.8679	210.8765	167.3036	117.2372	68.3077	37.0425	25.0322	(83)
Total gains	608.8644	650.4608	665.3198	705.3227	732.3628	726.5312	692.6329	650.0903	614.6146	584.7255	584.4547	592.2379	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1394	59.3101	59.4783	60.2815	60.4342	61.1552	61.1552	61.2906	60.8754	60.4342	60.1261	59.8073	
alpha	4.9426	4.9540	4.9652	5.0188	5.0289	5.0770	5.0770	5.0860	5.0584	5.0289	5.0084	4.9872	
util living area	0.9813	0.9719	0.9547	0.8972	0.7758	0.5830	0.4307	0.4764	0.7112	0.9075	0.9665	0.9834	(86)
MIT	19.9664	20.1084	20.3184	20.6327	20.8662	20.9752	20.9956	20.9928	20.9345	20.6638	20.2856	19.9482	(87)
Th 2	20.2401	20.2421	20.2441	20.2535	20.2552	20.2634	20.2634	20.2649	20.2602	20.2552	20.2517	20.2480	(88)
util rest of house	0.9775	0.9662	0.9452	0.8761	0.7346	0.5224	0.3602	0.4030	0.6521	0.8843	0.9589	0.9800	(89)
MIT 2	19.0307	19.2112	19.4762	19.8666	20.1323	20.2460	20.2613	20.2612	20.2093	19.9106	19.4435	19.0136	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.3234	19.4919	19.7397	20.1062	20.3619	20.4741	20.4910	20.4901	20.4362	20.1462	19.7069	19.3059	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3234	19.4919	19.7397	20.1062	20.3619	20.4741	20.4910	20.4901	20.4362	20.1462	19.7069	19.3059	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9717	0.9594	0.9377	0.8715	0.7409	0.5402	0.3822	0.4258	0.6668	0.8804	0.9520	0.9746	(94)
Useful gains	591.6155	624.0264	623.8706	614.6961	542.5868	392.4398	264.6991	276.7981	409.8470	514.8206	556.4167	577.2215	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1061.9535	1028.4821	930.5354	777.1241	599.1619	401.5358	265.9737	278.9653	435.1099	660.3311	876.5192	1055.8633	(97)
Space heating kWh	349.9314	271.7942	228.1587	116.9482	42.0919	0.0000	0.0000	0.0000	0.0000	108.2598	230.4738	356.1095	(98a)
Space heating requirement - total per year (kWh/year)												1703.7675	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	349.9314	271.7942	228.1587	116.9482	42.0919	0.0000	0.0000	0.0000	0.0000	108.2598	230.4738	356.1095	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1703.7675	
Space heating per m2											(98c) / (4) =	19.6513	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	349.9314	271.7942	228.1587	116.9482	42.0919	0.0000	0.0000	0.0000	0.0000	108.2598	230.4738	356.1095	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	379.1240	294.4683	247.1925	126.7044	45.6033	0.0000	0.0000	0.0000	0.0000	117.2912	249.7008	385.8174	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9632	84.6761	84.1466	82.9683	81.3092	79.8000	79.8000	79.8000	79.8000	82.7868	84.2928	85.0249	(217)
Fuel for water heating, kWh/month	275.0381	243.9515	260.8617	233.1516	230.9043	212.3443	209.9929	218.2535	220.5242	236.5943	246.4910	271.9403	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1845.9019	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2860.0476	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4159.2549	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1845.9019	0.2100	387.6394	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2860.0476	0.2100	600.6100	(264)
Space and water heating			988.2494	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			921.3477	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.6300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1845.9019	1.1300	2085.8692	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2860.0476	1.1300	3231.8538	(278)
Space and water heating			5317.7230	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4903.9501	(286)
Target Primary Energy Rate (TPER)			56.5600	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.74	**TER**	10.63
Environmental	99 A	**% DER < TER**			83.63
CO_2 Emissions (t/year)	0.12	**DFEE**	20.64	**TFEE**	25.22
Compliance Check	See BREL	**% DFEE < TFEE**			18.15
% DPER < TPER	60.58	**DPER**	22.29	**TPER**	56.56

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.4800	10.6334	0.7600	0.7000	0.7700	29.3237	(74)
North	1.7600	10.6334	0.7600	0.7000	0.7700	6.8997	(74)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	36.2234	69.2247	117.6297	188.9434	254.5240	272.4755	254.3907	201.8266	141.4290	82.4029	44.6862	30.1976	(83)
Total gains	675.8472	706.5185	735.9149	771.8971	802.3267	788.5804	751.8392	702.5390	660.3507	633.5841	634.6900	653.9803	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area													
	0.9632	0.9492	0.9138	0.8278	0.6730	0.4895	0.3559	0.3975	0.6170	0.8479	0.9409	0.9686	(86)
MIT	20.3304	20.4331	20.6145	20.8204	20.9513	20.9928	20.9990	20.9982	20.9763	20.8238	20.5438	20.2873	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house													
	0.9567	0.9404	0.8992	0.8015	0.6331	0.4407	0.3027	0.3410	0.5641	0.8188	0.9294	0.9630	(89)
MIT 2	19.5633	19.6909	19.9131	20.1548	20.2952	20.3335	20.3379	20.3374	20.3205	20.1635	19.8303	19.5097	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8033	19.9231	20.1325	20.3630	20.5004	20.5397	20.5447	20.5441	20.5256	20.3700	20.0535	19.7529	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8033	19.9231	20.1325	20.3630	20.5004	20.5397	20.5447	20.5441	20.5256	20.3700	20.0535	19.7529	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9505	0.9341	0.8942	0.8025	0.6431	0.4557	0.3193	0.3587	0.5794	0.8203	0.9237	0.9570	(94)
Useful gains	642.3960	659.9797	658.0558	619.4425	515.9700	359.3481	240.0708	251.9662	382.5819	519.7016	586.2465	625.8884	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	944.6324	915.3741	830.6435	698.4556	536.2201	361.9134	240.3547	252.5062	391.5208	595.3004	789.2716	947.6578	(97)
Space heating kWh													
	224.8639	171.6250	128.4053	56.8895	15.0661	0.0000	0.0000	0.0000	0.0000	56.2455	146.1781	239.3964	(98a)
Space heating requirement - total per year (kWh/year)												1038.6697	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	224.8639	171.6250	128.4053	56.8895	15.0661	0.0000	0.0000	0.0000	0.0000	56.2455	146.1781	239.3964	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1038.6697	
Space heating per m2											(98c) / (4) =	11.9800	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	224.8639	171.6250	128.4053	56.8895	15.0661	0.0000	0.0000	0.0000	0.0000	56.2455	146.1781	239.3964	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	337.2959	257.4375	192.6079	85.3342	22.5991	0.0000	0.0000	0.0000	0.0000	84.3682	219.2672	359.0946	
Space heating requirement													
	337.2959	257.4375	192.6079	85.3342	22.5991	0.0000	0.0000	0.0000	0.0000	84.3682	219.2672	359.0946	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1558.0046	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												15.5800	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4977.1054	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1558.0046	4.4400	69.1754	(340a)
Space heating total			69.1754	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			277.7664	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7593 (357)
SAP value		87.6922
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1516.1348	0.1566	65.0507	(367)
Electrical energy for heat distribution (space & water)	15.5800	0.0000	8.2551	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			228.3900	(373)
Space and water heating			228.3900	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			142.8152	(383)
CO2 emissions per m2			1.6500	(384)
EI value			98.5469	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor		43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)

Average = Sum(39)m / 12 = 60.9312

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)											Total = Sum(45)m =	2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)

Total per year (kWh/year) = Sum(64)m = 2751.6674 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.4800	12.7500	0.7600	0.7000	0.7700	35.1606	(74)
North	1.7600	12.7500	0.7600	0.7000	0.7700	8.2731	(74)

Solar gains	43.4336	74.5092	126.2264	206.2135	267.3389	306.4834	281.0067	227.7396	160.7181	94.0355	52.9325	36.3187	(83)
Total gains	683.0575	711.8031	744.5117	789.1672	815.1415	822.5883	778.4551	728.4520	679.6398	645.2166	642.9363	660.1014	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area													
	0.9586	0.9439	0.8992	0.8017	0.6345	0.4274	0.3050	0.3424	0.5783	0.8180	0.9310	0.9649	(86)
MIT	20.3708	20.4687	20.6647	20.8535	20.9653	20.9967	20.9996	20.9992	20.9834	20.8622	20.5909	20.3270	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house													
	0.9514	0.9342	0.8824	0.7728	0.5928	0.3795	0.2534	0.2874	0.5249	0.7846	0.9176	0.9585	(89)
MIT 2	19.6138	19.7349	19.9734	20.1915	20.3087	20.3363	20.3382	20.3380	20.3264	20.2056	19.8877	19.5595	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8506	19.9645	20.1896	20.3985	20.5141	20.5429	20.5451	20.5449	20.5319	20.4109	20.1077	19.7995	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8506	19.9645	20.1896	20.3985	20.5141	20.5429	20.5451	20.5449	20.5319	20.4109	20.1077	19.7995	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9451	0.9279	0.8783	0.7756	0.6041	0.3944	0.2695	0.3046	0.5407	0.7885	0.9123	0.9525	(94)
Useful gains	645.5503	660.5121	653.9242	612.0785	492.4381	324.4222	209.8107	221.8801	367.5117	508.7494	586.5762	628.7189	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	929.2375	899.6166	803.6592	676.2476	506.5893	325.5467	209.9138	222.0858	373.6232	567.3274	768.1994	932.2196	(97)
Space heating kWh													
	211.0632	160.6782	111.4029	46.2017	10.5285	0.0000	0.0000	0.0000	0.0000	43.5820	130.7687	225.8045	(98a)
Space heating requirement - total per year (kWh/year)												940.0297	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	211.0632	160.6782	111.4029	46.2017	10.5285	0.0000	0.0000	0.0000	0.0000	43.5820	130.7687	225.8045	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												940.0297	
Space heating per m2											(98c) / (4) =	10.8423	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	211.0632	160.6782	111.4029	46.2017	10.5285	0.0000	0.0000	0.0000	0.0000	43.5820	130.7687	225.8045	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	316.5948	241.0173	167.1043	69.3025	15.7928	0.0000	0.0000	0.0000	0.0000	65.3730	196.1531	338.7068	
Space heating requirement													
	316.5948	241.0173	167.1043	69.3025	15.7928	0.0000	0.0000	0.0000	0.0000	65.3730	196.1531	338.7068	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)

Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year	
Space heating fuel - community heating	1410.0446 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	14.1004 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)	
mechanical ventilation fans (SFP = 0.1292)	33.4924 (330a)
Total electricity for the above, kWh/year	33.4924 (331)
Electricity for lighting (calculated in Appendix L)	216.3282 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4732.6193 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1410.0446	6.5500	92.3579	(340a)
Space heating total			92.3579	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			355.6630	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1476.6788	0.1571	59.0530	(367)
Electrical energy for heat distribution (space & water)	14.1004	0.0000	8.0301	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			222.1674	(373)
Space and water heating			222.1674	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			124.3345	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1476.6788	1.5814	594.6333	(467)
Electrical energy for heat distribution (space & water)	14.1004	0.0000	85.0780	(472)
Overall CO2 factor for heat network			0.4251	(486)
Total CO2 associated with community systems			2353.8238	(473)
Space and water heating			2353.8238	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1709.9887	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - South

Current energy efficiency rating: B 88
Current environmental impact rating: A 99

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£71	£71	£0
Community scheme	£467	£467	£0
Space heating	£206	£206	£0
Water heating	£270	£270	£0
Lighting	£62	£62	£0
Generated (PV)	-£182	-£182	£0
Total cost of fuels	£356	£356	£0
Total cost of uses	£356	£356	£0
Delivered energy	55 kWh/m²	55 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	20 kWh/m²	20 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5778 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day)	126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.4800	10.6334	0.7600	0.7000	0.7700	29.3237	(74)
North	1.7600	10.6334	0.7600	0.7000	0.7700	6.8997	(74)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	36.2234	69.2247	117.6297	188.9434	254.5240	272.4755	254.3907	201.8266	141.4290	82.4029	44.6862	30.1976	(83)
Total gains	675.8472	706.5185	735.9149	771.8971	802.3267	788.5804	751.8392	702.5390	660.3507	633.5841	634.6900	653.9803	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area	0.9632	0.9492	0.9138	0.8278	0.6730	0.4895	0.3559	0.3975	0.6170	0.8479	0.9409	0.9686	(86)
MIT	20.3304	20.4331	20.6145	20.8204	20.9513	20.9928	20.9990	20.9982	20.9763	20.8238	20.5438	20.2873	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9567	0.9404	0.8992	0.8015	0.6331	0.4407	0.3027	0.3410	0.5641	0.8188	0.9294	0.9630	(89)
MIT 2	19.5633	19.6909	19.9131	20.1548	20.2952	20.3335	20.3379	20.3374	20.3205	20.1635	19.8303	19.5097	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.8033	19.9231	20.1325	20.3630	20.5004	20.5397	20.5447	20.5441	20.5256	20.3700	20.0535	19.7529	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8033	19.9231	20.1325	20.3630	20.5004	20.5397	20.5447	20.5441	20.5256	20.3700	20.0535	19.7529	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9505	0.9341	0.8942	0.8025	0.6431	0.4557	0.3193	0.3587	0.5794	0.8203	0.9237	0.9570	(94)
Useful gains	642.3960	659.9797	658.0558	619.4425	515.9700	359.3481	240.0708	251.9662	382.5819	519.7016	586.2465	625.8884	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	944.6324	915.3741	830.6435	698.4556	536.2201	361.9134	240.3547	252.5062	391.5208	595.3004	789.2716	947.6578	(97)
Space heating kWh	224.8639	171.6250	128.4053	56.8895	15.0661	0.0000	0.0000	0.0000	0.0000	56.2455	146.1781	239.3964	(98a)
Space heating requirement - total per year (kWh/year)												1038.6697	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	224.8639	171.6250	128.4053	56.8895	15.0661	0.0000	0.0000	0.0000	0.0000	56.2455	146.1781	239.3964	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1038.6697	
Space heating per m2										(98c) / (4) =		11.9800	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	224.8639	171.6250	128.4053	56.8895	15.0661	0.0000	0.0000	0.0000	0.0000	56.2455	146.1781	239.3964	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	337.2959	257.4375	192.6079	85.3342	22.5991	0.0000	0.0000	0.0000	0.0000	84.3682	219.2672	359.0946	
Space heating requirement													
	337.2959	257.4375	192.6079	85.3342	22.5991	0.0000	0.0000	0.0000	0.0000	84.3682	219.2672	359.0946	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1558.0046	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)

Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	15.5800	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4977.1054	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1558.0046	4.4400	69.1754	(340a)
Space heating total			69.1754	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			277.7664	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.7593	(357)
SAP value	87.6922	
SAP rating (Section 12)	88	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1516.1348	0.1566	65.0507	(367)
Electrical energy for heat distribution (space & water)	15.5800	0.0000	8.2551	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			228.3900	(373)
Space and water heating			228.3900	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			142.8152	(383)
CO2 emissions per m2			1.6500	(384)
EI value			98.5469	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 86.7000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5778	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.4800	12.7500	0.7600	0.7000	0.7700	35.1606	(74)
North	1.7600	12.7500	0.7600	0.7000	0.7700	8.2731	(74)
Solar gains	43.4336	74.5092	126.2264	206.2135	267.3389	306.4834	281.0067	227.7396	160.7181	94.0355	52.9325	36.3187	(83)
Total gains	683.0575	711.8031	744.5117	789.1672	815.1415	822.5883	778.4551	728.4520	679.6398	645.2166	642.9363	660.1014	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area													
	0.9586	0.9439	0.8992	0.8017	0.6345	0.4274	0.3050	0.3424	0.5783	0.8180	0.9310	0.9649	(86)
MIT	20.3708	20.4687	20.6647	20.8535	20.9653	20.9967	20.9996	20.9992	20.9834	20.8622	20.5909	20.3270	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house													
	0.9514	0.9342	0.8824	0.7728	0.5928	0.3795	0.2534	0.2874	0.5249	0.7846	0.9176	0.9585	(89)
MIT 2	19.6138	19.7349	19.9734	20.1915	20.3087	20.3363	20.3382	20.3380	20.3264	20.2056	19.8877	19.5595	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8506	19.9645	20.1896	20.3985	20.5141	20.5429	20.5451	20.5449	20.5319	20.4109	20.1077	19.7995	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8506	19.9645	20.1896	20.3985	20.5141	20.5429	20.5451	20.5449	20.5319	20.4109	20.1077	19.7995	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9451	0.9279	0.8783	0.7756	0.6041	0.3944	0.2695	0.3046	0.5407	0.7885	0.9123	0.9525	(94)
Useful gains	645.5503	660.5121	653.9242	612.0785	492.4381	324.4222	209.8107	221.8801	367.5117	508.7494	586.5762	628.7189	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	929.2375	899.6166	803.6592	676.2476	506.5893	325.5467	209.9138	222.0858	373.6232	567.3274	768.1994	932.2196	(97)
Space heating kWh													
	211.0632	160.6782	111.4029	46.2017	10.5285	0.0000	0.0000	0.0000	0.0000	43.5820	130.7687	225.8045	(98a)
Space heating requirement - total per year (kWh/year)												940.0297	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	211.0632	160.6782	111.4029	46.2017	10.5285	0.0000	0.0000	0.0000	0.0000	43.5820	130.7687	225.8045	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												940.0297	
Space heating per m2											(98c) / (4) =	10.8423	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement

	211.0632	160.6782	111.4029	46.2017	10.5285	0.0000	0.0000	0.0000	0.0000	43.5820	130.7687	225.8045 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	316.5948	241.0173	167.1043	69.3025	15.7928	0.0000	0.0000	0.0000	0.0000	65.3730	196.1531	338.7068
Space heating requirement												
	316.5948	241.0173	167.1043	69.3025	15.7928	0.0000	0.0000	0.0000	0.0000	65.3730	196.1531	338.7068 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388
Water heating fuel												
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446 (331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year

Space heating fuel - community heating	1410.0446 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	14.1004 (313)
Space cooling fuel	0.0000 (321)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)

mechanical ventilation fans (SFP = 0.1292)	33.4924 (330a)
Total electricity for the above, kWh/year	33.4924 (331)
Electricity for lighting (calculated in Appendix L)	216.3282 (332)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4732.6193 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1410.0446	6.5500	92.3579	(340a)
Space heating total			92.3579	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			355.6630	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1476.6788	0.1571	59.0530	(367)
Electrical energy for heat distribution (space & water)	14.1004	0.0000	8.0301	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			222.1674	(373)
Space and water heating			222.1674	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			124.3345	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)

Space and Water heating from Heat pump	1476.6788	1.5814	594.6333	(467)
Electrical energy for heat distribution (space & water)	14.1004	0.0000	85.0780	(472)
Overall CO2 factor for heat network			0.4251	(486)
Total CO2 associated with community systems			2353.8238	(473)
Space and water heating			2353.8238	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1709.9887	(483)

Full SAP Calculation Printout

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Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.71	**TER**	10.53
Environmental	99 A	**% DER < TER**			83.76
CO_2 Emissions (t/year)	0.12	**DFEE**	20.44	**TFEE**	24.93
Compliance Check	See BREL	**% DFEE < TFEE**			18.00
% DPER < TPER	60.67	**DPER**	22.04	**TPER**	56.05

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674 (64)
12Total per year (kWh/year)												2752 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.4800	11.2829	0.7600	0.7000	0.7700	31.1149	(81)
Northwest	1.7600	11.2829	0.7600	0.7000	0.7700	7.3212	(81)

Solar gains	38.4361	78.2378	140.9596	231.4961	311.1762	331.7468	310.3423	247.4085	171.7614	95.6128	48.3625	31.3888 (83)
Total gains	623.6086	677.6503	715.1060	786.5301	838.8873	841.7455	801.4341	739.5305	678.4742	618.3659	602.1101	604.9300 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area	0.9737	0.9569	0.9219	0.8192	0.6489	0.4598	0.3340	0.3779	0.6026	0.8581	0.9517	0.9775	(86)
MIT	20.2504	20.3925	20.5904	20.8302	20.9592	20.9947	20.9993	20.9986	20.9788	20.8117	20.4997	20.2103	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9688	0.9492	0.9083	0.7923	0.6092	0.4136	0.2840	0.3241	0.5503	0.8299	0.9418	0.9732	(89)
MIT 2	19.4639	19.6411	19.8845	20.1654	20.3025	20.3348	20.3380	20.3377	20.3225	20.1504	19.7769	19.4135	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.7099	19.8762	20.1053	20.3734	20.5079	20.5412	20.5449	20.5444	20.5278	20.3572	20.0030	19.6628	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7099	19.8762	20.1053	20.3734	20.5079	20.5412	20.5449	20.5444	20.5278	20.3572	20.0030	19.6628	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9632	0.9429	0.9030	0.7938	0.6196	0.4278	0.2997	0.3409	0.5655	0.8307	0.9360	0.9680	(94)
Useful gains	600.6506	638.9735	645.7411	624.3550	519.7445	360.1278	240.1610	252.1059	383.6967	513.6909	563.5644	585.5551	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	938.9448	912.5166	828.9884	699.0869	536.6767	362.0054	240.3657	252.5230	391.6541	594.5196	786.1938	942.1642	(97)
Space heating kWh	251.6909	183.8210	136.3360	53.8070	12.5976	0.0000	0.0000	0.0000	0.0000	60.1365	160.2931	265.3172	(98a)
Space heating requirement - total per year (kWh/year)												1123.9992	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	251.6909	183.8210	136.3360	53.8070	12.5976	0.0000	0.0000	0.0000	0.0000	60.1365	160.2931	265.3172	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1123.9992	
Space heating per m2											(98c) / (4) =	12.9642	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	251.6909	183.8210	136.3360	53.8070	12.5976	0.0000	0.0000	0.0000	0.0000	60.1365	160.2931	265.3172	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	377.5363	275.7315	204.5039	80.7105	18.8964	0.0000	0.0000	0.0000	0.0000	90.2048	240.4397	397.9757	
Space heating requirement	377.5363	275.7315	204.5039	80.7105	18.8964	0.0000	0.0000	0.0000	0.0000	90.2048	240.4397	397.9757	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1685.9988	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												16.8600	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5105.0996	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1550.2666	0.1568	70.5133	(367)
Electrical energy for heat distribution (space & water)	16.8600	0.0000	8.4599	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			234.0575	(373)
Space and water heating			234.0575	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			148.4826	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.7100	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1550.2666	1.5806	710.6474	(467)
Electrical energy for heat distribution (space & water)	16.8600	0.0000	89.4285	(472)
Overall CO2 factor for heat network			0.4256	(486)
Total CO2 associated with community systems			2474.1884	(473)
Space and water heating			2474.1884	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1911.2451	(483)
Dwelling Primary energy Rate (DPER)			22.0400	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
500mm mineral wool	43.3500		43.3500	0.1100	4.7685			(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2577			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.7700	0.0600	0.4062
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	19.4300	0.1200	2.3316
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1426 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 30.4003 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	70.6867	70.4833	70.2839	69.3475	69.1723	68.3567	68.3567	68.2057	68.6709	69.1723	69.5267	69.8973	(39)
Average = Sum(39)m / 12 =												69.3467	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8153	0.8130	0.8107	0.7999	0.7978	0.7884	0.7884	0.7867	0.7921	0.7978	0.8019	0.8062	(40)
HLP (average)												0.7998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	9.2400	11.2829	0.6300	0.7000	0.7700	31.8615	(81)

Solar gains	31.8615	64.8550	116.8481	191.8981	257.9487	275.0006	257.2574	205.0886	142.3812	79.2579	40.0900	26.0197	(83)
Total gains	610.6987	657.9322	684.6591	740.5967	779.3244	775.6640	739.0138	687.8753	639.7586	595.6757	587.5022	593.2254	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1394	59.3101	59.4783	60.2815	60.4342	61.1552	61.1552	61.2906	60.8754	60.4342	60.1261	59.8073	
alpha	4.9426	4.9540	4.9652	5.0188	5.0289	5.0770	5.0770	5.0860	5.0584	5.0289	5.0084	4.9872	
util living area	0.9810	0.9706	0.9498	0.8813	0.7453	0.5502	0.4045	0.4515	0.6904	0.9020	0.9659	0.9833	(86)
MIT	19.9693	20.1198	20.3453	20.6681	20.8888	20.9808	20.9967	20.9943	20.9427	20.6757	20.2902	19.9498	(87)
Th 2	20.2401	20.2421	20.2441	20.2535	20.2552	20.2634	20.2634	20.2649	20.2602	20.2552	20.2517	20.2480	(88)
util rest of house	0.9772	0.9648	0.9395	0.8583	0.7028	0.4916	0.3379	0.3814	0.6311	0.8780	0.9581	0.9799	(89)
MIT 2	19.0344	19.2255	19.5090	19.9070	20.1545	20.2501	20.2618	20.2620	20.2162	19.9241	19.4491	19.0156	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.3269	19.5052	19.7706	20.1451	20.3842	20.4787	20.4917	20.4911	20.4434	20.1592	19.7122	19.3078	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3269	19.5052	19.7706	20.1451	20.3842	20.4787	20.4917	20.4911	20.4434	20.1592	19.7122	19.3078	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9714	0.9578	0.9319	0.8546	0.7106	0.5090	0.3587	0.4032	0.6464	0.8745	0.9512	0.9745	(94)
Useful gains	593.2132	630.1521	638.0642	632.9152	553.7525	394.8490	265.0691	277.3439	413.5683	520.8922	558.8315	578.0933	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1062.1987	1029.4230	932.7088	779.8169	600.7074	401.8482	266.0222	279.0364	435.6083	661.2307	876.8860	1055.9957	(97)
Space heating kWh	348.9252	268.3100	219.2156	105.7692	34.9345	0.0000	0.0000	0.0000	0.0000	104.4118	228.9993	355.5595	(98a)
Space heating requirement - total per year (kWh/year)												1666.1250	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	348.9252	268.3100	219.2156	105.7692	34.9345	0.0000	0.0000	0.0000	0.0000	104.4118	228.9993	355.5595	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1666.1250	
Space heating per m2											(98c) / (4) =	19.2171	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	348.9252	268.3100	219.2156	105.7692	34.9345	0.0000	0.0000	0.0000	0.0000	104.4118	228.9993	355.5595	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	378.0338	290.6934	237.5033	114.5929	37.8488	0.0000	0.0000	0.0000	0.0000	113.1222	248.1032	385.2215	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9569	84.6473	84.0568	82.7652	81.0893	79.8000	79.8000	79.8000	79.8000	82.7150	84.2784	85.0215	(217)
Fuel for water heating, kWh/month	275.0586	244.0346	261.1403	233.7236	231.5304	212.3443	209.9929	218.2535	220.5242	236.7996	246.5333	271.9511	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1805.1192 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2861.8864 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	224.3782 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-857.0729 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4120.3110 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1805.1192	0.2100	379.0750	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2861.8864	0.2100	600.9962	(264)
Space and water heating			980.0712	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			913.1695	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.5300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1805.1192	1.1300	2039.7847	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2861.8864	1.1300	3233.9317	(278)
Space and water heating			5273.7164	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4859.9435	(286)
Target Primary Energy Rate (TPER)			56.0500	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.71	**TER**	10.53
Environmental	99 A	**% DER < TER**			83.76
CO_2 Emissions (t/year)	0.12	**DFEE**	20.44	**TFEE**	24.93
Compliance Check	See BREL	**% DFEE < TFEE**			18.00
% DPER < TPER	60.67	**DPER**	22.04	**TPER**	56.05

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.2912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2257 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2878	0.2821	0.2765	0.2483	0.2426	0.2144	0.2144	0.2088	0.2257	0.2426	0.2539	0.2652	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5414	0.5398	0.5382	0.5308	0.5294	0.5230	0.5230	0.5218	0.5255	0.5294	0.5322	0.5352	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15049.3300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							173.5794	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9510	37.8383	37.7278	37.2089	37.1118	36.6599	36.6599	36.5762	36.8339	37.1118	37.3082	37.5135	(38)
Heat transfer coeff	63.8337	63.7210	63.6105	63.0916	62.9945	62.5426	62.5426	62.4589	62.7167	62.9945	63.1909	63.3963	(39)
Average = Sum(39)m / 12 =												63.0912	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7363	0.7350	0.7337	0.7277	0.7266	0.7214	0.7214	0.7204	0.7234	0.7266	0.7288	0.7312	(40)
HLP (average)												0.7277	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
									Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)											908	(64)

Electric shower(s)

54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 614.3496 (64a)

Heat gains from water heating, kWh/month

37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.4800	11.2829	0.7600	0.7000	0.7700	31.1149	(81)
Northwest	1.7600	11.2829	0.7600	0.7000	0.7700	7.3212	(81)

Solar gains	38.4361	78.2378	140.9596	231.4961	311.1762	331.7468	310.3423	247.4085	171.7614	95.6128	48.3625	31.3888	(83)
Total gains	516.6645	571.9626	612.3192	690.7385	747.2108	754.4150	717.0745	653.1903	589.7415	524.7848	501.8521	498.9376	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.4884	65.6043	65.7182	66.2587	66.3608	66.8404	66.8404	66.9299	66.6548	66.3608	66.1546	65.9403	
alpha	5.3659	5.3736	5.3812	5.4172	5.4241	5.4560	5.4560	5.4620	5.4437	5.4241	5.4103	5.3960	
util living area	0.9893	0.9804	0.9600	0.8831	0.7268	0.5226	0.3825	0.4371	0.6919	0.9214	0.9787	0.9910	(86)

MIT	19.9955	20.1576	20.3940	20.7217	20.9224	20.9891	20.9983	20.9967	20.9551	20.6885	20.2976	19.9657 (87)
Th 2	20.3089	20.3101	20.3112	20.3164	20.3174	20.3220	20.3220	20.3228	20.3202	20.3174	20.3154	20.3133 (88)
util rest of house	0.9871	0.9764	0.9517	0.8613	0.6862	0.4701	0.3242	0.3740	0.6361	0.9014	0.9736	0.9892 (89)
MIT 2	19.3822	19.5431	19.7754	20.0890	20.2628	20.3161	20.3214	20.3215	20.2930	20.0650	19.6869	19.3562 (90)
Living area fraction										fLA = Living area / (4) =		0.3128 (91)
MIT	19.5741	19.7353	19.9689	20.2869	20.4691	20.5266	20.5331	20.5327	20.5001	20.2600	19.8780	19.5469 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5741	19.7353	19.9689	20.2869	20.4691	20.5266	20.5331	20.5327	20.5001	20.2600	19.8780	19.5469 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9842	0.9723	0.9470	0.8603	0.6956	0.4861	0.3424	0.3937	0.6514	0.8995	0.9697	0.9865	(94)
Useful gains	508.4763	556.1372	579.8532	594.2166	519.7313	366.7210	245.5166	257.1430	384.1640	472.0694	486.6374	492.2264	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	974.9994	945.3227	856.7630	718.4170	552.4051	370.6654	245.9884	258.1252	401.3948	608.5286	807.4519	972.9346	(97)
Space heating kWh	347.0932	261.5326	206.0209	89.4243	24.3093	0.0000	0.0000	0.0000	0.0000	101.5257	230.9864	357.6469	(98a)
Space heating requirement - total per year (kWh/year)												1618.5393	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	347.0932	261.5326	206.0209	89.4243	24.3093	0.0000	0.0000	0.0000	0.0000	101.5257	230.9864	357.6469	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1618.5393	
Space heating per m2											(98c) / (4) =	18.6683	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	587.9004	462.8152	474.6877	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9473	0.9752	0.9592	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	556.9074	451.3350	455.3239	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	817.6695	777.0574	705.1508	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	187.7487	242.3374	185.8712	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	46.9372	60.5844	46.4678	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												153.9893	(107)
Energy for space heating												18.6683	(99)
Energy for space cooling												1.7761	(108)
Total												20.4444	(109)
Fabric Energy Efficiency (DFEE)												20.4	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
500mm mineral wool	43.3500		43.3500	0.1100	4.7685			(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2577			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.7700	0.0600	0.4062
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	19.4300	0.1200	2.3316
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1426 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.4003 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	70.6867	70.4833	70.2839	69.3475	69.1723	68.3567	68.3567	68.2057	68.6709	69.1723	69.5267	69.8973	(39)
Average = Sum(39)m / 12 =												69.3467	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8153	0.8130	0.8107	0.7999	0.7978	0.7884	0.7884	0.7867	0.7921	0.7978	0.8019	0.8062	(40)
HLP (average)												0.7998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												64.3029	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122 (71)

Water heating gains (Table 5)

	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778 (72)

Total internal gains

	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	9.2400	11.2829	0.6300	0.7000	0.7700	31.8615	(81)

Solar gains	31.8615	64.8550	116.8481	191.8981	257.9487	275.0006	257.2574	205.0886	142.3812	79.2579	40.0900	26.0197 (83)
Total gains	510.0899	558.5798	588.2077	651.1405	693.9833	697.6688	663.9896	610.8704	560.3613	508.4300	493.5796	493.5684 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1394	59.3101	59.4783	60.2815	60.4342	61.1552	61.1552	61.2906	60.8754	60.4342	60.1261	59.8073	
alpha	4.9426	4.9540	4.9652	5.0188	5.0289	5.0770	5.0770	5.0860	5.0584	5.0289	5.0084	4.9872	
util living area													
	0.9910	0.9846	0.9713	0.9199	0.8010	0.6038	0.4485	0.5050	0.7580	0.9416	0.9828	0.9923	(86)
MIT	19.8033	19.9626	20.2051	20.5725	20.8443	20.9711	20.9947	20.9906	20.9124	20.5714	20.1436	19.7835	(87)
Th 2	20.2401	20.2421	20.2441	20.2535	20.2552	20.2634	20.2634	20.2649	20.2602	20.2552	20.2517	20.2480	(88)
util rest of house													
	0.9890	0.9813	0.9649	0.9021	0.7614	0.5421	0.3755	0.4281	0.7004	0.9249	0.9785	0.9906	(89)
MIT 2	19.1369	19.2962	19.5368	19.8975	20.1424	20.2475	20.2614	20.2611	20.2057	19.9033	19.4841	19.1234	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.3453	19.5046	19.7459	20.1087	20.3619	20.4738	20.4908	20.4893	20.4268	20.1123	19.6904	19.3299	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3453	19.5046	19.7459	20.1087	20.3619	20.4738	20.4908	20.4893	20.4268	20.1123	19.6904	19.3299	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9860	0.9773	0.9597	0.8982	0.7675	0.5602	0.3982	0.4519	0.7141	0.9212	0.9744	0.9879	(94)
Useful gains	502.9720	545.8841	564.5204	584.8624	532.6127	390.8298	264.4225	276.0799	400.1817	468.3686	480.9658	487.6204	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1063.5039	1029.3818	930.9728	777.2936	599.1646	401.5139	265.9603	278.9153	434.4642	657.9849	875.3692	1057.5381	(97)
Space heating kWh													
	417.0357	324.9105	272.6406	138.5505	49.5146	0.0000	0.0000	0.0000	0.0000	141.0745	283.9704	424.0188	(98a)
Space heating requirement - total per year (kWh/year)												2051.7155	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	417.0357	324.9105	272.6406	138.5505	49.5146	0.0000	0.0000	0.0000	0.0000	141.0745	283.9704	424.0188	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2051.7155	
Space heating per m2											(98c) / (4) =	23.6645	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	642.5530	505.8396	518.3630	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8933	0.9425	0.9167	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	574.0050	476.7544	475.1767	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	751.3428	715.0101	655.6860	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	127.6832	177.2623	134.2990	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	31.9208	44.3156	33.5747	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												109.8111	(107)
Energy for space heating												23.6645	(99)
Energy for space cooling												1.2666	(108)
Total												24.9311	(109)
Fabric Energy Efficiency (TFEE)												24.9	(109)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.71	**TER**	10.53
Environmental	99 A	**% DER < TER**			83.76
CO_2 Emissions (t/year)	0.12	**DFEE**	20.44	**TFEE**	24.93
Compliance Check	See BREL	**% DFEE < TFEE**			18.00
% DPER < TPER	60.67	**DPER**	22.04	**TPER**	56.05

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674 (64)
12Total per year (kWh/year)												2752 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.4800	11.2829	0.7600	0.7000	0.7700	31.1149	(81)
Northwest	1.7600	11.2829	0.7600	0.7000	0.7700	7.3212	(81)

Solar gains	38.4361	78.2378	140.9596	231.4961	311.1762	331.7468	310.3423	247.4085	171.7614	95.6128	48.3625	31.3888 (83)
Total gains	623.6086	677.6503	715.1060	786.5301	838.8873	841.7455	801.4341	739.5305	678.4742	618.3659	602.1101	604.9300 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area	0.9737	0.9569	0.9219	0.8192	0.6489	0.4598	0.3340	0.3779	0.6026	0.8581	0.9517	0.9775	(86)
MIT	20.2504	20.3925	20.5904	20.8302	20.9592	20.9947	20.9993	20.9986	20.9788	20.8117	20.4997	20.2103	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9688	0.9492	0.9083	0.7923	0.6092	0.4136	0.2840	0.3241	0.5503	0.8299	0.9418	0.9732	(89)
MIT 2	19.4639	19.6411	19.8845	20.1654	20.3025	20.3348	20.3380	20.3377	20.3225	20.1504	19.7769	19.4135	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.7099	19.8762	20.1053	20.3734	20.5079	20.5412	20.5449	20.5444	20.5278	20.3572	20.0030	19.6628	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7099	19.8762	20.1053	20.3734	20.5079	20.5412	20.5449	20.5444	20.5278	20.3572	20.0030	19.6628	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9632	0.9429	0.9030	0.7938	0.6196	0.4278	0.2997	0.3409	0.5655	0.8307	0.9360	0.9680	(94)
Useful gains	600.6506	638.9735	645.7411	624.3550	519.7445	360.1278	240.1610	252.1059	383.6967	513.6909	563.5644	585.5551	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	938.9448	912.5166	828.9884	699.0869	536.6767	362.0054	240.3657	252.5230	391.6541	594.5196	786.1938	942.1642	(97)
Space heating kWh	251.6909	183.8210	136.3360	53.8070	12.5976	0.0000	0.0000	0.0000	0.0000	60.1365	160.2931	265.3172	(98a)
Space heating requirement - total per year (kWh/year)												1123.9992	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	251.6909	183.8210	136.3360	53.8070	12.5976	0.0000	0.0000	0.0000	0.0000	60.1365	160.2931	265.3172	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1123.9992	
Space heating per m2											(98c) / (4) =	12.9642	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	251.6909	183.8210	136.3360	53.8070	12.5976	0.0000	0.0000	0.0000	0.0000	60.1365	160.2931	265.3172	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	377.5363	275.7315	204.5039	80.7105	18.8964	0.0000	0.0000	0.0000	0.0000	90.2048	240.4397	397.9757	
Space heating requirement	377.5363	275.7315	204.5039	80.7105	18.8964	0.0000	0.0000	0.0000	0.0000	90.2048	240.4397	397.9757	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1685.9988	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												16.8600	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5105.0996	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1550.2666	0.1568	70.5133	(367)
Electrical energy for heat distribution (space & water)	16.8600	0.0000	8.4599	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			234.0575	(373)
Space and water heating			234.0575	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			148.4826	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.7100	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1550.2666	1.5806	710.6474	(467)
Electrical energy for heat distribution (space & water)	16.8600	0.0000	89.4285	(472)
Overall CO2 factor for heat network			0.4256	(486)
Total CO2 associated with community systems			2474.1884	(473)
Space and water heating			2474.1884	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1911.2451	(483)
Dwelling Primary energy Rate (DPER)			22.0400	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
500mm mineral wool	43.3500		43.3500	0.1100	4.7685			(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2577			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.7700	0.0600	0.4062
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	19.4300	0.1200	2.3316
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1426 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 30.4003 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	70.6867	70.4833	70.2839	69.3475	69.1723	68.3567	68.3567	68.2057	68.6709	69.1723	69.5267	69.8973	(39)
Average = Sum(39)m / 12 =												69.3467	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8153	0.8130	0.8107	0.7999	0.7978	0.7884	0.7884	0.7867	0.7921	0.7978	0.8019	0.8062	(40)
HLP (average)												0.7998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	9.2400	11.2829	0.6300	0.7000	0.7700	31.8615	(81)

Solar gains	31.8615	64.8550	116.8481	191.8981	257.9487	275.0006	257.2574	205.0886	142.3812	79.2579	40.0900	26.0197	(83)
Total gains	610.6987	657.9322	684.6591	740.5967	779.3244	775.6640	739.0138	687.8753	639.7586	595.6757	587.5022	593.2254	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1394	59.3101	59.4783	60.2815	60.4342	61.1552	61.1552	61.2906	60.8754	60.4342	60.1261	59.8073	
alpha	4.9426	4.9540	4.9652	5.0188	5.0289	5.0770	5.0770	5.0860	5.0584	5.0289	5.0084	4.9872	
util living area	0.9810	0.9706	0.9498	0.8813	0.7453	0.5502	0.4045	0.4515	0.6904	0.9020	0.9659	0.9833	(86)
MIT	19.9693	20.1198	20.3453	20.6681	20.8888	20.9808	20.9967	20.9943	20.9427	20.6757	20.2902	19.9498	(87)
Th 2	20.2401	20.2421	20.2441	20.2535	20.2552	20.2634	20.2634	20.2649	20.2602	20.2552	20.2517	20.2480	(88)
util rest of house	0.9772	0.9648	0.9395	0.8583	0.7028	0.4916	0.3379	0.3814	0.6311	0.8780	0.9581	0.9799	(89)
MIT 2	19.0344	19.2255	19.5090	19.9070	20.1545	20.2501	20.2618	20.2620	20.2162	19.9241	19.4491	19.0156	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.3269	19.5052	19.7706	20.1451	20.3842	20.4787	20.4917	20.4911	20.4434	20.1592	19.7122	19.3078	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3269	19.5052	19.7706	20.1451	20.3842	20.4787	20.4917	20.4911	20.4434	20.1592	19.7122	19.3078	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9714	0.9578	0.9319	0.8546	0.7106	0.5090	0.3587	0.4032	0.6464	0.8745	0.9512	0.9745	(94)
Useful gains	593.2132	630.1521	638.0642	632.9152	553.7525	394.8490	265.0691	277.3439	413.5683	520.8922	558.8315	578.0933	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1062.1987	1029.4230	932.7088	779.8169	600.7074	401.8482	266.0222	279.0364	435.6083	661.2307	876.8860	1055.9957	(97)
Space heating kWh	348.9252	268.3100	219.2156	105.7692	34.9345	0.0000	0.0000	0.0000	0.0000	104.4118	228.9993	355.5595	(98a)
Space heating requirement - total per year (kWh/year)												1666.1250	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	348.9252	268.3100	219.2156	105.7692	34.9345	0.0000	0.0000	0.0000	0.0000	104.4118	228.9993	355.5595	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1666.1250	
Space heating per m2											(98c) / (4) =	19.2171	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	348.9252	268.3100	219.2156	105.7692	34.9345	0.0000	0.0000	0.0000	0.0000	104.4118	228.9993	355.5595	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	378.0338	290.6934	237.5033	114.5929	37.8488	0.0000	0.0000	0.0000	0.0000	113.1222	248.1032	385.2215	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9569	84.6473	84.0568	82.7652	81.0893	79.8000	79.8000	79.8000	79.8000	82.7150	84.2784	85.0215	(217)
Fuel for water heating, kWh/month	275.0586	244.0346	261.1403	233.7236	231.5304	212.3443	209.9929	218.2535	220.5242	236.7996	246.5333	271.9511	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1805.1192 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2861.8864 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	224.3782 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-857.0729 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4120.3110 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1805.1192	0.2100	379.0750	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2861.8864	0.2100	600.9962	(264)
Space and water heating			980.0712	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			913.1695	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.5300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1805.1192	1.1300	2039.7847	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2861.8864	1.1300	3233.9317	(278)
Space and water heating			5273.7164	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4859.9435	(286)
Target Primary Energy Rate (TPER)			56.0500	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.71	**TER**	10.53
Environmental	99 A	**% DER < TER**			83.76
CO_2 Emissions (t/year)	0.12	**DFEE**	20.44	**TFEE**	24.93
Compliance Check	See BREL	**% DFEE < TFEE**			18.00
% DPER < TPER	60.67	**DPER**	22.04	**TPER**	56.05

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.4800	11.2829	0.7600	0.7000	0.7700	31.1149	(81)
Northwest	1.7600	11.2829	0.7600	0.7000	0.7700	7.3212	(81)

Solar gains	38.4361	78.2378	140.9596	231.4961	311.1762	331.7468	310.3423	247.4085	171.7614	95.6128	48.3625	31.3888	(83)
Total gains	678.0599	715.5316	759.2448	814.4498	858.9788	847.8517	807.7907	748.1209	690.6831	646.7939	638.3664	655.1716	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area													
	0.9627	0.9467	0.9042	0.8027	0.6361	0.4566	0.3314	0.3737	0.5931	0.8391	0.9397	0.9684	(86)
MIT	20.3337	20.4454	20.6402	20.8475	20.9629	20.9949	20.9993	20.9987	20.9804	20.8338	20.5486	20.2891	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house													
	0.9561	0.9376	0.8886	0.7749	0.5966	0.4106	0.2818	0.3204	0.5413	0.8091	0.9279	0.9627	(89)
MIT 2	19.5674	19.7060	19.9434	20.1841	20.3059	20.3349	20.3380	20.3377	20.3237	20.1742	19.8361	19.5119	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8071	19.9373	20.1613	20.3916	20.5114	20.5414	20.5449	20.5444	20.5291	20.3805	20.0590	19.7550	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8071	19.9373	20.1613	20.3916	20.5114	20.5414	20.5449	20.5444	20.5291	20.3805	20.0590	19.7550	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9499	0.9313	0.8840	0.7772	0.6071	0.4248	0.2973	0.3370	0.5565	0.8111	0.9222	0.9568	(94)
Useful gains	644.1040	666.3439	671.1856	633.0310	521.5272	360.2009	240.1703	252.1329	384.3706	524.6273	588.7157	626.8397	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	944.8651	916.2388	832.4019	700.1959	536.8914	362.0141	240.3668	252.5262	391.7345	595.9374	789.6061	947.7874	(97)
Space heating kWh													
	223.7663	167.9293	119.9449	48.3587	11.4310	0.0000	0.0000	0.0000	0.0000	53.0547	144.6411	238.7851	(98a)
Space heating requirement - total per year (kWh/year)												1007.9112	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	223.7663	167.9293	119.9449	48.3587	11.4310	0.0000	0.0000	0.0000	0.0000	53.0547	144.6411	238.7851	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1007.9112	
Space heating per m2											(98c) / (4) =	11.6253	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	223.7663	167.9293	119.9449	48.3587	11.4310	0.0000	0.0000	0.0000	0.0000	53.0547	144.6411	238.7851	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	335.6494	251.8940	179.9174	72.5381	17.1465	0.0000	0.0000	0.0000	0.0000	79.5821	216.9616	358.1777	
Space heating requirement													
	335.6494	251.8940	179.9174	72.5381	17.1465	0.0000	0.0000	0.0000	0.0000	79.5821	216.9616	358.1777	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1511.8668	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												15.1187	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4930.9676	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1511.8668	4.4400	67.1269	(340a)
Space heating total			67.1269	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			275.7179	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7537 (357)
SAP value		87.7830
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1503.8314	0.1569	63.2386	(367)
Electrical energy for heat distribution (space & water)	15.1187	0.0000	8.1871	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			226.5100	(373)
Space and water heating			226.5100	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			140.9352	(383)
CO2 emissions per m2			1.6300	(384)
EI value			98.5660	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			3.0000 (17)
Infiltration rate			0.1500 (18)
Number of sides sheltered			3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7750 (20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)

Average = Sum(39)m / 12 = 60.9312

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)											Total = Sum(45)m =	2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)

Total per year (kWh/year) = Sum(64)m = 2751.6674 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.4800	13.7758	0.7600	0.7000	0.7700	37.9894	(81)
Northwest	1.7600	13.7758	0.7600	0.7000	0.7700	8.9387	(81)

Solar gains	46.9281	85.4061	152.2932	252.8092	326.2339	372.2643	342.0586	278.9737	195.9553	110.3656	58.2773	38.4694	(83)
Total gains	686.5519	722.6999	770.5784	835.7629	874.0366	888.3692	839.5070	779.6862	714.8770	661.5468	648.2812	662.2521	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area													
	0.9578	0.9406	0.8875	0.7733	0.5973	0.3964	0.2829	0.3200	0.5523	0.8062	0.9290	0.9644	(86)
MIT	20.3759	20.4831	20.6910	20.8783	20.9741	20.9977	20.9997	20.9995	20.9867	20.8723	20.5975	20.3302	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house													
	0.9504	0.9304	0.8695	0.7432	0.5567	0.3517	0.2350	0.2686	0.5005	0.7720	0.9152	0.9580	(89)
MIT 2	19.6200	19.7525	20.0039	20.2177	20.3165	20.3370	20.3383	20.3381	20.3289	20.2161	19.8956	19.5635	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8565	19.9810	20.2188	20.4244	20.5222	20.5436	20.5452	20.5450	20.5346	20.4214	20.1151	19.8033	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8565	19.9810	20.2188	20.4244	20.5222	20.5436	20.5452	20.5450	20.5346	20.4214	20.1151	19.8033	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9441	0.9242	0.8660	0.7472	0.5681	0.3656	0.2500	0.2847	0.5161	0.7766	0.9100	0.9519	(94)
Useful gains	648.1719	667.9507	667.3148	624.5142	496.5499	324.8267	209.8490	221.9494	368.9171	513.7286	589.9541	630.3957	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	929.5944	900.6256	805.4396	677.8208	507.0817	325.5945	209.9185	222.0943	373.7902	567.9618	768.6552	932.4481	(97)
Space heating kWh													
	209.3784	156.3576	102.7648	38.3808	7.8356	0.0000	0.0000	0.0000	0.0000	40.3495	128.6648	224.7270	(98a)
Space heating requirement - total per year (kWh/year)												908.4585	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	209.3784	156.3576	102.7648	38.3808	7.8356	0.0000	0.0000	0.0000	0.0000	40.3495	128.6648	224.7270	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												908.4585	
Space heating per m2											(98c) / (4) =	10.4782	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	209.3784	156.3576	102.7648	38.3808	7.8356	0.0000	0.0000	0.0000	0.0000	40.3495	128.6648	224.7270	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	314.0676	234.5363	154.1472	57.5712	11.7534	0.0000	0.0000	0.0000	0.0000	60.5243	192.9972	337.0905	
Space heating requirement													
	314.0676	234.5363	154.1472	57.5712	11.7534	0.0000	0.0000	0.0000	0.0000	60.5243	192.9972	337.0905	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)

Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year	
Space heating fuel - community heating	1362.6877 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	13.6269 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)	
mechanical ventilation fans (SFP = 0.1292)	33.4924 (330a)
Total electricity for the above, kWh/year	33.4924 (331)
Electricity for lighting (calculated in Appendix L)	216.3282 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4685.2624 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1362.6877	6.5500	89.2560	(340a)
Space heating total			89.2560	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			352.5611	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1464.0503	0.1573	57.1752	(367)
Electrical energy for heat distribution (space & water)	13.6269	0.0000	7.9597	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			220.2193	(373)
Space and water heating			220.2193	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			122.3863	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1464.0503	1.5825	575.0475	(467)
Electrical energy for heat distribution (space & water)	13.6269	0.0000	84.3435	(472)
Overall CO2 factor for heat network			0.4250	(486)
Total CO2 associated with community systems			2333.5035	(473)
Space and water heating			2333.5035	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1689.6684	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Southeast

Current energy efficiency rating: B 88
Current environmental impact rating: A 99

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£71	£71	£0
Community scheme	£464	£464	£0
Space heating	£203	£203	£0
Water heating	£270	£270	£0
Lighting	£62	£62	£0
Generated (PV)	-£182	-£182	£0
Total cost of fuels	£353	£353	£0
Total cost of uses	£353	£353	£0
Delivered energy	54 kWh/m²	54 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	19 kWh/m²	19 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5778 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day)	126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.4800	11.2829	0.7600	0.7000	0.7700	31.1149	(81)
Northwest	1.7600	11.2829	0.7600	0.7000	0.7700	7.3212	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	38.4361	78.2378	140.9596	231.4961	311.1762	331.7468	310.3423	247.4085	171.7614	95.6128	48.3625	31.3888	(83)
Total gains	678.0599	715.5316	759.2448	814.4498	858.9788	847.8517	807.7907	748.1209	690.6831	646.7939	638.3664	655.1716	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area	0.9627	0.9467	0.9042	0.8027	0.6361	0.4566	0.3314	0.3737	0.5931	0.8391	0.9397	0.9684	(86)
MIT	20.3337	20.4454	20.6402	20.8475	20.9629	20.9949	20.9993	20.9987	20.9804	20.8338	20.5486	20.2891	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9561	0.9376	0.8886	0.7749	0.5966	0.4106	0.2818	0.3204	0.5413	0.8091	0.9279	0.9627	(89)
MIT 2	19.5674	19.7060	19.9434	20.1841	20.3059	20.3349	20.3380	20.3377	20.3237	20.1742	19.8361	19.5119	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8071	19.9373	20.1613	20.3916	20.5114	20.5414	20.5449	20.5444	20.5291	20.3805	20.0590	19.7550	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8071	19.9373	20.1613	20.3916	20.5114	20.5414	20.5449	20.5444	20.5291	20.3805	20.0590	19.7550	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9499	0.9313	0.8840	0.7772	0.6071	0.4248	0.2973	0.3370	0.5565	0.8111	0.9222	0.9568	(94)
Useful gains	644.1040	666.3439	671.1856	633.0310	521.5272	360.2009	240.1703	252.1329	384.3706	524.6273	588.7157	626.8397	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	944.8651	916.2388	832.4019	700.1959	536.8914	362.0141	240.3668	252.5262	391.7345	595.9374	789.6061	947.7874	(97)
Space heating kWh	223.7663	167.9293	119.9449	48.3587	11.4310	0.0000	0.0000	0.0000	0.0000	53.0547	144.6411	238.7851	(98a)
Space heating requirement - total per year (kWh/year)												1007.9112	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	223.7663	167.9293	119.9449	48.3587	11.4310	0.0000	0.0000	0.0000	0.0000	53.0547	144.6411	238.7851	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1007.9112	
Space heating per m2										(98c) / (4) =		11.6253	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:													
Space heating requirement	223.7663	167.9293	119.9449	48.3587	11.4310	0.0000	0.0000	0.0000	0.0000	53.0547	144.6411	238.7851	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	335.6494	251.8940	179.9174	72.5381	17.1465	0.0000	0.0000	0.0000	0.0000	79.5821	216.9616	358.1777	
Space heating requirement	335.6494	251.8940	179.9174	72.5381	17.1465	0.0000	0.0000	0.0000	0.0000	79.5821	216.9616	358.1777	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1511.8668	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4127.5010	(310)

Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	15.1187	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4930.9676	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1511.8668	4.4400	67.1269	(340a)
Space heating total			67.1269	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			275.7179	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.7537	(357)
SAP value	87.7830	
SAP rating (Section 12)	88	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1503.8314	0.1569	63.2386	(367)
Electrical energy for heat distribution (space & water)	15.1187	0.0000	8.1871	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			226.5100	(373)
Space and water heating			226.5100	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			140.9352	(383)
CO2 emissions per m2			1.6300	(384)
EI value			98.5660	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 86.7000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5778	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.4800	13.7758	0.7600	0.7000	0.7700	37.9894	(81)
Northwest	1.7600	13.7758	0.7600	0.7000	0.7700	8.9387	(81)

Solar gains	46.9281	85.4061	152.2932	252.8092	326.2339	372.2643	342.0586	278.9737	195.9553	110.3656	58.2773	38.4694	(83)
Total gains	686.5519	722.6999	770.5784	835.7629	874.0366	888.3692	839.5070	779.6862	714.8770	661.5468	648.2812	662.2521	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area													
	0.9578	0.9406	0.8875	0.7733	0.5973	0.3964	0.2829	0.3200	0.5523	0.8062	0.9290	0.9644	(86)
MIT	20.3759	20.4831	20.6910	20.8783	20.9741	20.9977	20.9997	20.9995	20.9867	20.8723	20.5975	20.3302	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house													
	0.9504	0.9304	0.8695	0.7432	0.5567	0.3517	0.2350	0.2686	0.5005	0.7720	0.9152	0.9580	(89)
MIT 2	19.6200	19.7525	20.0039	20.2177	20.3165	20.3370	20.3383	20.3381	20.3289	20.2161	19.8956	19.5635	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8565	19.9810	20.2188	20.4244	20.5222	20.5436	20.5452	20.5450	20.5346	20.4214	20.1151	19.8033	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8565	19.9810	20.2188	20.4244	20.5222	20.5436	20.5452	20.5450	20.5346	20.4214	20.1151	19.8033	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9441	0.9242	0.8660	0.7472	0.5681	0.3656	0.2500	0.2847	0.5161	0.7766	0.9100	0.9519	(94)
Useful gains	648.1719	667.9507	667.3148	624.5142	496.5499	324.8267	209.8490	221.9494	368.9171	513.7286	589.9541	630.3957	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	929.5944	900.6256	805.4396	677.8208	507.0817	325.5945	209.9185	222.0943	373.7902	567.9618	768.6552	932.4481	(97)
Space heating kWh													
	209.3784	156.3576	102.7648	38.3808	7.8356	0.0000	0.0000	0.0000	0.0000	40.3495	128.6648	224.7270	(98a)
Space heating requirement - total per year (kWh/year)												908.4585	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	209.3784	156.3576	102.7648	38.3808	7.8356	0.0000	0.0000	0.0000	0.0000	40.3495	128.6648	224.7270	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												908.4585	
Space heating per m2										(98c) / (4) =		10.4782	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement

	209.3784	156.3576	102.7648	38.3808	7.8356	0.0000	0.0000	0.0000	0.0000	40.3495	128.6648	224.7270 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	314.0676	234.5363	154.1472	57.5712	11.7534	0.0000	0.0000	0.0000	0.0000	60.5243	192.9972	337.0905
Space heating requirement												
	314.0676	234.5363	154.1472	57.5712	11.7534	0.0000	0.0000	0.0000	0.0000	60.5243	192.9972	337.0905 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388
Water heating fuel												
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446 (331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year

Space heating fuel - community heating	1362.6877 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	13.6269 (313)
Space cooling fuel	0.0000 (321)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)	
mechanical ventilation fans (SFP = 0.1292)	33.4924 (330a)
Total electricity for the above, kWh/year	33.4924 (331)
Electricity for lighting (calculated in Appendix L)	216.3282 (332)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4685.2624 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1362.6877	6.5500	89.2560	(340a)
Space heating total			89.2560	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			352.5611	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1464.0503	0.1573	57.1752	(367)
Electrical energy for heat distribution (space & water)	13.6269	0.0000	7.9597	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			220.2193	(373)
Space and water heating			220.2193	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			122.3863	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)

Space and Water heating from Heat pump	1464.0503	1.5825	575.0475	(467)
Electrical energy for heat distribution (space & water)	13.6269	0.0000	84.3435	(472)
Overall CO2 factor for heat network			0.4250	(486)
Total CO2 associated with community systems			2333.5035	(473)
Space and water heating			2333.5035	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1689.6684	(483)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.71	**TER**	10.53
Environmental	99 A	**% DER < TER**			83.76
CO_2 Emissions (t/year)	0.12	**DFEE**	20.44	**TFEE**	24.93
Compliance Check	See BREL	**% DFEE < TFEE**			18.00
% DPER < TPER	60.67	**DPER**	22.04	**TPER**	56.05

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674 (64)
12Total per year (kWh/year)												2752 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.4800	11.2829	0.7600	0.7000	0.7700	31.1149	(75)
Northeast	1.7600	11.2829	0.7600	0.7000	0.7700	7.3212	(75)

Solar gains	38.4361	78.2378	140.9596	231.4961	311.1762	331.7468	310.3423	247.4085	171.7614	95.6128	48.3625	31.3888 (83)
Total gains	623.6086	677.6503	715.1060	786.5301	838.8873	841.7455	801.4341	739.5305	678.4742	618.3659	602.1101	604.9300 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area	0.9737	0.9569	0.9219	0.8192	0.6489	0.4598	0.3340	0.3779	0.6026	0.8581	0.9517	0.9775	(86)
MIT	20.2504	20.3925	20.5904	20.8302	20.9592	20.9947	20.9993	20.9986	20.9788	20.8117	20.4997	20.2103	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9688	0.9492	0.9083	0.7923	0.6092	0.4136	0.2840	0.3241	0.5503	0.8299	0.9418	0.9732	(89)
MIT 2	19.4639	19.6411	19.8845	20.1654	20.3025	20.3348	20.3380	20.3377	20.3225	20.1504	19.7769	19.4135	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.7099	19.8762	20.1053	20.3734	20.5079	20.5412	20.5449	20.5444	20.5278	20.3572	20.0030	19.6628	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7099	19.8762	20.1053	20.3734	20.5079	20.5412	20.5449	20.5444	20.5278	20.3572	20.0030	19.6628	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9632	0.9429	0.9030	0.7938	0.6196	0.4278	0.2997	0.3409	0.5655	0.8307	0.9360	0.9680	(94)
Useful gains	600.6506	638.9735	645.7411	624.3550	519.7445	360.1278	240.1610	252.1059	383.6967	513.6909	563.5644	585.5551	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	938.9448	912.5166	828.9884	699.0869	536.6767	362.0054	240.3657	252.5230	391.6541	594.5196	786.1938	942.1642	(97)
Space heating kWh	251.6909	183.8210	136.3360	53.8070	12.5976	0.0000	0.0000	0.0000	0.0000	60.1365	160.2931	265.3172	(98a)
Space heating requirement - total per year (kWh/year)												1123.9992	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	251.6909	183.8210	136.3360	53.8070	12.5976	0.0000	0.0000	0.0000	0.0000	60.1365	160.2931	265.3172	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1123.9992	
Space heating per m2											(98c) / (4) =	12.9642	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	251.6909	183.8210	136.3360	53.8070	12.5976	0.0000	0.0000	0.0000	0.0000	60.1365	160.2931	265.3172	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	377.5363	275.7315	204.5039	80.7105	18.8964	0.0000	0.0000	0.0000	0.0000	90.2048	240.4397	397.9757	
Space heating requirement	377.5363	275.7315	204.5039	80.7105	18.8964	0.0000	0.0000	0.0000	0.0000	90.2048	240.4397	397.9757	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1685.9988	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												16.8600	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5105.0996	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1550.2666	0.1568	70.5133	(367)
Electrical energy for heat distribution (space & water)	16.8600	0.0000	8.4599	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			234.0575	(373)
Space and water heating			234.0575	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			148.4826	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.7100	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1550.2666	1.5806	710.6474	(467)
Electrical energy for heat distribution (space & water)	16.8600	0.0000	89.4285	(472)
Overall CO2 factor for heat network			0.4256	(486)
Total CO2 associated with community systems			2474.1884	(473)
Space and water heating			2474.1884	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1911.2451	(483)
Dwelling Primary energy Rate (DPER)			22.0400	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
500mm mineral wool	43.3500		43.3500	0.1100	4.7685			(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2577			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.7700	0.0600	0.4062
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	19.4300	0.1200	2.3316
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1426 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 30.4003 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	70.6867	70.4833	70.2839	69.3475	69.1723	68.3567	68.3567	68.2057	68.6709	69.1723	69.5267	69.8973	(39)
Average = Sum(39)m / 12 =												69.3467	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8153	0.8130	0.8107	0.7999	0.7978	0.7884	0.7884	0.7867	0.7921	0.7978	0.8019	0.8062	(40)
HLP (average)												0.7998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.2400	11.2829	0.6300	0.7000	0.7700	31.8615	(75)

Solar gains	31.8615	64.8550	116.8481	191.8981	257.9487	275.0006	257.2574	205.0886	142.3812	79.2579	40.0900	26.0197	(83)
Total gains	610.6987	657.9322	684.6591	740.5967	779.3244	775.6640	739.0138	687.8753	639.7586	595.6757	587.5022	593.2254	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1394	59.3101	59.4783	60.2815	60.4342	61.1552	61.1552	61.2906	60.8754	60.4342	60.1261	59.8073	
alpha	4.9426	4.9540	4.9652	5.0188	5.0289	5.0770	5.0770	5.0860	5.0584	5.0289	5.0084	4.9872	
util living area	0.9810	0.9706	0.9498	0.8813	0.7453	0.5502	0.4045	0.4515	0.6904	0.9020	0.9659	0.9833	(86)
MIT	19.9693	20.1198	20.3453	20.6681	20.8888	20.9808	20.9967	20.9943	20.9427	20.6757	20.2902	19.9498	(87)
Th 2	20.2401	20.2421	20.2441	20.2535	20.2552	20.2634	20.2634	20.2649	20.2602	20.2552	20.2517	20.2480	(88)
util rest of house	0.9772	0.9648	0.9395	0.8583	0.7028	0.4916	0.3379	0.3814	0.6311	0.8780	0.9581	0.9799	(89)
MIT 2	19.0344	19.2255	19.5090	19.9070	20.1545	20.2501	20.2618	20.2620	20.2162	19.9241	19.4491	19.0156	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.3269	19.5052	19.7706	20.1451	20.3842	20.4787	20.4917	20.4911	20.4434	20.1592	19.7122	19.3078	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3269	19.5052	19.7706	20.1451	20.3842	20.4787	20.4917	20.4911	20.4434	20.1592	19.7122	19.3078	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9714	0.9578	0.9319	0.8546	0.7106	0.5090	0.3587	0.4032	0.6464	0.8745	0.9512	0.9745	(94)
Useful gains	593.2132	630.1521	638.0642	632.9152	553.7525	394.8490	265.0691	277.3439	413.5683	520.8922	558.8315	578.0933	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1062.1987	1029.4230	932.7088	779.8169	600.7074	401.8482	266.0222	279.0364	435.6083	661.2307	876.8860	1055.9957	(97)
Space heating kWh	348.9252	268.3100	219.2156	105.7692	34.9345	0.0000	0.0000	0.0000	0.0000	104.4118	228.9993	355.5595	(98a)
Space heating requirement - total per year (kWh/year)												1666.1250	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	348.9252	268.3100	219.2156	105.7692	34.9345	0.0000	0.0000	0.0000	0.0000	104.4118	228.9993	355.5595	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1666.1250	
Space heating per m2											(98c) / (4) =	19.2171	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	348.9252	268.3100	219.2156	105.7692	34.9345	0.0000	0.0000	0.0000	0.0000	104.4118	228.9993	355.5595	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	378.0338	290.6934	237.5033	114.5929	37.8488	0.0000	0.0000	0.0000	0.0000	113.1222	248.1032	385.2215	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9569	84.6473	84.0568	82.7652	81.0893	79.8000	79.8000	79.8000	79.8000	82.7150	84.2784	85.0215	(217)
Fuel for water heating, kWh/month	275.0586	244.0346	261.1403	233.7236	231.5304	212.3443	209.9929	218.2535	220.5242	236.7996	246.5333	271.9511	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1805.1192 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2861.8864 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	224.3782 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-857.0729 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4120.3110 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1805.1192	0.2100	379.0750	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2861.8864	0.2100	600.9962	(264)
Space and water heating			980.0712	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			913.1695	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.5300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1805.1192	1.1300	2039.7847	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2861.8864	1.1300	3233.9317	(278)
Space and water heating			5273.7164	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4859.9435	(286)
Target Primary Energy Rate (TPER)			56.0500	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.71	**TER**	10.53
Environmental	99 A	**% DER < TER**			83.76
CO_2 Emissions (t/year)	0.12	**DFEE**	20.44	**TFEE**	24.93
Compliance Check	See BREL	**% DFEE < TFEE**			18.00
% DPER < TPER	60.67	**DPER**	22.04	**TPER**	56.05

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		3 * 10 =	30.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1412 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			3.0000 (17)
Infiltration rate			0.2912 (18)
Number of sides sheltered			3 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2257 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2878	0.2821	0.2765	0.2483	0.2426	0.2144	0.2144	0.2088	0.2257	0.2426	0.2539	0.2652	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5414	0.5398	0.5382	0.5308	0.5294	0.5230	0.5230	0.5218	0.5255	0.5294	0.5322	0.5352	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15049.3300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							173.5794	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9510	37.8383	37.7278	37.2089	37.1118	36.6599	36.6599	36.5762	36.8339	37.1118	37.3082	37.5135	(38)
Heat transfer coeff	63.8337	63.7210	63.6105	63.0916	62.9945	62.5426	62.5426	62.4589	62.7167	62.9945	63.1909	63.3963	(39)
Average = Sum(39)m / 12 =												63.0912	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7363	0.7350	0.7337	0.7277	0.7266	0.7214	0.7214	0.7204	0.7234	0.7266	0.7288	0.7312	(40)
HLP (average)												0.7277	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
									Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)											908	(64)

Electric shower(s)

54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 614.3496 (64a)

Heat gains from water heating, kWh/month

37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.4800	11.2829	0.7600	0.7000	0.7700	31.1149	(75)
Northeast	1.7600	11.2829	0.7600	0.7000	0.7700	7.3212	(75)

Solar gains	38.4361	78.2378	140.9596	231.4961	311.1762	331.7468	310.3423	247.4085	171.7614	95.6128	48.3625	31.3888	(83)
Total gains	516.6645	571.9626	612.3192	690.7385	747.2108	754.4150	717.0745	653.1903	589.7415	524.7848	501.8521	498.9376	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.4884	65.6043	65.7182	66.2587	66.3608	66.8404	66.8404	66.9299	66.6548	66.3608	66.1546	65.9403	
alpha	5.3659	5.3736	5.3812	5.4172	5.4241	5.4560	5.4560	5.4620	5.4437	5.4241	5.4103	5.3960	
util living area	0.9893	0.9804	0.9600	0.8831	0.7268	0.5226	0.3825	0.4371	0.6919	0.9214	0.9787	0.9910	(86)

MIT	19.9955	20.1576	20.3940	20.7217	20.9224	20.9891	20.9983	20.9967	20.9551	20.6885	20.2976	19.9657 (87)
Th 2	20.3089	20.3101	20.3112	20.3164	20.3174	20.3220	20.3220	20.3228	20.3202	20.3174	20.3154	20.3133 (88)
util rest of house	0.9871	0.9764	0.9517	0.8613	0.6862	0.4701	0.3242	0.3740	0.6361	0.9014	0.9736	0.9892 (89)
MIT 2	19.3822	19.5431	19.7754	20.0890	20.2628	20.3161	20.3214	20.3215	20.2930	20.0650	19.6869	19.3562 (90)
Living area fraction										fLA = Living area / (4) =		0.3128 (91)
MIT	19.5741	19.7353	19.9689	20.2869	20.4691	20.5266	20.5331	20.5327	20.5001	20.2600	19.8780	19.5469 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5741	19.7353	19.9689	20.2869	20.4691	20.5266	20.5331	20.5327	20.5001	20.2600	19.8780	19.5469 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9842	0.9723	0.9470	0.8603	0.6956	0.4861	0.3424	0.3937	0.6514	0.8995	0.9697	0.9865	(94)
Useful gains	508.4763	556.1372	579.8532	594.2166	519.7313	366.7210	245.5166	257.1430	384.1640	472.0694	486.6374	492.2264	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	974.9994	945.3227	856.7630	718.4170	552.4051	370.6654	245.9884	258.1252	401.3948	608.5286	807.4519	972.9346	(97)
Space heating kWh	347.0932	261.5326	206.0209	89.4243	24.3093	0.0000	0.0000	0.0000	0.0000	101.5257	230.9864	357.6469	(98a)
Space heating requirement - total per year (kWh/year)												1618.5393	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	347.0932	261.5326	206.0209	89.4243	24.3093	0.0000	0.0000	0.0000	0.0000	101.5257	230.9864	357.6469	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1618.5393	
Space heating per m2											(98c) / (4) =	18.6683	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	587.9004	462.8152	474.6877	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9473	0.9752	0.9592	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	556.9074	451.3350	455.3239	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	817.6695	777.0574	705.1508	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	187.7487	242.3374	185.8712	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	46.9372	60.5844	46.4678	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												153.9893	(107)
Energy for space heating												18.6683	(99)
Energy for space cooling												1.7761	(108)
Total												20.4444	(109)
Fabric Energy Efficiency (DFEE)												20.4	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
500mm mineral wool	43.3500		43.3500	0.1100	4.7685			(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2577			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.7700	0.0600	0.4062
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	19.4300	0.1200	2.3316
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1426 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.4003 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	70.6867	70.4833	70.2839	69.3475	69.1723	68.3567	68.3567	68.2057	68.6709	69.1723	69.5267	69.8973	(39)
Average = Sum(39)m / 12 =												69.3467	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8153	0.8130	0.8107	0.7999	0.7978	0.7884	0.7884	0.7867	0.7921	0.7978	0.8019	0.8062	(40)
HLP (average)												0.7998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												64.3029	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
133.8049 148.1412 133.8049 138.2651 133.8049 138.2651 133.8049 133.8049 138.2651 133.8049 138.2651 133.8049 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
232.8739 235.2904 229.2009 216.2371 199.8726 184.4922 174.2172 171.8007 177.8902 190.8540 207.2186 222.5989 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
35.8890 35.8890 35.8890 35.8890 35.8890 35.8890 35.8890 35.8890 35.8890 35.8890 35.8890 35.8890 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-103.1122 -103.1122 -103.1122 -103.1122 -103.1122 -103.1122 -103.1122 -103.1122 -103.1122 -103.1122 -103.1122 -103.1122 (71)
Water heating gains (Table 5)
49.8825 48.6262 46.6867 43.0732 40.6901 38.2439 37.0430 38.5091 40.1577 42.8460 46.3389 49.4778 (72)
Total internal gains
478.2284 493.7248 471.3597 459.2424 436.0346 422.6682 406.7322 405.7818 417.9801 429.1721 453.4896 467.5487 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.2400	11.2829	0.6300	0.7000	0.7700	31.8615	(75)

Solar gains 31.8615 64.8550 116.8481 191.8981 257.9487 275.0006 257.2574 205.0886 142.3812 79.2579 40.0900 26.0197 (83)
Total gains 510.0899 558.5798 588.2077 651.1405 693.9833 697.6688 663.9896 610.8704 560.3613 508.4300 493.5796 493.5684 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1394	59.3101	59.4783	60.2815	60.4342	61.1552	61.1552	61.2906	60.8754	60.4342	60.1261	59.8073	
alpha	4.9426	4.9540	4.9652	5.0188	5.0289	5.0770	5.0770	5.0860	5.0584	5.0289	5.0084	4.9872	
util living area	0.9910	0.9846	0.9713	0.9199	0.8010	0.6038	0.4485	0.5050	0.7580	0.9416	0.9828	0.9923	(86)
MIT	19.8033	19.9626	20.2051	20.5725	20.8443	20.9711	20.9947	20.9906	20.9124	20.5714	20.1436	19.7835	(87)
Th 2	20.2401	20.2421	20.2441	20.2535	20.2552	20.2634	20.2634	20.2649	20.2602	20.2552	20.2517	20.2480	(88)
util rest of house	0.9890	0.9813	0.9649	0.9021	0.7614	0.5421	0.3755	0.4281	0.7004	0.9249	0.9785	0.9906	(89)
MIT 2	19.1369	19.2962	19.5368	19.8975	20.1424	20.2475	20.2614	20.2611	20.2057	19.9033	19.4841	19.1234	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.3453	19.5046	19.7459	20.1087	20.3619	20.4738	20.4908	20.4893	20.4268	20.1123	19.6904	19.3299	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3453	19.5046	19.7459	20.1087	20.3619	20.4738	20.4908	20.4893	20.4268	20.1123	19.6904	19.3299	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9860	0.9773	0.9597	0.8982	0.7675	0.5602	0.3982	0.4519	0.7141	0.9212	0.9744	0.9879	(94)
Useful gains	502.9720	545.8841	564.5204	584.8624	532.6127	390.8298	264.4225	276.0799	400.1817	468.3686	480.9658	487.6204	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1063.5039	1029.3818	930.9728	777.2936	599.1646	401.5139	265.9603	278.9153	434.4642	657.9849	875.3692	1057.5381	(97)
Space heating kWh	417.0357	324.9105	272.6406	138.5505	49.5146	0.0000	0.0000	0.0000	0.0000	141.0745	283.9704	424.0188	(98a)
Space heating requirement - total per year (kWh/year)												2051.7155	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	417.0357	324.9105	272.6406	138.5505	49.5146	0.0000	0.0000	0.0000	0.0000	141.0745	283.9704	424.0188	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2051.7155	
Space heating per m2										(98c) / (4) =		23.6645	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	642.5530	505.8396	518.3630	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8933	0.9425	0.9167	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	574.0050	476.7544	475.1767	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	751.3428	715.0101	655.6860	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	127.6832	177.2623	134.2990	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	31.9208	44.3156	33.5747	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												109.8111	(107)
Energy for space heating												23.6645	(99)
Energy for space cooling												1.2666	(108)
Total												24.9311	(109)
Fabric Energy Efficiency (TFEE)												24.9	(109)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.71	**TER**	10.53
Environmental	99 A	**% DER < TER**			83.76
CO_2 Emissions (t/year)	0.12	**DFEE**	20.44	**TFEE**	24.93
Compliance Check	See BREL	**% DFEE < TFEE**			18.00
% DPER < TPER	60.67	**DPER**	22.04	**TPER**	56.05

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674 (64)
12Total per year (kWh/year)												2752 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.4800	11.2829	0.7600	0.7000	0.7700	31.1149	(75)
Northeast	1.7600	11.2829	0.7600	0.7000	0.7700	7.3212	(75)

Solar gains	38.4361	78.2378	140.9596	231.4961	311.1762	331.7468	310.3423	247.4085	171.7614	95.6128	48.3625	31.3888 (83)
Total gains	623.6086	677.6503	715.1060	786.5301	838.8873	841.7455	801.4341	739.5305	678.4742	618.3659	602.1101	604.9300 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area	0.9737	0.9569	0.9219	0.8192	0.6489	0.4598	0.3340	0.3779	0.6026	0.8581	0.9517	0.9775	(86)
MIT	20.2504	20.3925	20.5904	20.8302	20.9592	20.9947	20.9993	20.9986	20.9788	20.8117	20.4997	20.2103	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9688	0.9492	0.9083	0.7923	0.6092	0.4136	0.2840	0.3241	0.5503	0.8299	0.9418	0.9732	(89)
MIT 2	19.4639	19.6411	19.8845	20.1654	20.3025	20.3348	20.3380	20.3377	20.3225	20.1504	19.7769	19.4135	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.7099	19.8762	20.1053	20.3734	20.5079	20.5412	20.5449	20.5444	20.5278	20.3572	20.0030	19.6628	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7099	19.8762	20.1053	20.3734	20.5079	20.5412	20.5449	20.5444	20.5278	20.3572	20.0030	19.6628	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9632	0.9429	0.9030	0.7938	0.6196	0.4278	0.2997	0.3409	0.5655	0.8307	0.9360	0.9680	(94)
Useful gains	600.6506	638.9735	645.7411	624.3550	519.7445	360.1278	240.1610	252.1059	383.6967	513.6909	563.5644	585.5551	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	938.9448	912.5166	828.9884	699.0869	536.6767	362.0054	240.3657	252.5230	391.6541	594.5196	786.1938	942.1642	(97)
Space heating kWh	251.6909	183.8210	136.3360	53.8070	12.5976	0.0000	0.0000	0.0000	0.0000	60.1365	160.2931	265.3172	(98a)
Space heating requirement - total per year (kWh/year)												1123.9992	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	251.6909	183.8210	136.3360	53.8070	12.5976	0.0000	0.0000	0.0000	0.0000	60.1365	160.2931	265.3172	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1123.9992	
Space heating per m2											(98c) / (4) =	12.9642	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	251.6909	183.8210	136.3360	53.8070	12.5976	0.0000	0.0000	0.0000	0.0000	60.1365	160.2931	265.3172	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	377.5363	275.7315	204.5039	80.7105	18.8964	0.0000	0.0000	0.0000	0.0000	90.2048	240.4397	397.9757	
Space heating requirement	377.5363	275.7315	204.5039	80.7105	18.8964	0.0000	0.0000	0.0000	0.0000	90.2048	240.4397	397.9757	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1685.9988	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												16.8600	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5105.0996	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1550.2666	0.1568	70.5133	(367)
Electrical energy for heat distribution (space & water)	16.8600	0.0000	8.4599	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			234.0575	(373)
Space and water heating			234.0575	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			148.4826	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.7100	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1550.2666	1.5806	710.6474	(467)
Electrical energy for heat distribution (space & water)	16.8600	0.0000	89.4285	(472)
Overall CO2 factor for heat network			0.4256	(486)
Total CO2 associated with community systems			2474.1884	(473)
Space and water heating			2474.1884	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1911.2451	(483)
Dwelling Primary energy Rate (DPER)			22.0400	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
500mm mineral wool	43.3500		43.3500	0.1100	4.7685			(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2577			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.7700	0.0600	0.4062
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	19.4300	0.1200	2.3316
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1426 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 30.4003 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	70.6867	70.4833	70.2839	69.3475	69.1723	68.3567	68.3567	68.2057	68.6709	69.1723	69.5267	69.8973	(39)
Average = Sum(39)m / 12 =												69.3467	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8153	0.8130	0.8107	0.7999	0.7978	0.7884	0.7884	0.7867	0.7921	0.7978	0.8019	0.8062	(40)
HLP (average)												0.7998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.2400	11.2829	0.6300	0.7000	0.7700	31.8615	(75)

Solar gains	31.8615	64.8550	116.8481	191.8981	257.9487	275.0006	257.2574	205.0886	142.3812	79.2579	40.0900	26.0197	(83)
Total gains	610.6987	657.9322	684.6591	740.5967	779.3244	775.6640	739.0138	687.8753	639.7586	595.6757	587.5022	593.2254	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1394	59.3101	59.4783	60.2815	60.4342	61.1552	61.1552	61.2906	60.8754	60.4342	60.1261	59.8073	
alpha	4.9426	4.9540	4.9652	5.0188	5.0289	5.0770	5.0770	5.0860	5.0584	5.0289	5.0084	4.9872	
util living area	0.9810	0.9706	0.9498	0.8813	0.7453	0.5502	0.4045	0.4515	0.6904	0.9020	0.9659	0.9833	(86)
MIT	19.9693	20.1198	20.3453	20.6681	20.8888	20.9808	20.9967	20.9943	20.9427	20.6757	20.2902	19.9498	(87)
Th 2	20.2401	20.2421	20.2441	20.2535	20.2552	20.2634	20.2634	20.2649	20.2602	20.2552	20.2517	20.2480	(88)
util rest of house	0.9772	0.9648	0.9395	0.8583	0.7028	0.4916	0.3379	0.3814	0.6311	0.8780	0.9581	0.9799	(89)
MIT 2	19.0344	19.2255	19.5090	19.9070	20.1545	20.2501	20.2618	20.2620	20.2162	19.9241	19.4491	19.0156	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.3269	19.5052	19.7706	20.1451	20.3842	20.4787	20.4917	20.4911	20.4434	20.1592	19.7122	19.3078	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3269	19.5052	19.7706	20.1451	20.3842	20.4787	20.4917	20.4911	20.4434	20.1592	19.7122	19.3078	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9714	0.9578	0.9319	0.8546	0.7106	0.5090	0.3587	0.4032	0.6464	0.8745	0.9512	0.9745	(94)
Useful gains	593.2132	630.1521	638.0642	632.9152	553.7525	394.8490	265.0691	277.3439	413.5683	520.8922	558.8315	578.0933	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1062.1987	1029.4230	932.7088	779.8169	600.7074	401.8482	266.0222	279.0364	435.6083	661.2307	876.8860	1055.9957	(97)
Space heating kWh	348.9252	268.3100	219.2156	105.7692	34.9345	0.0000	0.0000	0.0000	0.0000	104.4118	228.9993	355.5595	(98a)
Space heating requirement - total per year (kWh/year)												1666.1250	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	348.9252	268.3100	219.2156	105.7692	34.9345	0.0000	0.0000	0.0000	0.0000	104.4118	228.9993	355.5595	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1666.1250	
Space heating per m2											(98c) / (4) =	19.2171	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	348.9252	268.3100	219.2156	105.7692	34.9345	0.0000	0.0000	0.0000	0.0000	104.4118	228.9993	355.5595	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	378.0338	290.6934	237.5033	114.5929	37.8488	0.0000	0.0000	0.0000	0.0000	113.1222	248.1032	385.2215	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9569	84.6473	84.0568	82.7652	81.0893	79.8000	79.8000	79.8000	79.8000	82.7150	84.2784	85.0215	(217)
Fuel for water heating, kWh/month	275.0586	244.0346	261.1403	233.7236	231.5304	212.3443	209.9929	218.2535	220.5242	236.7996	246.5333	271.9511	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1805.1192 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2861.8864 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	224.3782 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-857.0729 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4120.3110 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1805.1192	0.2100	379.0750	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2861.8864	0.2100	600.9962	(264)
Space and water heating			980.0712	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			913.1695	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.5300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1805.1192	1.1300	2039.7847	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2861.8864	1.1300	3233.9317	(278)
Space and water heating			5273.7164	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4859.9435	(286)
Target Primary Energy Rate (TPER)			56.0500	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.71	**TER**	10.53
Environmental	99 A	**% DER < TER**			83.76
CO_2 Emissions (t/year)	0.12	**DFEE**	20.44	**TFEE**	24.93
Compliance Check	See BREL	**% DFEE < TFEE**			18.00
% DPER < TPER	60.67	**DPER**	22.04	**TPER**	56.05

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.4800	11.2829	0.7600	0.7000	0.7700	31.1149	(75)
Northeast	1.7600	11.2829	0.7600	0.7000	0.7700	7.3212	(75)

Solar gains	38.4361	78.2378	140.9596	231.4961	311.1762	331.7468	310.3423	247.4085	171.7614	95.6128	48.3625	31.3888	(83)
Total gains	678.0599	715.5316	759.2448	814.4498	858.9788	847.8517	807.7907	748.1209	690.6831	646.7939	638.3664	655.1716	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area													
	0.9627	0.9467	0.9042	0.8027	0.6361	0.4566	0.3314	0.3737	0.5931	0.8391	0.9397	0.9684	(86)
MIT	20.3337	20.4454	20.6402	20.8475	20.9629	20.9949	20.9993	20.9987	20.9804	20.8338	20.5486	20.2891	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house													
	0.9561	0.9376	0.8886	0.7749	0.5966	0.4106	0.2818	0.3204	0.5413	0.8091	0.9279	0.9627	(89)
MIT 2	19.5674	19.7060	19.9434	20.1841	20.3059	20.3349	20.3380	20.3377	20.3237	20.1742	19.8361	19.5119	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8071	19.9373	20.1613	20.3916	20.5114	20.5414	20.5449	20.5444	20.5291	20.3805	20.0590	19.7550	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8071	19.9373	20.1613	20.3916	20.5114	20.5414	20.5449	20.5444	20.5291	20.3805	20.0590	19.7550	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9499	0.9313	0.8840	0.7772	0.6071	0.4248	0.2973	0.3370	0.5565	0.8111	0.9222	0.9568	(94)
Useful gains	644.1040	666.3439	671.1856	633.0310	521.5272	360.2009	240.1703	252.1329	384.3706	524.6273	588.7157	626.8397	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	944.8651	916.2388	832.4019	700.1959	536.8914	362.0141	240.3668	252.5262	391.7345	595.9374	789.6061	947.7874	(97)
Space heating kWh													
	223.7663	167.9293	119.9449	48.3587	11.4310	0.0000	0.0000	0.0000	0.0000	53.0547	144.6411	238.7851	(98a)
Space heating requirement - total per year (kWh/year)												1007.9112	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	223.7663	167.9293	119.9449	48.3587	11.4310	0.0000	0.0000	0.0000	0.0000	53.0547	144.6411	238.7851	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1007.9112	
Space heating per m2											(98c) / (4) =	11.6253	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	223.7663	167.9293	119.9449	48.3587	11.4310	0.0000	0.0000	0.0000	0.0000	53.0547	144.6411	238.7851	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	335.6494	251.8940	179.9174	72.5381	17.1465	0.0000	0.0000	0.0000	0.0000	79.5821	216.9616	358.1777	
Space heating requirement													
	335.6494	251.8940	179.9174	72.5381	17.1465	0.0000	0.0000	0.0000	0.0000	79.5821	216.9616	358.1777	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1511.8668	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												15.1187	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4930.9676	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1511.8668	4.4400	67.1269	(340a)
Space heating total			67.1269	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			275.7179	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7537 (357)
SAP value		87.7830
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1503.8314	0.1569	63.2386	(367)
Electrical energy for heat distribution (space & water)	15.1187	0.0000	8.1871	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			226.5100	(373)
Space and water heating			226.5100	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			140.9352	(383)
CO2 emissions per m2			1.6300	(384)
EI value			98.5660	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			3.0000 (17)
Infiltration rate			0.1500 (18)
Number of sides sheltered			3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7750 (20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)

Average = Sum(39)m / 12 = 60.9312

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)											Total = Sum(45)m =	2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)

Total per year (kWh/year) = Sum(64)m = 2751.6674 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.4800	13.7758	0.7600	0.7000	0.7700	37.9894	(75)
Northeast	1.7600	13.7758	0.7600	0.7000	0.7700	8.9387	(75)

Solar gains	46.9281	85.4061	152.2932	252.8092	326.2339	372.2643	342.0586	278.9737	195.9553	110.3656	58.2773	38.4694	(83)
Total gains	686.5519	722.6999	770.5784	835.7629	874.0366	888.3692	839.5070	779.6862	714.8770	661.5468	648.2812	662.2521	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area													
	0.9578	0.9406	0.8875	0.7733	0.5973	0.3964	0.2829	0.3200	0.5523	0.8062	0.9290	0.9644	(86)
MIT	20.3759	20.4831	20.6910	20.8783	20.9741	20.9977	20.9997	20.9995	20.9867	20.8723	20.5975	20.3302	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house													
	0.9504	0.9304	0.8695	0.7432	0.5567	0.3517	0.2350	0.2686	0.5005	0.7720	0.9152	0.9580	(89)
MIT 2	19.6200	19.7525	20.0039	20.2177	20.3165	20.3370	20.3383	20.3381	20.3289	20.2161	19.8956	19.5635	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8565	19.9810	20.2188	20.4244	20.5222	20.5436	20.5452	20.5450	20.5346	20.4214	20.1151	19.8033	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8565	19.9810	20.2188	20.4244	20.5222	20.5436	20.5452	20.5450	20.5346	20.4214	20.1151	19.8033	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9441	0.9242	0.8660	0.7472	0.5681	0.3656	0.2500	0.2847	0.5161	0.7766	0.9100	0.9519	(94)
Useful gains	648.1719	667.9507	667.3148	624.5142	496.5499	324.8267	209.8490	221.9494	368.9171	513.7286	589.9541	630.3957	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	929.5944	900.6256	805.4396	677.8208	507.0817	325.5945	209.9185	222.0943	373.7902	567.9618	768.6552	932.4481	(97)
Space heating kWh													
	209.3784	156.3576	102.7648	38.3808	7.8356	0.0000	0.0000	0.0000	0.0000	40.3495	128.6648	224.7270	(98a)
Space heating requirement - total per year (kWh/year)												908.4585	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	209.3784	156.3576	102.7648	38.3808	7.8356	0.0000	0.0000	0.0000	0.0000	40.3495	128.6648	224.7270	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												908.4585	
Space heating per m2											(98c) / (4) =	10.4782	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	209.3784	156.3576	102.7648	38.3808	7.8356	0.0000	0.0000	0.0000	0.0000	40.3495	128.6648	224.7270	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	314.0676	234.5363	154.1472	57.5712	11.7534	0.0000	0.0000	0.0000	0.0000	60.5243	192.9972	337.0905	
Space heating requirement													
	314.0676	234.5363	154.1472	57.5712	11.7534	0.0000	0.0000	0.0000	0.0000	60.5243	192.9972	337.0905	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)

Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year	
Space heating fuel - community heating	1362.6877 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	13.6269 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)	
mechanical ventilation fans (SFP = 0.1292)	33.4924 (330a)
Total electricity for the above, kWh/year	33.4924 (331)
Electricity for lighting (calculated in Appendix L)	216.3282 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4685.2624 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1362.6877	6.5500	89.2560	(340a)
Space heating total			89.2560	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			352.5611	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1464.0503	0.1573	57.1752	(367)
Electrical energy for heat distribution (space & water)	13.6269	0.0000	7.9597	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			220.2193	(373)
Space and water heating			220.2193	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			122.3863	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1464.0503	1.5825	575.0475	(467)
Electrical energy for heat distribution (space & water)	13.6269	0.0000	84.3435	(472)
Overall CO2 factor for heat network			0.4250	(486)
Total CO2 associated with community systems			2333.5035	(473)
Space and water heating			2333.5035	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1689.6684	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Southwest

Current energy efficiency rating: B 88
Current environmental impact rating: A 99

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£71	£71	£0
Community scheme	£464	£464	£0
Space heating	£203	£203	£0
Water heating	£270	£270	£0
Lighting	£62	£62	£0
Generated (PV)	-£182	-£182	£0
Total cost of fuels	£353	£353	£0
Total cost of uses	£353	£353	£0
Delivered energy	54 kWh/m²	54 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	19 kWh/m²	19 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5778 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day)	126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.4800	11.2829	0.7600	0.7000	0.7700	31.1149	(75)
Northeast	1.7600	11.2829	0.7600	0.7000	0.7700	7.3212	(75)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	38.4361	78.2378	140.9596	231.4961	311.1762	331.7468	310.3423	247.4085	171.7614	95.6128	48.3625	31.3888	(83)
Total gains	678.0599	715.5316	759.2448	814.4498	858.9788	847.8517	807.7907	748.1209	690.6831	646.7939	638.3664	655.1716	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area	0.9627	0.9467	0.9042	0.8027	0.6361	0.4566	0.3314	0.3737	0.5931	0.8391	0.9397	0.9684	(86)
MIT	20.3337	20.4454	20.6402	20.8475	20.9629	20.9949	20.9993	20.9987	20.9804	20.8338	20.5486	20.2891	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9561	0.9376	0.8886	0.7749	0.5966	0.4106	0.2818	0.3204	0.5413	0.8091	0.9279	0.9627	(89)
MIT 2	19.5674	19.7060	19.9434	20.1841	20.3059	20.3349	20.3380	20.3377	20.3237	20.1742	19.8361	19.5119	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8071	19.9373	20.1613	20.3916	20.5114	20.5414	20.5449	20.5444	20.5291	20.3805	20.0590	19.7550	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8071	19.9373	20.1613	20.3916	20.5114	20.5414	20.5449	20.5444	20.5291	20.3805	20.0590	19.7550	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9499	0.9313	0.8840	0.7772	0.6071	0.4248	0.2973	0.3370	0.5565	0.8111	0.9222	0.9568	(94)
Useful gains	644.1040	666.3439	671.1856	633.0310	521.5272	360.2009	240.1703	252.1329	384.3706	524.6273	588.7157	626.8397	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	944.8651	916.2388	832.4019	700.1959	536.8914	362.0141	240.3668	252.5262	391.7345	595.9374	789.6061	947.7874	(97)
Space heating kWh	223.7663	167.9293	119.9449	48.3587	11.4310	0.0000	0.0000	0.0000	0.0000	53.0547	144.6411	238.7851	(98a)
Space heating requirement - total per year (kWh/year)												1007.9112	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	223.7663	167.9293	119.9449	48.3587	11.4310	0.0000	0.0000	0.0000	0.0000	53.0547	144.6411	238.7851	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1007.9112	
Space heating per m2										(98c) / (4) =		11.6253	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	223.7663	167.9293	119.9449	48.3587	11.4310	0.0000	0.0000	0.0000	0.0000	53.0547	144.6411	238.7851	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	335.6494	251.8940	179.9174	72.5381	17.1465	0.0000	0.0000	0.0000	0.0000	79.5821	216.9616	358.1777	
Space heating requirement													
	335.6494	251.8940	179.9174	72.5381	17.1465	0.0000	0.0000	0.0000	0.0000	79.5821	216.9616	358.1777	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1511.8668	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)

Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	15.1187	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4930.9676	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1511.8668	4.4400	67.1269	(340a)
Space heating total			67.1269	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			275.7179	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.7537	(357)
SAP value	87.7830	
SAP rating (Section 12)	88	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1503.8314	0.1569	63.2386	(367)
Electrical energy for heat distribution (space & water)	15.1187	0.0000	8.1871	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			226.5100	(373)
Space and water heating			226.5100	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			140.9352	(383)
CO2 emissions per m2			1.6300	(384)
EI value			98.5660	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 86.7000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5778	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.4800	13.7758	0.7600	0.7000	0.7700	37.9894	(75)
Northeast	1.7600	13.7758	0.7600	0.7000	0.7700	8.9387	(75)

Solar gains	46.9281	85.4061	152.2932	252.8092	326.2339	372.2643	342.0586	278.9737	195.9553	110.3656	58.2773	38.4694	(83)
Total gains	686.5519	722.6999	770.5784	835.7629	874.0366	888.3692	839.5070	779.6862	714.8770	661.5468	648.2812	662.2521	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area													
	0.9578	0.9406	0.8875	0.7733	0.5973	0.3964	0.2829	0.3200	0.5523	0.8062	0.9290	0.9644	(86)
MIT	20.3759	20.4831	20.6910	20.8783	20.9741	20.9977	20.9997	20.9995	20.9867	20.8723	20.5975	20.3302	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house													
	0.9504	0.9304	0.8695	0.7432	0.5567	0.3517	0.2350	0.2686	0.5005	0.7720	0.9152	0.9580	(89)
MIT 2	19.6200	19.7525	20.0039	20.2177	20.3165	20.3370	20.3383	20.3381	20.3289	20.2161	19.8956	19.5635	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8565	19.9810	20.2188	20.4244	20.5222	20.5436	20.5452	20.5450	20.5346	20.4214	20.1151	19.8033	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8565	19.9810	20.2188	20.4244	20.5222	20.5436	20.5452	20.5450	20.5346	20.4214	20.1151	19.8033	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9441	0.9242	0.8660	0.7472	0.5681	0.3656	0.2500	0.2847	0.5161	0.7766	0.9100	0.9519	(94)
Useful gains	648.1719	667.9507	667.3148	624.5142	496.5499	324.8267	209.8490	221.9494	368.9171	513.7286	589.9541	630.3957	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	929.5944	900.6256	805.4396	677.8208	507.0817	325.5945	209.9185	222.0943	373.7902	567.9618	768.6552	932.4481	(97)
Space heating kWh													
	209.3784	156.3576	102.7648	38.3808	7.8356	0.0000	0.0000	0.0000	0.0000	40.3495	128.6648	224.7270	(98a)
Space heating requirement - total per year (kWh/year)												908.4585	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	209.3784	156.3576	102.7648	38.3808	7.8356	0.0000	0.0000	0.0000	0.0000	40.3495	128.6648	224.7270	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												908.4585	
Space heating per m2										(98c) / (4) =		10.4782	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement

	209.3784	156.3576	102.7648	38.3808	7.8356	0.0000	0.0000	0.0000	0.0000	40.3495	128.6648	224.7270 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	314.0676	234.5363	154.1472	57.5712	11.7534	0.0000	0.0000	0.0000	0.0000	60.5243	192.9972	337.0905
Space heating requirement												
	314.0676	234.5363	154.1472	57.5712	11.7534	0.0000	0.0000	0.0000	0.0000	60.5243	192.9972	337.0905 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388
Water heating fuel												
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446 (331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year

Space heating fuel - community heating	1362.6877 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	13.6269 (313)
Space cooling fuel	0.0000 (321)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)	
mechanical ventilation fans (SFP = 0.1292)	33.4924 (330a)
Total electricity for the above, kWh/year	33.4924 (331)
Electricity for lighting (calculated in Appendix L)	216.3282 (332)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4685.2624 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1362.6877	6.5500	89.2560	(340a)
Space heating total			89.2560	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			352.5611	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1464.0503	0.1573	57.1752	(367)
Electrical energy for heat distribution (space & water)	13.6269	0.0000	7.9597	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			220.2193	(373)
Space and water heating			220.2193	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			122.3863	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)

Space and Water heating from Heat pump	1464.0503	1.5825	575.0475	(467)
Electrical energy for heat distribution (space & water)	13.6269	0.0000	84.3435	(472)
Overall CO2 factor for heat network			0.4250	(486)
Total CO2 associated with community systems			2333.5035	(473)
Space and water heating			2333.5035	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1689.6684	(483)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.62	**TER**	10.21
Environmental	99 A	**% DER < TER**			84.13
CO_2 Emissions (t/year)	0.12	**DFEE**	19.03	**TFEE**	23.52
Compliance Check	See BREL	**% DFEE < TFEE**			19.08
% DPER < TPER	61.13	**DPER**	21.12	**TPER**	54.33

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
12Total per year (kWh/year)												2752	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(76)
East	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(76)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	652.0784	730.2946	789.6905	869.3922	912.9689	904.3786	866.5575	814.6416	757.3995	678.0557	637.1713	628.5612	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area	0.9682	0.9424	0.8912	0.7703	0.6034	0.4289	0.3091	0.3435	0.5456	0.8178	0.9401	0.9735	(86)
MIT	20.2946	20.4652	20.6717	20.8766	20.9712	20.9963	20.9995	20.9991	20.9869	20.8554	20.5471	20.2479	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9625	0.9327	0.8742	0.7411	0.5649	0.3854	0.2627	0.2943	0.4964	0.7861	0.9284	0.9686	(89)
MIT 2	19.5189	19.7301	19.9802	20.2151	20.3135	20.3359	20.3381	20.3379	20.3288	20.1970	19.8342	19.4605	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.7615	19.9600	20.1965	20.4220	20.5192	20.5424	20.5450	20.5448	20.5346	20.4029	20.0572	19.7068	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7615	19.9600	20.1965	20.4220	20.5192	20.5424	20.5450	20.5448	20.5346	20.4029	20.0572	19.7068	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9565	0.9264	0.8703	0.7450	0.5756	0.3989	0.2772	0.3097	0.5112	0.7894	0.9227	0.9629	(94)
Useful gains	623.7347	676.5653	687.2569	647.6685	525.4789	360.7555	240.2383	252.2903	387.1876	535.2616	587.9151	605.2655	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	942.0898	917.6264	834.5437	702.0481	537.3651	362.0795	240.3750	252.5452	392.0693	597.3036	789.4977	944.8481	(97)
Space heating kWh	236.8562	161.9931	109.5814	39.1533	8.8434	0.0000	0.0000	0.0000	0.0000	46.1592	145.1395	252.6494	(98a)
Space heating requirement - total per year (kWh/year)												1000.3755	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	236.8562	161.9931	109.5814	39.1533	8.8434	0.0000	0.0000	0.0000	0.0000	46.1592	145.1395	252.6494	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1000.3755	
Space heating per m2											(98c) / (4) =	11.5384	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	236.8562	161.9931	109.5814	39.1533	8.8434	0.0000	0.0000	0.0000	0.0000	46.1592	145.1395	252.6494	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	355.2843	242.9896	164.3721	58.7300	13.2651	0.0000	0.0000	0.0000	0.0000	69.2389	217.7092	378.9742	
Space heating requirement	355.2843	242.9896	164.3721	58.7300	13.2651	0.0000	0.0000	0.0000	0.0000	69.2389	217.7092	378.9742	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1500.5632	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												15.0056	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4919.6640	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1500.8171	0.1574	62.9737	(367)
Electrical energy for heat distribution (space & water)	15.0056	0.0000	8.1772	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			226.2352	(373)
Space and water heating			226.2352	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			140.6603	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6200	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1500.8171	1.5826	633.2709	(467)
Electrical energy for heat distribution (space & water)	15.0056	0.0000	86.5269	(472)
Overall CO2 factor for heat network			0.4254	(486)
Total CO2 associated with community systems			2393.9104	(473)
Space and water heating			2393.9104	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1830.9671	(483)
Dwelling Primary energy Rate (DPER)			21.1200	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
500mm mineral wool	43.3500		43.3500	0.1100	4.7685			(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2577			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.7700	0.0600	0.4062
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	19.4300	0.1200	2.3316
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1426 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 30.4003 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	70.6867	70.4833	70.2839	69.3475	69.1723	68.3567	68.3567	68.2057	68.6709	69.1723	69.5267	69.8973	(39)
Average = Sum(39)m / 12 =												69.3467	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8153	0.8130	0.8107	0.7999	0.7978	0.7884	0.7884	0.7867	0.7921	0.7978	0.8019	0.8062	(40)
HLP (average)												0.7998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(76)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088 (83)
Total gains	634.2986	701.5715	746.4857	809.2850	840.7342	827.5835	792.9978	750.1384	705.1835	645.1554	616.5661	612.8145 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1394	59.3101	59.4783	60.2815	60.4342	61.1552	61.1552	61.2906	60.8754	60.4342	60.1261	59.8073	
alpha	4.9426	4.9540	4.9652	5.0188	5.0289	5.0770	5.0770	5.0860	5.0584	5.0289	5.0084	4.9872	
util living area	0.9780	0.9626	0.9324	0.8486	0.7068	0.5186	0.3776	0.4153	0.6395	0.8760	0.9591	0.9809	(86)
MIT	20.0069	20.1849	20.4265	20.7288	20.9126	20.9852	20.9976	20.9961	20.9592	20.7254	20.3327	19.9815	(87)
Th 2	20.2401	20.2421	20.2441	20.2535	20.2552	20.2634	20.2634	20.2649	20.2602	20.2552	20.2517	20.2480	(88)
util rest of house	0.9736	0.9554	0.9195	0.8222	0.6634	0.4625	0.3152	0.3503	0.5809	0.8482	0.9501	0.9771	(89)
MIT 2	19.0817	19.3064	19.6073	19.9749	20.1773	20.2533	20.2622	20.2630	20.2296	19.9795	19.5015	19.0555	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.3711	19.5812	19.8635	20.2107	20.4073	20.4822	20.4923	20.4923	20.4579	20.2128	19.7615	19.3452	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3711	19.5812	19.8635	20.2107	20.4073	20.4822	20.4923	20.4923	20.4579	20.2128	19.7615	19.3452	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9673	0.9479	0.9121	0.8205	0.6726	0.4794	0.3346	0.3706	0.5971	0.8465	0.9429	0.9713	(94)
Useful gains	613.5639	665.0086	680.8355	664.0567	565.4461	396.7299	265.3698	277.9667	421.0368	546.1054	581.3836	595.2543	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1065.3248	1034.7792	939.2428	784.3688	602.3050	402.0911	266.0617	279.1176	436.5991	664.9400	880.3115	1058.6050	(97)
Space heating kWh	336.1101	248.4859	192.2550	86.6247	27.4230	0.0000	0.0000	0.0000	0.0000	88.4129	215.2280	344.7329	(98a)
Space heating requirement - total per year (kWh/year)												1539.2726	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	336.1101	248.4859	192.2550	86.6247	27.4230	0.0000	0.0000	0.0000	0.0000	88.4129	215.2280	344.7329	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1539.2726	
Space heating per m2											(98c) / (4) =	17.7540	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	336.1101	248.4859	192.2550	86.6247	27.4230	0.0000	0.0000	0.0000	0.0000	88.4129	215.2280	344.7329	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	364.1496	269.2154	208.2936	93.8513	29.7107	0.0000	0.0000	0.0000	0.0000	95.7887	233.1832	373.4918	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.8742	84.4752	83.7639	82.3825	80.8443	79.8000	79.8000	79.8000	79.8000	82.3972	84.1389	84.9536	(217)
Fuel for water heating, kWh/month	275.3264	244.5318	262.0536	234.8094	232.2322	212.3443	209.9929	218.2535	220.5242	237.7128	246.9419	272.1687	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1667.6843	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2866.8916	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3987.8813	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1667.6843	0.2100	350.2137	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2866.8916	0.2100	602.0472	(264)
Space and water heating			952.2610	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			885.3593	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.2100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1667.6843	1.1300	1884.4833	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2866.8916	1.1300	3239.5876	(278)
Space and water heating			5124.0709	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4710.2979	(286)
Target Primary Energy Rate (TPER)			54.3300	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.62	**TER**	10.21
Environmental	99 A	**% DER < TER**			84.13
CO_2 Emissions (t/year)	0.12	**DFEE**	19.03	**TFEE**	23.52
Compliance Check	See BREL	**% DFEE < TFEE**			19.08
% DPER < TPER	61.13	**DPER**	21.12	**TPER**	54.33

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2257	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2878	0.2821	0.2765	0.2483	0.2426	0.2144	0.2144	0.2088	0.2257	0.2426	0.2539	0.2652	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5414	0.5398	0.5382	0.5308	0.5294	0.5230	0.5230	0.5218	0.5255	0.5294	0.5322	0.5352	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15049.3300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							173.5794	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9510	37.8383	37.7278	37.2089	37.1118	36.6599	36.6599	36.5762	36.8339	37.1118	37.3082	37.5135	(38)
Heat transfer coeff	63.8337	63.7210	63.6105	63.0916	62.9945	62.5426	62.5426	62.4589	62.7167	62.9945	63.1909	63.3963	(39)
Average = Sum(39)m / 12 =												63.0912	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7363	0.7350	0.7337	0.7277	0.7266	0.7214	0.7214	0.7204	0.7234	0.7266	0.7288	0.7312	(40)
HLP (average)												0.7277	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
									Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)											908	(64)

Electric shower(s)

54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 614.3496 (64a)

Heat gains from water heating, kWh/month

37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(76)
East	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(76)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	545.1343	624.6069	686.9038	773.6007	821.2924	817.0482	782.1979	728.3014	668.6668	584.4747	536.9133	522.5689	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.4884	65.6043	65.7182	66.2587	66.3608	66.8404	66.8404	66.9299	66.6548	66.3608	66.1546	65.9403	
alpha	5.3659	5.3736	5.3812	5.4172	5.4241	5.4560	5.4560	5.4620	5.4437	5.4241	5.4103	5.3960	
util living area	0.9864	0.9716	0.9383	0.8385	0.6764	0.4848	0.3510	0.3930	0.6244	0.8882	0.9717	0.9890	(86)

MIT	20.0437	20.2412	20.4967	20.7918	20.9449	20.9924	20.9989	20.9980	20.9724	20.7532	20.3531	20.0061	(87)
Th 2	20.3089	20.3101	20.3112	20.3164	20.3174	20.3220	20.3220	20.3228	20.3202	20.3174	20.3154	20.3133	(88)
util rest of house	0.9837	0.9661	0.9267	0.8125	0.6355	0.4353	0.2973	0.3358	0.5701	0.8632	0.9652	0.9867	(89)
MIT 2	19.4297	19.6246	19.8728	20.1500	20.2794	20.3179	20.3216	20.3221	20.3040	20.1221	19.7407	19.3963	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.6218	19.8175	20.0680	20.3508	20.4876	20.5289	20.5335	20.5335	20.5131	20.3195	19.9322	19.5870	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6218	19.8175	20.0680	20.3508	20.4876	20.5289	20.5335	20.5335	20.5131	20.3195	19.9322	19.5870	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9803	0.9614	0.9221	0.8139	0.6459	0.4505	0.3141	0.3537	0.5859	0.8633	0.9609	0.9837	(94)
Useful gains	534.3937	600.5218	633.3960	629.6398	530.5035	368.0722	245.7026	257.5964	391.7389	504.5545	515.9253	514.0515	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	978.0444	950.5557	863.0678	722.4481	553.5695	370.8085	246.0090	258.1748	402.2069	612.2735	810.8819	975.4807	(97)
Space heating kWh	330.0761	235.2228	170.8758	66.8220	17.1611	0.0000	0.0000	0.0000	0.0000	80.1429	212.3687	343.3033	(98a)
Space heating requirement - total per year (kWh/year)												1455.9728	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	330.0761	235.2228	170.8758	66.8220	17.1611	0.0000	0.0000	0.0000	0.0000	80.1429	212.3687	343.3033	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1455.9728	
Space heating per m2											(98c) / (4) =	16.7932	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	587.9004	462.8152	474.6877	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9622	0.9834	0.9747	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	565.6804	455.1416	462.6958	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	890.8770	853.1757	792.9430	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	234.1415	296.1374	245.7039	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	58.5354	74.0344	61.4260	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												193.9957	(107)
Energy for space heating												16.7932	(99)
Energy for space cooling												2.2376	(108)
Total												19.0308	(109)
Fabric Energy Efficiency (DFEE)												19.0	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
500mm mineral wool	43.3500		43.3500	0.1100	4.7685			(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2577			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.7700	0.0600	0.4062
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	19.4300	0.1200	2.3316
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1426 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.4003 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	70.6867	70.4833	70.2839	69.3475	69.1723	68.3567	68.3567	68.2057	68.6709	69.1723	69.5267	69.8973	(39)
Average = Sum(39)m / 12 =												69.3467	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8153	0.8130	0.8107	0.7999	0.7978	0.7884	0.7884	0.7867	0.7921	0.7978	0.8019	0.8062	(40)
HLP (average)												0.7998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												64.3029	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122 (71)

Water heating gains (Table 5)

	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778 (72)

Total internal gains

	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(76)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088 (83)
Total gains	533.6898	602.2192	650.0344	719.8289	755.3931	749.5884	717.9735	673.1335	625.7862	557.9097	522.6435	513.1575 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1394	59.3101	59.4783	60.2815	60.4342	61.1552	61.1552	61.2906	60.8754	60.4342	60.1261	59.8073	
alpha	4.9426	4.9540	4.9652	5.0188	5.0289	5.0770	5.0770	5.0860	5.0584	5.0289	5.0084	4.9872	
util living area	0.9891	0.9792	0.9583	0.8907	0.7608	0.5672	0.4160	0.4609	0.7019	0.9203	0.9783	0.9909	(86)
MIT	19.8430	20.0330	20.2967	20.6477	20.8778	20.9780	20.9962	20.9938	20.9383	20.6332	20.1903	19.8168	(87)
Th 2	20.2401	20.2421	20.2441	20.2535	20.2552	20.2634	20.2634	20.2649	20.2602	20.2552	20.2517	20.2480	(88)
util rest of house	0.9867	0.9748	0.9495	0.8689	0.7189	0.5076	0.3477	0.3896	0.6427	0.8994	0.9731	0.9889	(89)
MIT 2	19.1761	19.3652	19.6250	19.9653	20.1684	20.2515	20.2620	20.2624	20.2230	19.9593	19.5296	19.1564	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.3847	19.5741	19.8351	20.1787	20.3903	20.4788	20.4917	20.4912	20.4468	20.1701	19.7363	19.3629	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3847	19.5741	19.8351	20.1787	20.3903	20.4788	20.4917	20.4912	20.4468	20.1701	19.7363	19.3629	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9834	0.9701	0.9439	0.8665	0.7269	0.5254	0.3690	0.4118	0.6583	0.8966	0.9686	0.9860	(94)
Useful gains	524.8327	584.2407	613.5446	623.7020	549.0775	393.8023	264.9348	277.1807	411.9421	500.2349	506.2127	505.9545	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1066.2872	1034.2797	937.2438	782.1511	601.1278	401.8523	266.0207	279.0435	435.8379	661.9873	878.5600	1059.8483	(97)
Space heating kWh	402.8422	302.4263	240.8322	114.0833	38.7255	0.0000	0.0000	0.0000	0.0000	120.3438	268.0900	412.0970	(98a)
Space heating requirement - total per year (kWh/year)												1899.4402	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	402.8422	302.4263	240.8322	114.0833	38.7255	0.0000	0.0000	0.0000	0.0000	120.3438	268.0900	412.0970	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1899.4402	
Space heating per m2										(98c) / (4) =		21.9082	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	642.5530	505.8396	518.3630	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9162	0.9576	0.9415	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	588.7112	484.3929	488.0519	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	812.0280	778.1082	728.4611	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	160.7881	218.5242	178.8644	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	40.1970	54.6310	44.7161	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												139.5442	(107)
Energy for space heating												21.9082	(99)
Energy for space cooling												1.6095	(108)
Total												23.5177	(109)
Fabric Energy Efficiency (TFEE)												23.5	(109)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.62	**TER**	10.21
Environmental	99 A	**% DER < TER**			84.13
CO_2 Emissions (t/year)	0.12	**DFEE**	19.03	**TFEE**	23.52
Compliance Check	See BREL	**% DFEE < TFEE**			19.08
% DPER < TPER	61.13	**DPER**	21.12	**TPER**	54.33

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
12Total per year (kWh/year)												2752	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(76)
East	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(76)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	652.0784	730.2946	789.6905	869.3922	912.9689	904.3786	866.5575	814.6416	757.3995	678.0557	637.1713	628.5612	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area	0.9682	0.9424	0.8912	0.7703	0.6034	0.4289	0.3091	0.3435	0.5456	0.8178	0.9401	0.9735	(86)
MIT	20.2946	20.4652	20.6717	20.8766	20.9712	20.9963	20.9995	20.9991	20.9869	20.8554	20.5471	20.2479	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9625	0.9327	0.8742	0.7411	0.5649	0.3854	0.2627	0.2943	0.4964	0.7861	0.9284	0.9686	(89)
MIT 2	19.5189	19.7301	19.9802	20.2151	20.3135	20.3359	20.3381	20.3379	20.3288	20.1970	19.8342	19.4605	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.7615	19.9600	20.1965	20.4220	20.5192	20.5424	20.5450	20.5448	20.5346	20.4029	20.0572	19.7068	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7615	19.9600	20.1965	20.4220	20.5192	20.5424	20.5450	20.5448	20.5346	20.4029	20.0572	19.7068	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9565	0.9264	0.8703	0.7450	0.5756	0.3989	0.2772	0.3097	0.5112	0.7894	0.9227	0.9629	(94)
Useful gains	623.7347	676.5653	687.2569	647.6685	525.4789	360.7555	240.2383	252.2903	387.1876	535.2616	587.9151	605.2655	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	942.0898	917.6264	834.5437	702.0481	537.3651	362.0795	240.3750	252.5452	392.0693	597.3036	789.4977	944.8481	(97)
Space heating kWh	236.8562	161.9931	109.5814	39.1533	8.8434	0.0000	0.0000	0.0000	0.0000	46.1592	145.1395	252.6494	(98a)
Space heating requirement - total per year (kWh/year)												1000.3755	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	236.8562	161.9931	109.5814	39.1533	8.8434	0.0000	0.0000	0.0000	0.0000	46.1592	145.1395	252.6494	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1000.3755	
Space heating per m2											(98c) / (4) =	11.5384	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	236.8562	161.9931	109.5814	39.1533	8.8434	0.0000	0.0000	0.0000	0.0000	46.1592	145.1395	252.6494	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	355.2843	242.9896	164.3721	58.7300	13.2651	0.0000	0.0000	0.0000	0.0000	69.2389	217.7092	378.9742	
Space heating requirement	355.2843	242.9896	164.3721	58.7300	13.2651	0.0000	0.0000	0.0000	0.0000	69.2389	217.7092	378.9742	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1500.5632	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												15.0056	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4919.6640	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1500.8171	0.1574	62.9737	(367)
Electrical energy for heat distribution (space & water)	15.0056	0.0000	8.1772	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			226.2352	(373)
Space and water heating			226.2352	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			140.6603	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6200	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1500.8171	1.5826	633.2709	(467)
Electrical energy for heat distribution (space & water)	15.0056	0.0000	86.5269	(472)
Overall CO2 factor for heat network			0.4254	(486)
Total CO2 associated with community systems			2393.9104	(473)
Space and water heating			2393.9104	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1830.9671	(483)
Dwelling Primary energy Rate (DPER)			21.1200	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
500mm mineral wool	43.3500		43.3500	0.1100	4.7685			(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2577			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.7700	0.0600	0.4062
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	19.4300	0.1200	2.3316
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1426 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 30.4003 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	70.6867	70.4833	70.2839	69.3475	69.1723	68.3567	68.3567	68.2057	68.6709	69.1723	69.5267	69.8973	(39)
Average = Sum(39)m / 12 =												69.3467	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8153	0.8130	0.8107	0.7999	0.7978	0.7884	0.7884	0.7867	0.7921	0.7978	0.8019	0.8062	(40)
HLP (average)												0.7998	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(76)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088 (83)
Total gains	634.2986	701.5715	746.4857	809.2850	840.7342	827.5835	792.9978	750.1384	705.1835	645.1554	616.5661	612.8145 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.1394	59.3101	59.4783	60.2815	60.4342	61.1552	61.1552	61.2906	60.8754	60.4342	60.1261	59.8073	
alpha	4.9426	4.9540	4.9652	5.0188	5.0289	5.0770	5.0770	5.0860	5.0584	5.0289	5.0084	4.9872	
util living area	0.9780	0.9626	0.9324	0.8486	0.7068	0.5186	0.3776	0.4153	0.6395	0.8760	0.9591	0.9809	(86)
MIT	20.0069	20.1849	20.4265	20.7288	20.9126	20.9852	20.9976	20.9961	20.9592	20.7254	20.3327	19.9815	(87)
Th 2	20.2401	20.2421	20.2441	20.2535	20.2552	20.2634	20.2634	20.2649	20.2602	20.2552	20.2517	20.2480	(88)
util rest of house	0.9736	0.9554	0.9195	0.8222	0.6634	0.4625	0.3152	0.3503	0.5809	0.8482	0.9501	0.9771	(89)
MIT 2	19.0817	19.3064	19.6073	19.9749	20.1773	20.2533	20.2622	20.2630	20.2296	19.9795	19.5015	19.0555	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.3711	19.5812	19.8635	20.2107	20.4073	20.4822	20.4923	20.4923	20.4579	20.2128	19.7615	19.3452	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3711	19.5812	19.8635	20.2107	20.4073	20.4822	20.4923	20.4923	20.4579	20.2128	19.7615	19.3452	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9673	0.9479	0.9121	0.8205	0.6726	0.4794	0.3346	0.3706	0.5971	0.8465	0.9429	0.9713	(94)
Useful gains	613.5639	665.0086	680.8355	664.0567	565.4461	396.7299	265.3698	277.9667	421.0368	546.1054	581.3836	595.2543	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1065.3248	1034.7792	939.2428	784.3688	602.3050	402.0911	266.0617	279.1176	436.5991	664.9400	880.3115	1058.6050	(97)
Space heating kWh	336.1101	248.4859	192.2550	86.6247	27.4230	0.0000	0.0000	0.0000	0.0000	88.4129	215.2280	344.7329	(98a)
Space heating requirement - total per year (kWh/year)												1539.2726	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	336.1101	248.4859	192.2550	86.6247	27.4230	0.0000	0.0000	0.0000	0.0000	88.4129	215.2280	344.7329	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1539.2726	
Space heating per m2											(98c) / (4) =	17.7540	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	336.1101	248.4859	192.2550	86.6247	27.4230	0.0000	0.0000	0.0000	0.0000	88.4129	215.2280	344.7329	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	364.1496	269.2154	208.2936	93.8513	29.7107	0.0000	0.0000	0.0000	0.0000	95.7887	233.1832	373.4918	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.8742	84.4752	83.7639	82.3825	80.8443	79.8000	79.8000	79.8000	79.8000	82.3972	84.1389	84.9536	(217)
Fuel for water heating, kWh/month	275.3264	244.5318	262.0536	234.8094	232.2322	212.3443	209.9929	218.2535	220.5242	237.7128	246.9419	272.1687	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.0882	-28.5517	-43.5008	-51.9243	-58.6422	-55.6977	-55.0197	-50.6287	-43.3479	-33.9577	-21.5608	-16.3171	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3010	-13.6026	-27.7041	-42.6139	-57.3511	-58.0065	-57.3242	-48.0668	-34.6229	-19.7734	-8.5129	-4.9570	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1667.6843	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2866.8916	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-857.0729	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3987.8813	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1667.6843	0.2100	350.2137	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2866.8916	0.2100	602.0472	(264)
Space and water heating			952.2610	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	0.1334	-63.7846	
PV Unit electricity exported	-378.8362	0.1252	-47.4311	
Total			-111.2157	(269)
Total CO2, kg/year			885.3593	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.2100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1667.6843	1.1300	1884.4833	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2866.8916	1.1300	3239.5876	(278)
Space and water heating			5124.0709	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2367	1.4929	-713.9407	
PV Unit electricity exported	-378.8362	0.4595	-174.0918	
Total			-888.0325	(283)
Total Primary energy kWh/year			4710.2979	(286)
Target Primary Energy Rate (TPER)			54.3300	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.62	**TER**	10.21
Environmental	99 A	**% DER < TER**			84.13
CO_2 Emissions (t/year)	0.12	**DFEE**	19.03	**TFEE**	23.52
Compliance Check	See BREL	**% DFEE < TFEE**			19.08
% DPER < TPER	61.13	**DPER**	21.12	**TPER**	54.33

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(76)
East	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(76)
Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	706.5297	768.1759	833.8294	897.3119	933.0604	910.4848	872.9142	823.2320	769.6084	706.4837	673.4276	678.8029	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area													
	0.9560	0.9306	0.8713	0.7540	0.5919	0.4261	0.3068	0.3399	0.5376	0.7983	0.9267	0.9634	(86)
MIT	20.3751	20.5139	20.7132	20.8892	20.9738	20.9964	20.9995	20.9992	20.9878	20.8726	20.5928	20.3248	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house													
	0.9485	0.9194	0.8526	0.7244	0.5538	0.3829	0.2608	0.2913	0.4890	0.7654	0.9131	0.9570	(89)
MIT 2	19.6185	19.7890	20.0283	20.2283	20.3157	20.3359	20.3382	20.3380	20.3294	20.2150	19.8890	19.5562	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8552	20.0157	20.2426	20.4350	20.5216	20.5425	20.5450	20.5448	20.5354	20.4207	20.1091	19.7966	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8552	20.0157	20.2426	20.4350	20.5216	20.5425	20.5450	20.5448	20.5354	20.4207	20.1091	19.7966	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9421	0.9134	0.8497	0.7288	0.5645	0.3963	0.2752	0.3065	0.5036	0.7697	0.9078	0.9508	(94)
Useful gains	665.6232	701.6258	708.4743	654.0033	526.6868	360.8043	240.2441	252.3055	387.5770	543.7723	611.3326	645.4182	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	947.7957	921.0206	837.3507	702.8419	537.5093	362.0852	240.3757	252.5470	392.1155	598.3872	792.6626	950.3189	(97)
Space heating kWh													
	209.9363	147.4333	95.8841	35.1638	8.0519	0.0000	0.0000	0.0000	0.0000	40.6336	130.5576	226.8461	(98a)
Space heating requirement - total per year (kWh/year)												894.5067	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	209.9363	147.4333	95.8841	35.1638	8.0519	0.0000	0.0000	0.0000	0.0000	40.6336	130.5576	226.8461	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												894.5067	
Space heating per m2											(98c) / (4) =	10.3173	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	209.9363	147.4333	95.8841	35.1638	8.0519	0.0000	0.0000	0.0000	0.0000	40.6336	130.5576	226.8461	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	314.9045	221.1499	143.8261	52.7457	12.0779	0.0000	0.0000	0.0000	0.0000	60.9503	195.8364	340.2692	
Space heating requirement													
	314.9045	221.1499	143.8261	52.7457	12.0779	0.0000	0.0000	0.0000	0.0000	60.9503	195.8364	340.2692	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1341.7601	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												13.4176	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4760.8608	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1341.7601	4.4400	59.5741	(340a)
Space heating total			59.5741	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			268.1652	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7330 (357)
SAP value		88.1177
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1458.4696	0.1574	56.3147	(367)
Electrical energy for heat distribution (space & water)	13.4176	0.0000	7.9275	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			219.3265	(373)
Space and water heating			219.3265	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			133.7516	(383)
CO2 emissions per m2			1.5400	(384)
EI value			98.6391	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)

Average = Sum(39)m / 12 = 60.9312

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)											Total = Sum(45)m =	2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)

Total per year (kWh/year) = Sum(64)m = 2751.6674 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	7.4800	23.7835	0.7600	0.7000	0.7700	65.5876	(76)
East	1.7600	23.7835	0.7600	0.7000	0.7700	15.4324	(76)

Solar gains	81.0200	140.8292	228.1692	335.8028	395.8111	434.4066	405.9044	355.9037	279.8628	176.2264	99.5150	67.0100	(83)
Total gains	720.6439	778.1231	846.4545	918.7565	943.6137	950.5115	903.3528	856.6161	798.7845	727.4075	689.5188	690.7928	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area													
	0.9490	0.9223	0.8511	0.7238	0.5575	0.3709	0.2629	0.2914	0.4979	0.7588	0.9119	0.9578	(86)
MIT	20.4239	20.5524	20.7578	20.9126	20.9814	20.9984	20.9998	20.9997	20.9920	20.9064	20.6460	20.3721	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house													
	0.9403	0.9100	0.8301	0.6925	0.5185	0.3289	0.2184	0.2445	0.4500	0.7224	0.8959	0.9504	(89)
MIT 2	19.6790	19.8360	20.0804	20.2532	20.3229	20.3374	20.3383	20.3382	20.3327	20.2506	19.9528	19.6153	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9120	20.0601	20.2923	20.4594	20.5289	20.5441	20.5452	20.5451	20.5389	20.4558	20.1696	19.8520	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9120	20.0601	20.2923	20.4594	20.5289	20.5441	20.5452	20.5451	20.5389	20.4558	20.1696	19.8520	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9339	0.9042	0.8286	0.6984	0.5298	0.3420	0.2323	0.2592	0.4646	0.7291	0.8914	0.9441	(94)
Useful gains	673.0450	703.5786	701.3423	641.6458	499.9677	325.0775	209.8744	222.0133	371.1353	530.3712	614.6497	652.1881	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	932.9783	905.4425	809.9161	679.9568	507.4882	325.6242	209.9217	222.1021	374.0528	570.0578	771.9758	935.4164	(97)
Space heating kWh													
	193.3904	135.6525	80.7789	27.5839	5.5952	0.0000	0.0000	0.0000	0.0000	29.5268	113.2748	210.7218	(98a)
Space heating requirement - total per year (kWh/year)												796.5245	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	193.3904	135.6525	80.7789	27.5839	5.5952	0.0000	0.0000	0.0000	0.0000	29.5268	113.2748	210.7218	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												796.5245	
Space heating per m2											(98c) / (4) =	9.1871	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	193.3904	135.6525	80.7789	27.5839	5.5952	0.0000	0.0000	0.0000	0.0000	29.5268	113.2748	210.7218	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	290.0857	203.4788	121.1684	41.3758	8.3928	0.0000	0.0000	0.0000	0.0000	44.2902	169.9122	316.0827	
Space heating requirement													
	290.0857	203.4788	121.1684	41.3758	8.3928	0.0000	0.0000	0.0000	0.0000	44.2902	169.9122	316.0827	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)

Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year	
Space heating fuel - community heating	1194.7867 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	11.9479 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)	
mechanical ventilation fans (SFP = 0.1292)	33.4924 (330a)
Total electricity for the above, kWh/year	33.4924 (331)
Electricity for lighting (calculated in Appendix L)	216.3282 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4517.3614 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1194.7867	6.5500	78.2585	(340a)
Space heating total			78.2585	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			341.5636	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1419.2767	0.1579	50.2948	(367)
Electrical energy for heat distribution (space & water)	11.9479	0.0000	7.7017	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			213.0809	(373)
Space and water heating			213.0809	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			115.2479	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1419.2767	1.5844	504.7916	(467)
Electrical energy for heat distribution (space & water)	11.9479	0.0000	81.7089	(472)
Overall CO2 factor for heat network			0.4247	(486)
Total CO2 associated with community systems			2260.6131	(473)
Space and water heating			2260.6131	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1616.7779	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - West

Current energy efficiency rating: B 88
Current environmental impact rating: A 99

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£71	£71	£0
Community scheme	£453	£453	£0
Space heating	£192	£192	£0
Water heating	£270	£270	£0
Lighting	£62	£62	£0
Generated (PV)	-£182	-£182	£0
Total cost of fuels	£342	£342	£0
Total cost of uses	£342	£342	£0
Delivered energy	52 kWh/m²	52 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	19 kWh/m²	19 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5778 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day)	126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(76)
East	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	706.5297	768.1759	833.8294	897.3119	933.0604	910.4848	872.9142	823.2320	769.6084	706.4837	673.4276	678.8029	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area	0.9560	0.9306	0.8713	0.7540	0.5919	0.4261	0.3068	0.3399	0.5376	0.7983	0.9267	0.9634	(86)
MIT	20.3751	20.5139	20.7132	20.8892	20.9738	20.9964	20.9995	20.9992	20.9878	20.8726	20.5928	20.3248	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house	0.9485	0.9194	0.8526	0.7244	0.5538	0.3829	0.2608	0.2913	0.4890	0.7654	0.9131	0.9570	(89)
MIT 2	19.6185	19.7890	20.0283	20.2283	20.3157	20.3359	20.3382	20.3380	20.3294	20.2150	19.8890	19.5562	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8552	20.0157	20.2426	20.4350	20.5216	20.5425	20.5450	20.5448	20.5354	20.4207	20.1091	19.7966	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8552	20.0157	20.2426	20.4350	20.5216	20.5425	20.5450	20.5448	20.5354	20.4207	20.1091	19.7966	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9421	0.9134	0.8497	0.7288	0.5645	0.3963	0.2752	0.3065	0.5036	0.7697	0.9078	0.9508	(94)
Useful gains	665.6232	701.6258	708.4743	654.0033	526.6868	360.8043	240.2441	252.3055	387.5770	543.7723	611.3326	645.4182	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	947.7957	921.0206	837.3507	702.8419	537.5093	362.0852	240.3757	252.5470	392.1155	598.3872	792.6626	950.3189	(97)
Space heating kWh	209.9363	147.4333	95.8841	35.1638	8.0519	0.0000	0.0000	0.0000	0.0000	40.6336	130.5576	226.8461	(98a)
Space heating requirement - total per year (kWh/year)												894.5067	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	209.9363	147.4333	95.8841	35.1638	8.0519	0.0000	0.0000	0.0000	0.0000	40.6336	130.5576	226.8461	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												894.5067	
Space heating per m2										(98c) / (4) =		10.3173	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

Space heating:

Space heating requirement

	209.9363	147.4333	95.8841	35.1638	8.0519	0.0000	0.0000	0.0000	0.0000	40.6336	130.5576	226.8461 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	314.9045	221.1499	143.8261	52.7457	12.0779	0.0000	0.0000	0.0000	0.0000	60.9503	195.8364	340.2692
Space heating requirement												
	314.9045	221.1499	143.8261	52.7457	12.0779	0.0000	0.0000	0.0000	0.0000	60.9503	195.8364	340.2692 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388
Water heating fuel												
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446 (331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year

Space heating fuel - community heating 1341.7601 (307)
Space heating fuel - secondary 0.0000 (309)
Water heating fuel - community heating 4127.5010 (310)

Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	13.4176	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4760.8608	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1341.7601	4.4400	59.5741	(340a)
Space heating total			59.5741	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			268.1652	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.7330	(357)
SAP value	88.1177	
SAP rating (Section 12)	88	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1458.4696	0.1574	56.3147	(367)
Electrical energy for heat distribution (space & water)	13.4176	0.0000	7.9275	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			219.3265	(373)
Space and water heating			219.3265	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			133.7516	(383)
CO2 emissions per m2			1.5400	(384)
EI value			98.6391	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
Balcony Door			1.7600	1.0536	1.8544			(27)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2300	5.0508	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2000	3.3180	150.0000	2488.5000	(29a)
500mm mineral wool	43.3500		43.3500	0.0900	3.9015	10.0000	433.5000	(30)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.0894			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Floor			43.3500			70.0000	3034.5000	(32d)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15049.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		173.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	25.8827 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	60.9312	(39)
Average = Sum(39)m / 12 =												60.9312	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	0.7028	(40)
HLP (average)												0.7028	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5778	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	7.4800	23.7835	0.7600	0.7000	0.7700	65.5876	(76)
East	1.7600	23.7835	0.7600	0.7000	0.7700	15.4324	(76)

Solar gains	81.0200	140.8292	228.1692	335.8028	395.8111	434.4066	405.9044	355.9037	279.8628	176.2264	99.5150	67.0100	(83)
Total gains	720.6439	778.1231	846.4545	918.7565	943.6137	950.5115	903.3528	856.6161	798.7845	727.4075	689.5188	690.7928	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	68.6080	
alpha	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	5.5739	
util living area													
	0.9490	0.9223	0.8511	0.7238	0.5575	0.3709	0.2629	0.2914	0.4979	0.7588	0.9119	0.9578	(86)
MIT	20.4239	20.5524	20.7578	20.9126	20.9814	20.9984	20.9998	20.9997	20.9920	20.9064	20.6460	20.3721	(87)
Th 2	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	20.3384	(88)
util rest of house													
	0.9403	0.9100	0.8301	0.6925	0.5185	0.3289	0.2184	0.2445	0.4500	0.7224	0.8959	0.9504	(89)
MIT 2	19.6790	19.8360	20.0804	20.2532	20.3229	20.3374	20.3383	20.3382	20.3327	20.2506	19.9528	19.6153	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9120	20.0601	20.2923	20.4594	20.5289	20.5441	20.5452	20.5451	20.5389	20.4558	20.1696	19.8520	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9120	20.0601	20.2923	20.4594	20.5289	20.5441	20.5452	20.5451	20.5389	20.4558	20.1696	19.8520	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9339	0.9042	0.8286	0.6984	0.5298	0.3420	0.2323	0.2592	0.4646	0.7291	0.8914	0.9441	(94)
Useful gains	673.0450	703.5786	701.3423	641.6458	499.9677	325.0775	209.8744	222.0133	371.1353	530.3712	614.6497	652.1881	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	932.9783	905.4425	809.9161	679.9568	507.4882	325.6242	209.9217	222.1021	374.0528	570.0578	771.9758	935.4164	(97)
Space heating kWh													
	193.3904	135.6525	80.7789	27.5839	5.5952	0.0000	0.0000	0.0000	0.0000	29.5268	113.2748	210.7218	(98a)
Space heating requirement - total per year (kWh/year)												796.5245	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	193.3904	135.6525	80.7789	27.5839	5.5952	0.0000	0.0000	0.0000	0.0000	29.5268	113.2748	210.7218	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												796.5245	
Space heating per m2											(98c) / (4) =	9.1871	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement

	193.3904	135.6525	80.7789	27.5839	5.5952	0.0000	0.0000	0.0000	0.0000	29.5268	113.2748	210.7218 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	290.0857	203.4788	121.1684	41.3758	8.3928	0.0000	0.0000	0.0000	0.0000	44.2902	169.9122	316.0827
Space heating requirement												
	290.0857	203.4788	121.1684	41.3758	8.3928	0.0000	0.0000	0.0000	0.0000	44.2902	169.9122	316.0827 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388
Water heating fuel												
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446 (331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year	
Space heating fuel - community heating	1194.7867 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	11.9479 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)	
mechanical ventilation fans (SFP = 0.1292)	33.4924 (330a)
Total electricity for the above, kWh/year	33.4924 (331)
Electricity for lighting (calculated in Appendix L)	216.3282 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4517.3614 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1194.7867	6.5500	78.2585	(340a)
Space heating total			78.2585	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			341.5636	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1419.2767	0.1579	50.2948	(367)
Electrical energy for heat distribution (space & water)	11.9479	0.0000	7.7017	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			213.0809	(373)
Space and water heating			213.0809	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			115.2479	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)

Space and Water heating from Heat pump	1419.2767	1.5844	504.7916 (467)
Electrical energy for heat distribution (space & water)	11.9479	0.0000	81.7089 (472)
Overall CO2 factor for heat network			0.4247 (486)
Total CO2 associated with community systems			2260.6131 (473)
Space and water heating			2260.6131 (476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673 (478)
Energy for lighting	216.3282	1.5338	331.8115 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405
PV Unit electricity exported	-520.7528	0.4449	-231.6735
Total			-1026.3140 (480)
Total Primary energy kWh/year			1616.7779 (483)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	81 B	**DER**	4.44	**TER**	16.89
Environmental	97 A	**% DER < TER**			73.71
CO_2 Emissions (t/year)	0.18	**DFEE**	22.87	**TFEE**	37.04
Compliance Check	See BREL	**% DFEE < TFEE**			38.26
% DPER < TPER	48.24	**DPER**	47.21	**TPER**	91.21

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	

Distribution loss (46)m = 0.15 x (45)m

23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)	
									Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)	
12Total per year (kWh/year)											2188	(64)	

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)

Water heating gains (Table 5)

130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)

Total internal gains

377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	419.7672	467.2558	506.0368	555.7052	584.1265	578.6970	555.6038	523.3987	486.8526	437.0989	410.7463	405.5434	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106

alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874		
util living area	0.9673	0.9391	0.8794	0.7447	0.5704	0.4010	0.2876	0.3191	0.5109	0.7927	0.9345	0.9729	(86)
MIT	20.4545	20.6028	20.7778	20.9302	20.9874	20.9988	20.9999	20.9998	20.9949	20.9148	20.6707	20.4133	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house	0.9595	0.9258	0.8561	0.7074	0.5252	0.3525	0.2367	0.2651	0.4549	0.7507	0.9180	0.9663	(89)
MIT 2	19.6081	19.7882	19.9933	20.1575	20.2113	20.2201	20.2207	20.2206	20.2177	20.1463	19.8733	19.5573	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0123	20.1773	20.3680	20.5265	20.5820	20.5920	20.5929	20.5928	20.5889	20.5134	20.2542	19.9662	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0123	20.1773	20.3680	20.5265	20.5820	20.5920	20.5929	20.5928	20.5889	20.5134	20.2542	19.9662	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9571	0.9250	0.8608	0.7224	0.5463	0.3756	0.2610	0.2909	0.4815	0.7671	0.9188	0.9637	(94)
Useful gains	401.7598	432.2106	435.6061	401.4579	319.1330	217.3690	145.0173	152.2566	234.4309	335.3008	377.3945	390.8402	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	570.7504	554.9474	503.7549	422.3338	322.6373	217.6595	145.0404	152.3026	235.7086	360.1025	477.8254	572.7063	(97)
Space heating kWh	125.7290	82.4791	50.7027	15.0307	2.6072	0.0000	0.0000	0.0000	0.0000	18.4524	72.3102	135.3084	(98a)
Space heating requirement - total per year (kWh/year)												502.6198	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	125.7290	82.4791	50.7027	15.0307	2.6072	0.0000	0.0000	0.0000	0.0000	18.4524	72.3102	135.3084	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												502.6198	
Space heating per m2											(98c) / (4) =	11.5918	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	125.7290	82.4791	50.7027	15.0307	2.6072	0.0000	0.0000	0.0000	0.0000	18.4524	72.3102	135.3084	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	188.5935	123.7187	76.0541	22.5460	3.9108	0.0000	0.0000	0.0000	0.0000	27.6786	108.4654	202.9626	
Space heating requirement	188.5935	123.7187	76.0541	22.5460	3.9108	0.0000	0.0000	0.0000	0.0000	27.6786	108.4654	202.9626	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												753.9297	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												7.5393	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4178.0134	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			350.0000	(367)
Space and Water heating from Heat pump	1152.9737	0.1580	34.0394	(367)
Electrical energy for heat distribution (space & water)	7.5393	0.0000	5.8093	(372)
Overall CO2 factor for heat network			0.0426	(386)
Total CO2 associated with community systems			171.7880	(373)
Space and water heating			171.7880	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Total CO2, kg/year			192.3033	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.4400	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			350.0000	(467a)
Space and Water heating from Heat pump	1152.9737	1.5850	341.4125	(467)
Electrical energy for heat distribution (space & water)	7.5393	0.0000	61.8392	(472)
Overall CO2 factor for heat network			0.4532	(486)
Total CO2 associated with community systems			1828.6728	(473)
Space and water heating			1828.6728	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Total Primary energy kWh/year			2047.1548	(483)
Dwelling Primary energy Rate (DPER)			47.2100	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		2 * 10 =	20.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		20.0000 / (5) =	0.1883 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.4383 (18)
Number of sides sheltered			3 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.3397 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4004			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830	
E3 Sill	4.7600	0.0500	0.2380	
E4 Jamb	23.1600	0.0500	1.1580	
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284	
E16 Corner (normal)	5.0000	0.0900	0.4500	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000	
E18 Party wall between dwellings	5.0000	0.0600	0.3000	
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000	
E5 Ground floor (normal)	26.1200	0.1600	4.1792	
P1 Party wall - Ground floor	6.7000	0.0800	0.5360	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)											Total = Sum(45)m =	1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
										Total per year (kWh/year) = Sum(64)m =		1875.8483	(64)
12Total per year (kWh/year)												1876	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6300	0.7000	0.7700	39.0751	(80)

Solar gains	39.0751	76.4392	125.8845	183.5950	225.0025	230.3301	219.2837	188.3614	146.4088	90.7015	48.7221	32.1335	(83)
Total gains	408.2958	452.6009	487.6757	532.6961	557.8990	548.9788	526.8301	497.0792	463.7948	421.5301	398.4414	394.6229	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area	0.9835	0.9715	0.9453	0.8705	0.7337	0.5459	0.3986	0.4393	0.6725	0.8975	0.9688	0.9858	(86)
MIT	19.9106	20.0893	20.3508	20.6786	20.8917	20.9802	20.9966	20.9946	20.9463	20.6744	20.2495	19.8847	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house	0.9788	0.9636	0.9300	0.8369	0.6745	0.4660	0.3088	0.3457	0.5907	0.8627	0.9586	0.9817	(89)
MIT 2	18.7312	18.9566	19.2810	19.6746	19.8997	19.9839	19.9936	19.9945	19.9575	19.6814	19.1685	18.7054	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.2945	19.4976	19.7920	20.1541	20.3735	20.4597	20.4726	20.4722	20.4298	20.1557	19.6848	19.2687	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2945	19.4976	19.7920	20.1541	20.3735	20.4597	20.4726	20.4722	20.4298	20.1557	19.6848	19.2687	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9749	0.9591	0.9268	0.8431	0.6982	0.5036	0.3518	0.3904	0.6277	0.8693	0.9550	0.9781	(94)
Useful gains	398.0469	434.0923	451.9850	449.0967	389.5280	276.4737	185.3267	194.0822	291.1077	366.4217	380.5039	385.9848	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	742.0577	720.5526	654.4403	547.4923	420.9954	281.4218	185.9884	195.1855	305.2431	463.8155	613.6442	738.2617	(97)
Space heating kWh	255.9441	192.5013	150.6267	70.8448	23.4117	0.0000	0.0000	0.0000	0.0000	72.4610	167.8610	262.0940	(98a)
Space heating requirement - total per year (kWh/year)												1195.7446	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	255.9441	192.5013	150.6267	70.8448	23.4117	0.0000	0.0000	0.0000	0.0000	72.4610	167.8610	262.0940	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1195.7446	
Space heating per m2											(98c) / (4) =	27.5771	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 92.3000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	255.9441	192.5013	150.6267	70.8448	23.4117	0.0000	0.0000	0.0000	0.0000	72.4610	167.8610	262.0940	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	277.2959	208.5604	163.1925	76.7550	25.3648	0.0000	0.0000	0.0000	0.0000	78.5060	181.8645	283.9588	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.8067	84.4420	83.7496	82.4371	80.9080	79.8000	79.8000	79.8000	79.8000	82.4529	84.1107	84.8812	(217)
Fuel for water heating, kWh/month	216.3157	192.3305	206.6676	186.3399	185.2114	170.5061	169.2907	175.3325	176.4869	188.9442	195.0948	214.0019	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 1295.4979 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 79.8000
Water heating fuel used 2276.5223 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
Total electricity for the above, kWh/year 86.0000 (231)
Electricity for lighting (calculated in Appendix L) 116.2701 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3417.0942	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1295.4979	0.2100	272.0546	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2276.5223	0.2100	478.0697	(264)
Space and water heating			750.1242	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			732.4217	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.8900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1295.4979	1.1300	1463.9126	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2276.5223	1.1300	2572.4702	(278)
Space and water heating			4036.3829	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3954.8804	(286)
Target Primary Energy Rate (TPER)			91.2100	(287)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	81 B	**DER**	4.44	**TER**	16.89
Environmental	97 A	**% DER < TER**			73.71
CO_2 Emissions (t/year)	0.18	**DFEE**	22.87	**TFEE**	37.04
Compliance Check	See BREL	**% DFEE < TFEE**			38.26
% DPER < TPER	48.24	**DPER**	47.21	**TPER**	91.21

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
						(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2622	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)

Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	38.2833	38.2073	38.1327	37.7826	37.7171	37.4122	37.4122	37.3557	37.5296	37.7171	37.8496	37.9882	(39)
Average = Sum(39)m / 12 =												37.7823	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8829	0.8812	0.8794	0.8714	0.8699	0.8628	0.8628	0.8615	0.8655	0.8699	0.8729	0.8761	(40)
HLP (average)												0.8714	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
							Total per year (kWh/year) = Sum(64)m =				663.9767	(64)
12Total per year (kWh/year)											664	(64)

Electric shower(s)

39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
				Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							449.4572	(64a)

Heat gains from water heating, kWh/month

27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.4004	291.4783	279.0119	271.5070	258.2448	250.2442	241.2477	240.9702	247.9561	254.7841	268.8582	277.3654	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	325.5767	373.9841	414.8872	469.6730	501.1047	498.8545	477.9348	444.2810	405.9847	352.6842	321.4470	312.0492	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.2536	75.4034	75.5508	76.2509	76.3833	77.0059	77.0059	77.1223	76.7649	76.3833	76.1159	75.8383	
alpha	6.0169	6.0269	6.0367	6.0834	6.0922	6.1337	6.1337	6.1415	6.1177	6.0922	6.0744	6.0559	
util living area	0.9915	0.9799	0.9492	0.8470	0.6740	0.4772	0.3441	0.3861	0.6225	0.9003	0.9799	0.9932	(86)
MIT	20.1468	20.3294	20.5708	20.8396	20.9648	20.9962	20.9996	20.9992	20.9831	20.7981	20.4298	20.1140	(87)
Th 2	20.1820	20.1835	20.1850	20.1919	20.1932	20.1992	20.1992	20.2003	20.1969	20.1932	20.1906	20.1879	(88)
util rest of house	0.9890	0.9744	0.9359	0.8144	0.6235	0.4187	0.2817	0.3193	0.5561	0.8698	0.9734	0.9913	(89)

MIT 2	19.4111	19.5916	19.8248	20.0727	20.1718	20.1976	20.1991	20.2001	20.1887	20.0443	19.6975	19.3835	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.7625	19.9440	20.1811	20.4390	20.5506	20.5791	20.5814	20.5818	20.5681	20.4043	20.0472	19.7324	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7625	19.9440	20.1811	20.4390	20.5506	20.5791	20.5814	20.5818	20.5681	20.4043	20.0472	19.7324	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9875	0.9725	0.9358	0.8249	0.6463	0.4466	0.3115	0.3512	0.5873	0.8785	0.9720	0.9899	(94)
Useful gains	321.5005	363.6828	388.2693	387.4510	323.8803	222.7857	148.8737	156.0472	238.4372	309.8350	312.4541	308.9100	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	591.9551	574.7896	521.6975	435.9735	333.8190	223.6897	148.9541	156.2123	242.7460	369.7916	490.0479	590.0469	(97)
Space heating kWh	201.2182	141.8637	99.2706	34.9361	7.3944	0.0000	0.0000	0.0000	0.0000	44.6077	127.8675	209.1658	(98a)
Space heating requirement - total per year (kWh/year)												866.3242	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	201.2182	141.8637	99.2706	34.9361	7.3944	0.0000	0.0000	0.0000	0.0000	44.6077	127.8675	209.1658	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												866.3242	
Space heating per m2											(98c) / (4) =	19.9798	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	351.6746	276.8502	283.9035	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9766	0.9911	0.9854	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	343.4485	274.3912	279.7716	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	554.0542	531.1768	493.2464	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	151.6361	191.0485	158.8253	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	37.9090	47.7621	39.7063	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												125.3775	(107)
Energy for space heating												19.9798	(99)
Energy for space cooling												2.8915	(108)
Total												22.8713	(109)
Fabric Energy Efficiency (DFEE)												22.9	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4383 (18)
Number of sides sheltered		3 (19)
Shelter factor (20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =		0.3397 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4004			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
E5 Ground floor (normal)	26.1200	0.1600	4.1792
P1 Party wall - Ground floor	6.7000	0.0800	0.5360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)													
	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							449.4572	(64a)
Heat gains from water heating, kWh/month													
	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains													
	281.3655	289.2254	276.9770	269.4043	256.2100	248.1415	239.2128	238.9354	245.8534	252.7493	266.7555	275.3306	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6300	0.7000	0.7700	39.0751	(80)

Solar gains	39.0751	76.4392	125.8845	183.5950	225.0025	230.3301	219.2837	188.3614	146.4088	90.7015	48.7221	32.1335	(83)
Total gains	320.4406	365.6646	402.8615	452.9993	481.2125	478.4717	458.4965	427.2968	392.2623	343.4508	315.4775	307.4640	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area													
	0.9940	0.9878	0.9727	0.9201	0.8045	0.6154	0.4557	0.5067	0.7578	0.9473	0.9876	0.9951	(86)
MIT	19.6977	19.8879	20.1733	20.5578	20.8345	20.9666	20.9938	20.9898	20.9085	20.5380	20.0581	19.6712	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house													
	0.9921	0.9840	0.9640	0.8953	0.7498	0.5296	0.3543	0.4009	0.6774	0.9255	0.9831	0.9935	(89)
MIT 2	18.7944	18.9844	19.2662	19.6392	19.8786	19.9800	19.9931	19.9936	19.9436	19.6305	19.1631	18.7753	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.2258	19.4159	19.6995	20.0780	20.3352	20.4512	20.4711	20.4694	20.4044	20.0640	19.5906	19.2032	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2258	19.4159	19.6995	20.0780	20.3352	20.4512	20.4711	20.4694	20.4044	20.0640	19.5906	19.2032	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9903	0.9814	0.9612	0.8980	0.7700	0.5696	0.4028	0.4515	0.7124	0.9275	0.9809	0.9920	(94)
Useful gains	317.3388	358.8658	387.2348	406.7711	370.5136	272.5577	184.6948	192.9433	279.4651	318.5421	309.4535	304.9947	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	738.6574	716.5197	649.8882	543.7870	419.1347	281.0125	185.9127	195.0519	304.0221	459.3639	609.0488	735.0561	(97)
Space heating kWh													
	313.4610	240.3434	195.4141	98.6514	36.1741	0.0000	0.0000	0.0000	0.0000	104.7714	215.7086	319.9657	(98a)
Space heating requirement - total per year (kWh/year)												1524.4897	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	313.4610	240.3434	195.4141	98.6514	36.1741	0.0000	0.0000	0.0000	0.0000	104.7714	215.7086	319.9657	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1524.4897	
Space heating per m2											(98c) / (4) =	35.1589	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	451.4472	355.3946	364.2795	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8939	0.9440	0.9228	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	403.5707	335.4817	336.1678	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	532.5097	510.6427	475.5231	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	92.8361	130.3198	103.6803	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	23.2090	32.5800	25.9201	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												81.7091	(107)
Energy for space heating												35.1589	(99)
Energy for space cooling												1.8844	(108)
Total												37.0433	(109)
Fabric Energy Efficiency (TFEE)												37.0	(109)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	81 B	**DER**	4.44	**TER**	16.89
Environmental	97 A	**% DER < TER**			73.71
CO_2 Emissions (t/year)	0.18	**DFEE**	22.87	**TFEE**	37.04
Compliance Check	See BREL	**% DFEE < TFEE**			38.26
% DPER < TPER	48.24	**DPER**	47.21	**TPER**	91.21

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	

Distribution loss (46)m = 0.15 x (45)m

23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)	
									Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)	
12Total per year (kWh/year)											2188	(64)	

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)

Water heating gains (Table 5)

130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)

Total internal gains

377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	419.7672	467.2558	506.0368	555.7052	584.1265	578.6970	555.6038	523.3987	486.8526	437.0989	410.7463	405.5434	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106

alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874		
util living area	0.9673	0.9391	0.8794	0.7447	0.5704	0.4010	0.2876	0.3191	0.5109	0.7927	0.9345	0.9729	(86)
MIT	20.4545	20.6028	20.7778	20.9302	20.9874	20.9988	20.9999	20.9998	20.9949	20.9148	20.6707	20.4133	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house	0.9595	0.9258	0.8561	0.7074	0.5252	0.3525	0.2367	0.2651	0.4549	0.7507	0.9180	0.9663	(89)
MIT 2	19.6081	19.7882	19.9933	20.1575	20.2113	20.2201	20.2207	20.2206	20.2177	20.1463	19.8733	19.5573	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0123	20.1773	20.3680	20.5265	20.5820	20.5920	20.5929	20.5928	20.5889	20.5134	20.2542	19.9662	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0123	20.1773	20.3680	20.5265	20.5820	20.5920	20.5929	20.5928	20.5889	20.5134	20.2542	19.9662	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9571	0.9250	0.8608	0.7224	0.5463	0.3756	0.2610	0.2909	0.4815	0.7671	0.9188	0.9637	(94)
Useful gains	401.7598	432.2106	435.6061	401.4579	319.1330	217.3690	145.0173	152.2566	234.4309	335.3008	377.3945	390.8402	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	570.7504	554.9474	503.7549	422.3338	322.6373	217.6595	145.0404	152.3026	235.7086	360.1025	477.8254	572.7063	(97)
Space heating kWh	125.7290	82.4791	50.7027	15.0307	2.6072	0.0000	0.0000	0.0000	0.0000	18.4524	72.3102	135.3084	(98a)
Space heating requirement - total per year (kWh/year)												502.6198	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	125.7290	82.4791	50.7027	15.0307	2.6072	0.0000	0.0000	0.0000	0.0000	18.4524	72.3102	135.3084	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												502.6198	
Space heating per m2											(98c) / (4) =	11.5918	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	125.7290	82.4791	50.7027	15.0307	2.6072	0.0000	0.0000	0.0000	0.0000	18.4524	72.3102	135.3084	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	188.5935	123.7187	76.0541	22.5460	3.9108	0.0000	0.0000	0.0000	0.0000	27.6786	108.4654	202.9626	
Space heating requirement	188.5935	123.7187	76.0541	22.5460	3.9108	0.0000	0.0000	0.0000	0.0000	27.6786	108.4654	202.9626	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												753.9297	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												7.5393	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4178.0134	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			350.0000	(367)
Space and Water heating from Heat pump	1152.9737	0.1580	34.0394	(367)
Electrical energy for heat distribution (space & water)	7.5393	0.0000	5.8093	(372)
Overall CO2 factor for heat network			0.0426	(386)
Total CO2 associated with community systems			171.7880	(373)
Space and water heating			171.7880	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Total CO2, kg/year			192.3033	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.4400	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			350.0000	(467a)
Space and Water heating from Heat pump	1152.9737	1.5850	341.4125	(467)
Electrical energy for heat distribution (space & water)	7.5393	0.0000	61.8392	(472)
Overall CO2 factor for heat network			0.4532	(486)
Total CO2 associated with community systems			1828.6728	(473)
Space and water heating			1828.6728	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Total Primary energy kWh/year			2047.1548	(483)
Dwelling Primary energy Rate (DPER)			47.2100	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		2 * 10 =	20.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		20.0000 / (5) =	0.1883 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.4383 (18)
Number of sides sheltered			3 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.3397 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4004			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830	
E3 Sill	4.7600	0.0500	0.2380	
E4 Jamb	23.1600	0.0500	1.1580	
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284	
E16 Corner (normal)	5.0000	0.0900	0.4500	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000	
E18 Party wall between dwellings	5.0000	0.0600	0.3000	
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000	
E5 Ground floor (normal)	26.1200	0.1600	4.1792	
P1 Party wall - Ground floor	6.7000	0.0800	0.5360	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)											Total = Sum(45)m =	1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
										Total per year (kWh/year) = Sum(64)m =		1875.8483	(64)
12Total per year (kWh/year)												1876	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6300	0.7000	0.7700	39.0751	(80)

Solar gains	39.0751	76.4392	125.8845	183.5950	225.0025	230.3301	219.2837	188.3614	146.4088	90.7015	48.7221	32.1335	(83)
Total gains	408.2958	452.6009	487.6757	532.6961	557.8990	548.9788	526.8301	497.0792	463.7948	421.5301	398.4414	394.6229	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area	0.9835	0.9715	0.9453	0.8705	0.7337	0.5459	0.3986	0.4393	0.6725	0.8975	0.9688	0.9858	(86)
MIT	19.9106	20.0893	20.3508	20.6786	20.8917	20.9802	20.9966	20.9946	20.9463	20.6744	20.2495	19.8847	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house	0.9788	0.9636	0.9300	0.8369	0.6745	0.4660	0.3088	0.3457	0.5907	0.8627	0.9586	0.9817	(89)
MIT 2	18.7312	18.9566	19.2810	19.6746	19.8997	19.9839	19.9936	19.9945	19.9575	19.6814	19.1685	18.7054	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.2945	19.4976	19.7920	20.1541	20.3735	20.4597	20.4726	20.4722	20.4298	20.1557	19.6848	19.2687	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2945	19.4976	19.7920	20.1541	20.3735	20.4597	20.4726	20.4722	20.4298	20.1557	19.6848	19.2687	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9749	0.9591	0.9268	0.8431	0.6982	0.5036	0.3518	0.3904	0.6277	0.8693	0.9550	0.9781	(94)
Useful gains	398.0469	434.0923	451.9850	449.0967	389.5280	276.4737	185.3267	194.0822	291.1077	366.4217	380.5039	385.9848	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	742.0577	720.5526	654.4403	547.4923	420.9954	281.4218	185.9884	195.1855	305.2431	463.8155	613.6442	738.2617	(97)
Space heating kWh	255.9441	192.5013	150.6267	70.8448	23.4117	0.0000	0.0000	0.0000	0.0000	72.4610	167.8610	262.0940	(98a)
Space heating requirement - total per year (kWh/year)												1195.7446	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	255.9441	192.5013	150.6267	70.8448	23.4117	0.0000	0.0000	0.0000	0.0000	72.4610	167.8610	262.0940	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1195.7446	
Space heating per m2											(98c) / (4) =	27.5771	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 92.3000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	255.9441	192.5013	150.6267	70.8448	23.4117	0.0000	0.0000	0.0000	0.0000	72.4610	167.8610	262.0940	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	277.2959	208.5604	163.1925	76.7550	25.3648	0.0000	0.0000	0.0000	0.0000	78.5060	181.8645	283.9588	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.8067	84.4420	83.7496	82.4371	80.9080	79.8000	79.8000	79.8000	79.8000	82.4529	84.1107	84.8812	(217)
Fuel for water heating, kWh/month	216.3157	192.3305	206.6676	186.3399	185.2114	170.5061	169.2907	175.3325	176.4869	188.9442	195.0948	214.0019	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 1295.4979 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 79.8000
Water heating fuel used 2276.5223 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
Total electricity for the above, kWh/year 86.0000 (231)
Electricity for lighting (calculated in Appendix L) 116.2701 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3417.0942	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1295.4979	0.2100	272.0546	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2276.5223	0.2100	478.0697	(264)
Space and water heating			750.1242	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			732.4217	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.8900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1295.4979	1.1300	1463.9126	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2276.5223	1.1300	2572.4702	(278)
Space and water heating			4036.3829	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3954.8804	(286)
Target Primary Energy Rate (TPER)			91.2100	(287)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	81 B	**DER**	4.44	**TER**	16.89
Environmental	97 A	**% DER < TER**			73.71
CO_2 Emissions (t/year)	0.18	**DFEE**	22.87	**TFEE**	37.04
Compliance Check	See BREL	**% DFEE < TFEE**			38.26
% DPER < TPER	48.24	**DPER**	47.21	**TPER**	91.21

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	460.9371	499.3751	541.0594	581.5362	605.2805	592.0631	569.0364	538.2350	504.0534	463.4913	441.8157	444.4008	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874

util living area													
	0.9506	0.9208	0.8509	0.7193	0.5517	0.3920	0.2808	0.3103	0.4941	0.7613	0.9132	0.9589	(86)
MIT	20.5418	20.6601	20.8196	20.9423	20.9895	20.9989	20.9999	20.9998	20.9957	20.9322	20.7241	20.4992	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.9397	0.9048	0.8249	0.6817	0.5076	0.3446	0.2311	0.2578	0.4397	0.7180	0.8932	0.9496	(89)
MIT 2	19.7141	19.8554	20.0390	20.1690	20.2129	20.2202	20.2207	20.2207	20.2182	20.1624	19.9346	19.6624	(90)
Living area fraction											fLA = Living area / (4) =	0.4776	(91)
MIT	20.1094	20.2397	20.4119	20.5384	20.5838	20.5921	20.5929	20.5928	20.5896	20.5301	20.3117	20.0621	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1094	20.2397	20.4119	20.5384	20.5838	20.5921	20.5929	20.5928	20.5896	20.5301	20.3117	20.0621	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9380	0.9053	0.8316	0.6973	0.5283	0.3672	0.2549	0.2829	0.4656	0.7357	0.8958	0.9474	(94)
Useful gains	432.3420	452.0640	449.9610	405.5295	319.7866	217.4085	145.0207	152.2644	234.6742	341.0035	395.7573	421.0203	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	574.2773	557.2156	505.3480	422.7631	322.7042	217.6636	145.0408	152.3034	235.7337	360.7107	479.9145	576.1910	(97)
Space heating kWh													
	105.5999	70.6619	41.2080	12.4082	2.1707	0.0000	0.0000	0.0000	0.0000	14.6621	60.5932	115.4470	(98a)
Space heating requirement - total per year (kWh/year)												422.7510	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	105.5999	70.6619	41.2080	12.4082	2.1707	0.0000	0.0000	0.0000	0.0000	14.6621	60.5932	115.4470	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												422.7510	
Space heating per m2											(98c) / (4) =	9.7498	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	105.5999	70.6619	41.2080	12.4082	2.1707	0.0000	0.0000	0.0000	0.0000	14.6621	60.5932	115.4470	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	158.3998	105.9928	61.8120	18.6123	3.2561	0.0000	0.0000	0.0000	0.0000	21.9932	90.8898	173.1705	
Space heating requirement													
	158.3998	105.9928	61.8120	18.6123	3.2561	0.0000	0.0000	0.0000	0.0000	21.9932	90.8898	173.1705	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												634.1264	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												6.3413	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4058.2102	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	634.1264	4.4400	28.1552	(340a)
Space heating total			28.1552	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Total energy cost			289.3685	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1790	(357)
SAP value		80.8891	
SAP rating (Section 12)		81	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			350.0000	(367)
Space and Water heating from Heat pump	1118.7443	0.1581	28.6482	(367)
Electrical energy for heat distribution (space & water)	6.3413	0.0000	5.6206	(372)
Overall CO2 factor for heat network			0.0424	(386)
Total CO2 associated with community systems			166.2082	(373)
Space and water heating			166.2082	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Total CO2, kg/year			186.7235	(383)
CO2 emissions per m2			4.3100	(384)
EI value			97.1683	(384a)
EI rating			97	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.4982 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day)		92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:		
Store volume		110.0000 (47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)		0.0152 (51)
Volume factor from Table 2a		1.0294 (52)
Temperature factor from Table 2b		0.6000 (53)
Enter (49) or (54) in (55)		1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
									Total per year (kWh/year) = Sum(64)m =			2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	23.7835	0.6800	0.7000	0.7700	51.0736	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	51.0736	88.7763	143.8339	211.6843	249.5125	273.8424	255.8751	224.3556	176.4207	111.0901	62.7325	42.2420	(83)
Total gains	469.8344	505.6456	549.0181	595.0545	611.9331	617.2952	588.2244	559.2798	522.4455	476.6813	451.9594	451.9591	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area	0.9423	0.9110	0.8276	0.6873	0.5181	0.3410	0.2408	0.2662	0.4570	0.7183	0.8953	0.9522	(86)
MIT	20.5838	20.6918	20.8527	20.9564	20.9929	20.9996	21.0000	20.9999	20.9974	20.9532	20.7668	20.5403	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house	0.9297	0.8933	0.7989	0.6483	0.4738	0.2953	0.1927	0.2157	0.4039	0.6719	0.8721	0.9414	(89)
MIT 2	19.7649	19.8929	20.0754	20.1827	20.2157	20.2205	20.2207	20.2207	20.2192	20.1822	19.9837	19.7127	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.1560	20.2745	20.4467	20.5523	20.5869	20.5926	20.5929	20.5929	20.5909	20.5504	20.3578	20.1080	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1560	20.2745	20.4467	20.5523	20.5869	20.5926	20.5929	20.5929	20.5909	20.5504	20.3578	20.1080	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9286	0.8946	0.8076	0.6652	0.4947	0.3172	0.2157	0.2398	0.4292	0.6920	0.8765	0.9397	(94)
Useful gains	436.2812	452.3702	443.3841	395.8357	302.7368	195.7885	126.8735	134.1312	224.2433	329.8652	396.1579	424.6918	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	565.0732	547.5815	488.4503	408.7382	304.6551	195.8867	126.8799	134.1441	224.8841	343.2869	467.0580	566.9598	(97)
Space heating kWh	95.8212	63.9820	33.5292	9.2898	1.4272	0.0000	0.0000	0.0000	0.0000	9.9857	51.0481	105.8474	(98a)
Space heating requirement - total per year (kWh/year)												370.9307	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	95.8212	63.9820	33.5292	9.2898	1.4272	0.0000	0.0000	0.0000	0.0000	9.9857	51.0481	105.8474	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												370.9307	
Space heating per m2											(98c) / (4) =	8.5547	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	95.8212	63.9820	33.5292	9.2898	1.4272	0.0000	0.0000	0.0000	0.0000	9.9857	51.0481	105.8474	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	143.7318	95.9730	50.2938	13.9348	2.1408	0.0000	0.0000	0.0000	0.0000	14.9786	76.5721	158.7711	
Space heating requirement	143.7318	95.9730	50.2938	13.9348	2.1408	0.0000	0.0000	0.0000	0.0000	14.9786	76.5721	158.7711	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												556.3960	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												5.5640	(313)
Space cooling fuel												0.0000	(321)

Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(330a)
Total electricity for the above, kWh/year	11.9235	(331)
Electricity for lighting (calculated in Appendix L)	130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3980.4797	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	556.3960	6.5500	36.4439	(340a)
Space heating total			36.4439	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Total energy cost			395.9235	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			350.0000	(367)
Space and Water heating from Heat pump	1096.5356	0.1586	25.2095	(367)
Electrical energy for heat distribution (space & water)	5.5640	0.0000	5.5002	(372)
Overall CO2 factor for heat network			0.0424	(386)
Total CO2 associated with community systems			162.6491	(373)
Space and water heating			162.6491	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Total CO2, kg/year			183.1644	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			350.0000	(467a)
Space and Water heating from Heat pump	1096.5356	1.5870	252.2867	(467)
Electrical energy for heat distribution (space & water)	5.5640	0.0000	58.7198	(472)
Overall CO2 factor for heat network			0.4524	(486)
Total CO2 associated with community systems			1736.4276	(473)
Space and water heating			1736.4276	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Total Primary energy kWh/year			1954.9096	(483)

SAP 10 EPC IMPROVEMENTS

Rev C

Current energy efficiency rating: B 81
Current environmental impact rating: A 97

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 81
Potential environmental impact rating: A 97

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£41	£41	£0
Community scheme	£355	£355	£0
Space heating	£144	£144	£0
Water heating	£215	£215	£0
Lighting	£37	£37	£0

Total cost of fuels	£396	£396	£0
Total cost of uses	£396	£396	£0
Delivered energy	92 kWh/m²	92 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	4 kg/m²	4 kg/m²	0 kg/m²
Primary energy	45 kWh/m²	45 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers													
	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths													
	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses													
	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m													
	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	460.9371	499.3751	541.0594	581.5362	605.2805	592.0631	569.0364	538.2350	504.0534	463.4913	441.8157	444.4008	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area													
	0.9506	0.9208	0.8509	0.7193	0.5517	0.3920	0.2808	0.3103	0.4941	0.7613	0.9132	0.9589	(86)
MIT	20.5418	20.6601	20.8196	20.9423	20.9895	20.9989	20.9999	20.9998	20.9957	20.9322	20.7241	20.4992	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.9397	0.9048	0.8249	0.6817	0.5076	0.3446	0.2311	0.2578	0.4397	0.7180	0.8932	0.9496	(89)
MIT 2	19.7141	19.8554	20.0390	20.1690	20.2129	20.2202	20.2207	20.2207	20.2182	20.1624	19.9346	19.6624	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.1094	20.2397	20.4119	20.5384	20.5838	20.5921	20.5929	20.5928	20.5896	20.5301	20.3117	20.0621	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1094	20.2397	20.4119	20.5384	20.5838	20.5921	20.5929	20.5928	20.5896	20.5301	20.3117	20.0621	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9380	0.9053	0.8316	0.6973	0.5283	0.3672	0.2549	0.2829	0.4656	0.7357	0.8958	0.9474	(94)
Useful gains	432.3420	452.0640	449.9610	405.5295	319.7866	217.4085	145.0207	152.2644	234.6742	341.0035	395.7573	421.0203	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	574.2773	557.2156	505.3480	422.7631	322.7042	217.6636	145.0408	152.3034	235.7337	360.7107	479.9145	576.1910	(97)
Space heating kWh	105.5999	70.6619	41.2080	12.4082	2.1707	0.0000	0.0000	0.0000	0.0000	14.6621	60.5932	115.4470	(98a)
Space heating requirement - total per year (kWh/year)												422.7510	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	105.5999	70.6619	41.2080	12.4082	2.1707	0.0000	0.0000	0.0000	0.0000	14.6621	60.5932	115.4470	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												422.7510	
Space heating per m2											(98c) / (4) =	9.7498	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		
105.5999 70.6619 41.2080 12.4082 2.1707 0.0000 0.0000 0.0000 0.0000 14.6621 60.5932	115.4470	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50		
307a 158.3998 105.9928 61.8120 18.6123 3.2561 0.0000 0.0000 0.0000 0.0000 21.9932 90.8898	173.1705	
Space heating requirement		
158.3998 105.9928 61.8120 18.6123 3.2561 0.0000 0.0000 0.0000 0.0000 21.9932 90.8898	173.1705	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.0000	(309)
Water heating		
Annual water heating requirement		
214.6882 190.1982 202.6545 179.3121 174.6530 158.2600 156.7058 162.3469 163.5105 181.2971 191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50		
310a 322.0323 285.2973 303.9818 268.9682 261.9796 237.3900 235.0587 243.5203 245.2657 271.9456 287.3375	318.7016	
Water heating fuel		
322.0323 285.2973 303.9818 268.9682 261.9796 237.3900 235.0587 243.5203 245.2657 271.9456 287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio	0.0000	(314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.0000	(315)
Pumps and Fa 1.0127 0.9147 1.0127 0.9800 1.0127 0.9800 1.0127 1.0127 0.9800 1.0127 0.9800	1.0127	(331)
Lighting 16.1924 12.9901 11.6962 8.5691 6.6190 5.4078 6.0381 7.8486 10.1945 13.3757 15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		
(333a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)		
(334a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)		
(335a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)		
(333b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)		
(334b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)		
(335b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.0000	(335b)
Annual totals kWh/year		
Space heating fuel - community heating	634.1264	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	6.3413	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(330a)
Total electricity for the above, kWh/year	11.9235	(331)
Electricity for lighting (calculated in Appendix L)	130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4058.2102	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	634.1264	4.4400	28.1552	(340a)
Space heating total			28.1552	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Total energy cost			289.3685	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1790	(357)
SAP value		80.8891	
SAP rating (Section 12)		81	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			350.0000	(367)
Space and Water heating from Heat pump	1118.7443	0.1581	28.6482	(367)
Electrical energy for heat distribution (space & water)	6.3413	0.0000	5.6206	(372)
Overall CO2 factor for heat network			0.0424	(386)
Total CO2 associated with community systems			166.2082	(373)
Space and water heating			166.2082	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Total CO2, kg/year			186.7235	(383)
CO2 emissions per m2			4.3100	(384)
EI value			97.1683	(384a)
EI rating			97	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume					(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)

Party Ceiling 1	43.3600	30.0000	1300.8000 (32b)
Internal TF Wall	68.4500	9.0000	616.0500 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982 (42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)											Total = Sum(45)m =	1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	23.7835	0.6800	0.7000	0.7700	51.0736	(80)

Solar gains	51.0736	88.7763	143.8339	211.6843	249.5125	273.8424	255.8751	224.3556	176.4207	111.0901	62.7325	42.2420	(83)
Total gains	469.8344	505.6456	549.0181	595.0545	611.9331	617.2952	588.2244	559.2798	522.4455	476.6813	451.9594	451.9591	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area	0.9423	0.9110	0.8276	0.6873	0.5181	0.3410	0.2408	0.2662	0.4570	0.7183	0.8953	0.9522	(86)
MIT	20.5838	20.6918	20.8527	20.9564	20.9929	20.9996	21.0000	20.9999	20.9974	20.9532	20.7668	20.5403	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house	0.9297	0.8933	0.7989	0.6483	0.4738	0.2953	0.1927	0.2157	0.4039	0.6719	0.8721	0.9414	(89)
MIT 2	19.7649	19.8929	20.0754	20.1827	20.2157	20.2205	20.2207	20.2207	20.2192	20.1822	19.9837	19.7127	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.1560	20.2745	20.4467	20.5523	20.5869	20.5926	20.5929	20.5929	20.5909	20.5504	20.3578	20.1080	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1560	20.2745	20.4467	20.5523	20.5869	20.5926	20.5929	20.5929	20.5909	20.5504	20.3578	20.1080	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9286	0.8946	0.8076	0.6652	0.4947	0.3172	0.2157	0.2398	0.4292	0.6920	0.8765	0.9397	(94)
Useful gains	436.2812	452.3702	443.3841	395.8357	302.7368	195.7885	126.8735	134.1312	224.2433	329.8652	396.1579	424.6918	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	565.0732	547.5815	488.4503	408.7382	304.6551	195.8867	126.8799	134.1441	224.8841	343.2869	467.0580	566.9598	(97)
Space heating kWh	95.8212	63.9820	33.5292	9.2898	1.4272	0.0000	0.0000	0.0000	0.0000	9.9857	51.0481	105.8474	(98a)
Space heating requirement - total per year (kWh/year)												370.9307	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	95.8212	63.9820	33.5292	9.2898	1.4272	0.0000	0.0000	0.0000	0.0000	9.9857	51.0481	105.8474	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												370.9307	
Space heating per m2										(98c) / (4) =		8.5547	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement

95.8212	63.9820	33.5292	9.2898	1.4272	0.0000	0.0000	0.0000	0.0000	9.9857	51.0481	105.8474	(98)

Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50

307a	143.7318	95.9730	50.2938	13.9348	2.1408	0.0000	0.0000	0.0000	0.0000	14.9786	76.5721	158.7711	
Space heating requirement	143.7318	95.9730	50.2938	13.9348	2.1408	0.0000	0.0000	0.0000	0.0000	14.9786	76.5721	158.7711	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating
Annual water heating requirement

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50

310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)

Cooling System Energy Efficiency Ratio 0.0000 (314)

Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)

Electricity generated by PVs (Appendix M) (negative quantity)

(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)

Electricity generated by PVs (Appendix M) (negative quantity)

(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year
Space heating fuel - community heating 556.3960 (307)
Space heating fuel - secondary 0.0000 (309)
Water heating fuel - community heating 3281.4784 (310)
Efficiency of water heater 0.0000 (311)
Electricity used for heat distribution 5.5640 (313)
Space cooling fuel 0.0000 (321)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)
mechanical ventilation fans (SFP = 0.0920) 11.9235 (330a)
Total electricity for the above, kWh/year 11.9235 (331)
Electricity for lighting (calculated in Appendix L) 130.6818 (332)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (333)
Wind generation 0.0000 (334)
Hydro-electric generation (Appendix N) 0.0000 (335a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (335)
Appendix Q - special features
Energy saved or generated -0.0000 (336)
Energy used 0.0000 (337)
Total delivered energy for all uses 3980.4797 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	556.3960	6.5500	36.4439	(340a)
Space heating total			36.4439	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Total energy cost			395.9235	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			350.0000	(367)
Space and Water heating from Heat pump	1096.5356	0.1586	25.2095	(367)
Electrical energy for heat distribution (space & water)	5.5640	0.0000	5.5002	(372)
Overall CO2 factor for heat network			0.0424	(386)
Total CO2 associated with community systems			162.6491	(373)
Space and water heating			162.6491	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Total CO2, kg/year			183.1644	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			350.0000	(467a)
Space and Water heating from Heat pump	1096.5356	1.5870	252.2867	(467)
Electrical energy for heat distribution (space & water)	5.5640	0.0000	58.7198	(472)
Overall CO2 factor for heat network			0.4524	(486)
Total CO2 associated with community systems			1736.4276	(473)
Space and water heating			1736.4276	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Total Primary energy kWh/year			1954.9096	(483)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	81 B	**DER**	4.18	**TER**	16.89
Environmental	97 A	**% DER < TER**			75.25
CO_2 Emissions (t/year)	0.17	**DFEE**	22.87	**TFEE**	37.04
Compliance Check	See BREL	**% DFEE < TFEE**			38.26
% DPER < TPER	51.22	**DPER**	44.50	**TPER**	91.21

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			3.0000 (17)
Infiltration rate			0.1500 (18)
Number of sides sheltered			3 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	

Distribution loss (46)m = 0.15 x (45)m

23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)	
									Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)	
12Total per year (kWh/year)											2188	(64)	

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)

Water heating gains (Table 5)

130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)

Total internal gains

377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	419.7672	467.2558	506.0368	555.7052	584.1265	578.6970	555.6038	523.3987	486.8526	437.0989	410.7463	405.5434	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106

alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874		
util living area	0.9673	0.9391	0.8794	0.7447	0.5704	0.4010	0.2876	0.3191	0.5109	0.7927	0.9345	0.9729	(86)
MIT	20.4545	20.6028	20.7778	20.9302	20.9874	20.9988	20.9999	20.9998	20.9949	20.9148	20.6707	20.4133	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house	0.9595	0.9258	0.8561	0.7074	0.5252	0.3525	0.2367	0.2651	0.4549	0.7507	0.9180	0.9663	(89)
MIT 2	19.6081	19.7882	19.9933	20.1575	20.2113	20.2201	20.2207	20.2206	20.2177	20.1463	19.8733	19.5573	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0123	20.1773	20.3680	20.5265	20.5820	20.5920	20.5929	20.5928	20.5889	20.5134	20.2542	19.9662	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0123	20.1773	20.3680	20.5265	20.5820	20.5920	20.5929	20.5928	20.5889	20.5134	20.2542	19.9662	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9571	0.9250	0.8608	0.7224	0.5463	0.3756	0.2610	0.2909	0.4815	0.7671	0.9188	0.9637	(94)
Useful gains	401.7598	432.2106	435.6061	401.4579	319.1330	217.3690	145.0173	152.2566	234.4309	335.3008	377.3945	390.8402	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	570.7504	554.9474	503.7549	422.3338	322.6373	217.6595	145.0404	152.3026	235.7086	360.1025	477.8254	572.7063	(97)
Space heating kWh	125.7290	82.4791	50.7027	15.0307	2.6072	0.0000	0.0000	0.0000	0.0000	18.4524	72.3102	135.3084	(98a)
Space heating requirement - total per year (kWh/year)												502.6198	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	125.7290	82.4791	50.7027	15.0307	2.6072	0.0000	0.0000	0.0000	0.0000	18.4524	72.3102	135.3084	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												502.6198	
Space heating per m2											(98c) / (4) =	11.5918	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	125.7290	82.4791	50.7027	15.0307	2.6072	0.0000	0.0000	0.0000	0.0000	18.4524	72.3102	135.3084	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	188.5935	123.7187	76.0541	22.5460	3.9108	0.0000	0.0000	0.0000	0.0000	27.6786	108.4654	202.9626	
Space heating requirement	188.5935	123.7187	76.0541	22.5460	3.9108	0.0000	0.0000	0.0000	0.0000	27.6786	108.4654	202.9626	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												753.9297	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												7.5393	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4178.0134	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1076.1088	0.1580	31.7701	(367)
Electrical energy for heat distribution (space & water)	7.5393	0.0000	5.8093	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			160.7227	(373)
Space and water heating			160.7227	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Total CO2, kg/year			181.2381	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.1800	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1076.1088	1.5850	318.6517	(467)
Electrical energy for heat distribution (space & water)	7.5393	0.0000	61.8392	(472)
Overall CO2 factor for heat network			0.4240	(486)
Total CO2 associated with community systems			1710.8839	(473)
Space and water heating			1710.8839	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Total Primary energy kWh/year			1929.3659	(483)
Dwelling Primary energy Rate (DPER)			44.5000	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		2 * 10 =	20.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		20.0000 / (5) =	0.1883 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.4383 (18)
Number of sides sheltered			3 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.3397 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4004			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830	
E3 Sill	4.7600	0.0500	0.2380	
E4 Jamb	23.1600	0.0500	1.1580	
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284	
E16 Corner (normal)	5.0000	0.0900	0.4500	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000	
E18 Party wall between dwellings	5.0000	0.0600	0.3000	
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000	
E5 Ground floor (normal)	26.1200	0.1600	4.1792	
P1 Party wall - Ground floor	6.7000	0.0800	0.5360	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)											Total = Sum(45)m =	1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
										Total per year (kWh/year) = Sum(64)m =		1875.8483	(64)
12Total per year (kWh/year)												1876	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6300	0.7000	0.7700	39.0751	(80)

Solar gains	39.0751	76.4392	125.8845	183.5950	225.0025	230.3301	219.2837	188.3614	146.4088	90.7015	48.7221	32.1335	(83)
Total gains	408.2958	452.6009	487.6757	532.6961	557.8990	548.9788	526.8301	497.0792	463.7948	421.5301	398.4414	394.6229	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area	0.9835	0.9715	0.9453	0.8705	0.7337	0.5459	0.3986	0.4393	0.6725	0.8975	0.9688	0.9858	(86)
MIT	19.9106	20.0893	20.3508	20.6786	20.8917	20.9802	20.9966	20.9946	20.9463	20.6744	20.2495	19.8847	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house	0.9788	0.9636	0.9300	0.8369	0.6745	0.4660	0.3088	0.3457	0.5907	0.8627	0.9586	0.9817	(89)
MIT 2	18.7312	18.9566	19.2810	19.6746	19.8997	19.9839	19.9936	19.9945	19.9575	19.6814	19.1685	18.7054	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.2945	19.4976	19.7920	20.1541	20.3735	20.4597	20.4726	20.4722	20.4298	20.1557	19.6848	19.2687	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2945	19.4976	19.7920	20.1541	20.3735	20.4597	20.4726	20.4722	20.4298	20.1557	19.6848	19.2687	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9749	0.9591	0.9268	0.8431	0.6982	0.5036	0.3518	0.3904	0.6277	0.8693	0.9550	0.9781	(94)
Useful gains	398.0469	434.0923	451.9850	449.0967	389.5280	276.4737	185.3267	194.0822	291.1077	366.4217	380.5039	385.9848	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	742.0577	720.5526	654.4403	547.4923	420.9954	281.4218	185.9884	195.1855	305.2431	463.8155	613.6442	738.2617	(97)
Space heating kWh	255.9441	192.5013	150.6267	70.8448	23.4117	0.0000	0.0000	0.0000	0.0000	72.4610	167.8610	262.0940	(98a)
Space heating requirement - total per year (kWh/year)												1195.7446	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	255.9441	192.5013	150.6267	70.8448	23.4117	0.0000	0.0000	0.0000	0.0000	72.4610	167.8610	262.0940	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1195.7446	
Space heating per m2											(98c) / (4) =	27.5771	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 92.3000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	255.9441	192.5013	150.6267	70.8448	23.4117	0.0000	0.0000	0.0000	0.0000	72.4610	167.8610	262.0940	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	277.2959	208.5604	163.1925	76.7550	25.3648	0.0000	0.0000	0.0000	0.0000	78.5060	181.8645	283.9588	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.8067	84.4420	83.7496	82.4371	80.9080	79.8000	79.8000	79.8000	79.8000	82.4529	84.1107	84.8812	(217)
Fuel for water heating, kWh/month	216.3157	192.3305	206.6676	186.3399	185.2114	170.5061	169.2907	175.3325	176.4869	188.9442	195.0948	214.0019	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 1295.4979 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 79.8000
Water heating fuel used 2276.5223 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
Total electricity for the above, kWh/year 86.0000 (231)
Electricity for lighting (calculated in Appendix L) 116.2701 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3417.0942	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1295.4979	0.2100	272.0546	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2276.5223	0.2100	478.0697	(264)
Space and water heating			750.1242	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			732.4217	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.8900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1295.4979	1.1300	1463.9126	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2276.5223	1.1300	2572.4702	(278)
Space and water heating			4036.3829	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3954.8804	(286)
Target Primary Energy Rate (TPER)			91.2100	(287)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	81 B	**DER**	4.18	**TER**	16.89
Environmental	97 A	**% DER < TER**			75.25
CO_2 Emissions (t/year)	0.17	**DFEE**	22.87	**TFEE**	37.04
Compliance Check	See BREL	**% DFEE < TFEE**			38.26
% DPER < TPER	51.22	**DPER**	44.50	**TPER**	91.21

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area		Storey height		Volume	
Main dwelling		(m2)		(m)		(m3)	
Ground floor		43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2622	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)

Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	38.2833	38.2073	38.1327	37.7826	37.7171	37.4122	37.4122	37.3557	37.5296	37.7171	37.8496	37.9882	(39)
Average = Sum(39)m / 12 =												37.7823	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8829	0.8812	0.8794	0.8714	0.8699	0.8628	0.8628	0.8615	0.8655	0.8699	0.8729	0.8761	(40)
HLP (average)												0.8714	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
							Total per year (kWh/year) = Sum(64)m =				663.9767	(64)
12Total per year (kWh/year)											664	(64)

Electric shower(s)

39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
				Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							449.4572	(64a)

Heat gains from water heating, kWh/month

27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.4004	291.4783	279.0119	271.5070	258.2448	250.2442	241.2477	240.9702	247.9561	254.7841	268.8582	277.3654	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	325.5767	373.9841	414.8872	469.6730	501.1047	498.8545	477.9348	444.2810	405.9847	352.6842	321.4470	312.0492	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.2536	75.4034	75.5508	76.2509	76.3833	77.0059	77.0059	77.1223	76.7649	76.3833	76.1159	75.8383	
alpha	6.0169	6.0269	6.0367	6.0834	6.0922	6.1337	6.1337	6.1415	6.1177	6.0922	6.0744	6.0559	
util living area	0.9915	0.9799	0.9492	0.8470	0.6740	0.4772	0.3441	0.3861	0.6225	0.9003	0.9799	0.9932	(86)
MIT	20.1468	20.3294	20.5708	20.8396	20.9648	20.9962	20.9996	20.9992	20.9831	20.7981	20.4298	20.1140	(87)
Th 2	20.1820	20.1835	20.1850	20.1919	20.1932	20.1992	20.1992	20.2003	20.1969	20.1932	20.1906	20.1879	(88)
util rest of house	0.9890	0.9744	0.9359	0.8144	0.6235	0.4187	0.2817	0.3193	0.5561	0.8698	0.9734	0.9913	(89)

MIT 2	19.4111	19.5916	19.8248	20.0727	20.1718	20.1976	20.1991	20.2001	20.1887	20.0443	19.6975	19.3835	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.7625	19.9440	20.1811	20.4390	20.5506	20.5791	20.5814	20.5818	20.5681	20.4043	20.0472	19.7324	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7625	19.9440	20.1811	20.4390	20.5506	20.5791	20.5814	20.5818	20.5681	20.4043	20.0472	19.7324	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9875	0.9725	0.9358	0.8249	0.6463	0.4466	0.3115	0.3512	0.5873	0.8785	0.9720	0.9899	(94)
Useful gains	321.5005	363.6828	388.2693	387.4510	323.8803	222.7857	148.8737	156.0472	238.4372	309.8350	312.4541	308.9100	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	591.9551	574.7896	521.6975	435.9735	333.8190	223.6897	148.9541	156.2123	242.7460	369.7916	490.0479	590.0469	(97)
Space heating kWh	201.2182	141.8637	99.2706	34.9361	7.3944	0.0000	0.0000	0.0000	0.0000	44.6077	127.8675	209.1658	(98a)
Space heating requirement - total per year (kWh/year)												866.3242	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	201.2182	141.8637	99.2706	34.9361	7.3944	0.0000	0.0000	0.0000	0.0000	44.6077	127.8675	209.1658	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												866.3242	
Space heating per m2											(98c) / (4) =	19.9798	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	351.6746	276.8502	283.9035	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9766	0.9911	0.9854	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	343.4485	274.3912	279.7716	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	554.0542	531.1768	493.2464	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	151.6361	191.0485	158.8253	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	37.9090	47.7621	39.7063	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												125.3775	(107)
Energy for space heating												19.9798	(99)
Energy for space cooling												2.8915	(108)
Total												22.8713	(109)
Fabric Energy Efficiency (DFEE)												22.9	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4383 (18)
Number of sides sheltered		3 (19)
Shelter factor (20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =		0.3397 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4004			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
E5 Ground floor (normal)	26.1200	0.1600	4.1792
P1 Party wall - Ground floor	6.7000	0.0800	0.5360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)													
	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							449.4572	(64a)
Heat gains from water heating, kWh/month													
	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains													
	281.3655	289.2254	276.9770	269.4043	256.2100	248.1415	239.2128	238.9354	245.8534	252.7493	266.7555	275.3306	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6300	0.7000	0.7700	39.0751	(80)

Solar gains	39.0751	76.4392	125.8845	183.5950	225.0025	230.3301	219.2837	188.3614	146.4088	90.7015	48.7221	32.1335	(83)
Total gains	320.4406	365.6646	402.8615	452.9993	481.2125	478.4717	458.4965	427.2968	392.2623	343.4508	315.4775	307.4640	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area													
	0.9940	0.9878	0.9727	0.9201	0.8045	0.6154	0.4557	0.5067	0.7578	0.9473	0.9876	0.9951	(86)
MIT	19.6977	19.8879	20.1733	20.5578	20.8345	20.9666	20.9938	20.9898	20.9085	20.5380	20.0581	19.6712	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house													
	0.9921	0.9840	0.9640	0.8953	0.7498	0.5296	0.3543	0.4009	0.6774	0.9255	0.9831	0.9935	(89)
MIT 2	18.7944	18.9844	19.2662	19.6392	19.8786	19.9800	19.9931	19.9936	19.9436	19.6305	19.1631	18.7753	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.2258	19.4159	19.6995	20.0780	20.3352	20.4512	20.4711	20.4694	20.4044	20.0640	19.5906	19.2032	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2258	19.4159	19.6995	20.0780	20.3352	20.4512	20.4711	20.4694	20.4044	20.0640	19.5906	19.2032	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9903	0.9814	0.9612	0.8980	0.7700	0.5696	0.4028	0.4515	0.7124	0.9275	0.9809	0.9920	(94)
Useful gains	317.3388	358.8658	387.2348	406.7711	370.5136	272.5577	184.6948	192.9433	279.4651	318.5421	309.4535	304.9947	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	738.6574	716.5197	649.8882	543.7870	419.1347	281.0125	185.9127	195.0519	304.0221	459.3639	609.0488	735.0561	(97)
Space heating kWh													
	313.4610	240.3434	195.4141	98.6514	36.1741	0.0000	0.0000	0.0000	0.0000	104.7714	215.7086	319.9657	(98a)
Space heating requirement - total per year (kWh/year)												1524.4897	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	313.4610	240.3434	195.4141	98.6514	36.1741	0.0000	0.0000	0.0000	0.0000	104.7714	215.7086	319.9657	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1524.4897	
Space heating per m2											(98c) / (4) =	35.1589	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	451.4472	355.3946	364.2795	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8939	0.9440	0.9228	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	403.5707	335.4817	336.1678	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	532.5097	510.6427	475.5231	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	92.8361	130.3198	103.6803	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	23.2090	32.5800	25.9201	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												81.7091	(107)
Energy for space heating												35.1589	(99)
Energy for space cooling												1.8844	(108)
Total												37.0433	(109)
Fabric Energy Efficiency (TFEE)												37.0	(109)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	81 B	**DER**	4.18	**TER**	16.89
Environmental	97 A	**% DER < TER**			75.25
CO_2 Emissions (t/year)	0.17	**DFEE**	22.87	**TFEE**	37.04
Compliance Check	See BREL	**% DFEE < TFEE**			38.26
% DPER < TPER	51.22	**DPER**	44.50	**TPER**	91.21

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			3.0000 (17)
Infiltration rate			0.1500 (18)
Number of sides sheltered			3 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	

Distribution loss (46)m = 0.15 x (45)m

23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)	
									Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)	
12Total per year (kWh/year)											2188	(64)	

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)

Water heating gains (Table 5)

130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)

Total internal gains

377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	419.7672	467.2558	506.0368	555.7052	584.1265	578.6970	555.6038	523.3987	486.8526	437.0989	410.7463	405.5434	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106

alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874		
util living area	0.9673	0.9391	0.8794	0.7447	0.5704	0.4010	0.2876	0.3191	0.5109	0.7927	0.9345	0.9729	(86)
MIT	20.4545	20.6028	20.7778	20.9302	20.9874	20.9988	20.9999	20.9998	20.9949	20.9148	20.6707	20.4133	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house	0.9595	0.9258	0.8561	0.7074	0.5252	0.3525	0.2367	0.2651	0.4549	0.7507	0.9180	0.9663	(89)
MIT 2	19.6081	19.7882	19.9933	20.1575	20.2113	20.2201	20.2207	20.2206	20.2177	20.1463	19.8733	19.5573	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0123	20.1773	20.3680	20.5265	20.5820	20.5920	20.5929	20.5928	20.5889	20.5134	20.2542	19.9662	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0123	20.1773	20.3680	20.5265	20.5820	20.5920	20.5929	20.5928	20.5889	20.5134	20.2542	19.9662	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9571	0.9250	0.8608	0.7224	0.5463	0.3756	0.2610	0.2909	0.4815	0.7671	0.9188	0.9637	(94)
Useful gains	401.7598	432.2106	435.6061	401.4579	319.1330	217.3690	145.0173	152.2566	234.4309	335.3008	377.3945	390.8402	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	570.7504	554.9474	503.7549	422.3338	322.6373	217.6595	145.0404	152.3026	235.7086	360.1025	477.8254	572.7063	(97)
Space heating kWh	125.7290	82.4791	50.7027	15.0307	2.6072	0.0000	0.0000	0.0000	0.0000	18.4524	72.3102	135.3084	(98a)
Space heating requirement - total per year (kWh/year)												502.6198	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	125.7290	82.4791	50.7027	15.0307	2.6072	0.0000	0.0000	0.0000	0.0000	18.4524	72.3102	135.3084	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												502.6198	
Space heating per m2											(98c) / (4) =	11.5918	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	125.7290	82.4791	50.7027	15.0307	2.6072	0.0000	0.0000	0.0000	0.0000	18.4524	72.3102	135.3084	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	188.5935	123.7187	76.0541	22.5460	3.9108	0.0000	0.0000	0.0000	0.0000	27.6786	108.4654	202.9626	
Space heating requirement	188.5935	123.7187	76.0541	22.5460	3.9108	0.0000	0.0000	0.0000	0.0000	27.6786	108.4654	202.9626	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												753.9297	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												7.5393	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4178.0134	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1076.1088	0.1580	31.7701	(367)
Electrical energy for heat distribution (space & water)	7.5393	0.0000	5.8093	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			160.7227	(373)
Space and water heating			160.7227	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Total CO2, kg/year			181.2381	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.1800	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1076.1088	1.5850	318.6517	(467)
Electrical energy for heat distribution (space & water)	7.5393	0.0000	61.8392	(472)
Overall CO2 factor for heat network			0.4240	(486)
Total CO2 associated with community systems			1710.8839	(473)
Space and water heating			1710.8839	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Total Primary energy kWh/year			1929.3659	(483)
Dwelling Primary energy Rate (DPER)			44.5000	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		2 * 10 =	20.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		20.0000 / (5) =	0.1883 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.4383 (18)
Number of sides sheltered			3 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.3397 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4004			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830	
E3 Sill	4.7600	0.0500	0.2380	
E4 Jamb	23.1600	0.0500	1.1580	
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284	
E16 Corner (normal)	5.0000	0.0900	0.4500	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000	
E18 Party wall between dwellings	5.0000	0.0600	0.3000	
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000	
E5 Ground floor (normal)	26.1200	0.1600	4.1792	
P1 Party wall - Ground floor	6.7000	0.0800	0.5360	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)											Total = Sum(45)m =	1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
										Total per year (kWh/year) = Sum(64)m =		1875.8483	(64)
12Total per year (kWh/year)												1876	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6300	0.7000	0.7700	39.0751	(80)

Solar gains	39.0751	76.4392	125.8845	183.5950	225.0025	230.3301	219.2837	188.3614	146.4088	90.7015	48.7221	32.1335	(83)
Total gains	408.2958	452.6009	487.6757	532.6961	557.8990	548.9788	526.8301	497.0792	463.7948	421.5301	398.4414	394.6229	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area	0.9835	0.9715	0.9453	0.8705	0.7337	0.5459	0.3986	0.4393	0.6725	0.8975	0.9688	0.9858	(86)
MIT	19.9106	20.0893	20.3508	20.6786	20.8917	20.9802	20.9966	20.9946	20.9463	20.6744	20.2495	19.8847	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house	0.9788	0.9636	0.9300	0.8369	0.6745	0.4660	0.3088	0.3457	0.5907	0.8627	0.9586	0.9817	(89)
MIT 2	18.7312	18.9566	19.2810	19.6746	19.8997	19.9839	19.9936	19.9945	19.9575	19.6814	19.1685	18.7054	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.2945	19.4976	19.7920	20.1541	20.3735	20.4597	20.4726	20.4722	20.4298	20.1557	19.6848	19.2687	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2945	19.4976	19.7920	20.1541	20.3735	20.4597	20.4726	20.4722	20.4298	20.1557	19.6848	19.2687	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9749	0.9591	0.9268	0.8431	0.6982	0.5036	0.3518	0.3904	0.6277	0.8693	0.9550	0.9781	(94)
Useful gains	398.0469	434.0923	451.9850	449.0967	389.5280	276.4737	185.3267	194.0822	291.1077	366.4217	380.5039	385.9848	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	742.0577	720.5526	654.4403	547.4923	420.9954	281.4218	185.9884	195.1855	305.2431	463.8155	613.6442	738.2617	(97)
Space heating kWh	255.9441	192.5013	150.6267	70.8448	23.4117	0.0000	0.0000	0.0000	0.0000	72.4610	167.8610	262.0940	(98a)
Space heating requirement - total per year (kWh/year)												1195.7446	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	255.9441	192.5013	150.6267	70.8448	23.4117	0.0000	0.0000	0.0000	0.0000	72.4610	167.8610	262.0940	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1195.7446	
Space heating per m2											(98c) / (4) =	27.5771	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 92.3000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	255.9441	192.5013	150.6267	70.8448	23.4117	0.0000	0.0000	0.0000	0.0000	72.4610	167.8610	262.0940	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	277.2959	208.5604	163.1925	76.7550	25.3648	0.0000	0.0000	0.0000	0.0000	78.5060	181.8645	283.9588	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.8067	84.4420	83.7496	82.4371	80.9080	79.8000	79.8000	79.8000	79.8000	82.4529	84.1107	84.8812	(217)
Fuel for water heating, kWh/month	216.3157	192.3305	206.6676	186.3399	185.2114	170.5061	169.2907	175.3325	176.4869	188.9442	195.0948	214.0019	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 1295.4979 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 79.8000
Water heating fuel used 2276.5223 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
Total electricity for the above, kWh/year 86.0000 (231)
Electricity for lighting (calculated in Appendix L) 116.2701 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3417.0942	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1295.4979	0.2100	272.0546	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2276.5223	0.2100	478.0697	(264)
Space and water heating			750.1242	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			732.4217	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.8900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1295.4979	1.1300	1463.9126	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2276.5223	1.1300	2572.4702	(278)
Space and water heating			4036.3829	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3954.8804	(286)
Target Primary Energy Rate (TPER)			91.2100	(287)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	81 B	**DER**	4.18	**TER**	16.89
Environmental	97 A	**% DER < TER**			75.25
CO_2 Emissions (t/year)	0.17	**DFEE**	22.87	**TFEE**	37.04
Compliance Check	See BREL	**% DFEE < TFEE**			38.26
% DPER < TPER	51.22	**DPER**	44.50	**TPER**	91.21

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	460.9371	499.3751	541.0594	581.5362	605.2805	592.0631	569.0364	538.2350	504.0534	463.4913	441.8157	444.4008	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874

util living area													
	0.9506	0.9208	0.8509	0.7193	0.5517	0.3920	0.2808	0.3103	0.4941	0.7613	0.9132	0.9589	(86)
MIT	20.5418	20.6601	20.8196	20.9423	20.9895	20.9989	20.9999	20.9998	20.9957	20.9322	20.7241	20.4992	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.9397	0.9048	0.8249	0.6817	0.5076	0.3446	0.2311	0.2578	0.4397	0.7180	0.8932	0.9496	(89)
MIT 2	19.7141	19.8554	20.0390	20.1690	20.2129	20.2202	20.2207	20.2207	20.2182	20.1624	19.9346	19.6624	(90)
Living area fraction											fLA = Living area / (4) =	0.4776	(91)
MIT	20.1094	20.2397	20.4119	20.5384	20.5838	20.5921	20.5929	20.5928	20.5896	20.5301	20.3117	20.0621	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1094	20.2397	20.4119	20.5384	20.5838	20.5921	20.5929	20.5928	20.5896	20.5301	20.3117	20.0621	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9380	0.9053	0.8316	0.6973	0.5283	0.3672	0.2549	0.2829	0.4656	0.7357	0.8958	0.9474	(94)
Useful gains	432.3420	452.0640	449.9610	405.5295	319.7866	217.4085	145.0207	152.2644	234.6742	341.0035	395.7573	421.0203	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	574.2773	557.2156	505.3480	422.7631	322.7042	217.6636	145.0408	152.3034	235.7337	360.7107	479.9145	576.1910	(97)
Space heating kWh													
	105.5999	70.6619	41.2080	12.4082	2.1707	0.0000	0.0000	0.0000	0.0000	14.6621	60.5932	115.4470	(98a)
Space heating requirement - total per year (kWh/year)												422.7510	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	105.5999	70.6619	41.2080	12.4082	2.1707	0.0000	0.0000	0.0000	0.0000	14.6621	60.5932	115.4470	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												422.7510	
Space heating per m2											(98c) / (4) =	9.7498	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	105.5999	70.6619	41.2080	12.4082	2.1707	0.0000	0.0000	0.0000	0.0000	14.6621	60.5932	115.4470	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	158.3998	105.9928	61.8120	18.6123	3.2561	0.0000	0.0000	0.0000	0.0000	21.9932	90.8898	173.1705	
Space heating requirement													
	158.3998	105.9928	61.8120	18.6123	3.2561	0.0000	0.0000	0.0000	0.0000	21.9932	90.8898	173.1705	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												634.1264	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												6.3413	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4058.2102	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	634.1264	4.4400	28.1552	(340a)
Space heating total			28.1552	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Total energy cost			289.3685	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1790	(357)
SAP value		80.8891	
SAP rating (Section 12)		81	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1044.1613	0.1581	26.7384	(367)
Electrical energy for heat distribution (space & water)	6.3413	0.0000	5.6206	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			155.5023	(373)
Space and water heating			155.5023	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Total CO2, kg/year			176.0177	(383)
CO2 emissions per m2			4.0600	(384)
EI value			97.3307	(384a)
EI rating			97	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.4982 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day)		92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:		
Store volume		110.0000 (47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)		0.0152 (51)
Volume factor from Table 2a		1.0294 (52)
Temperature factor from Table 2b		0.6000 (53)
Enter (49) or (54) in (55)		1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
									Total per year (kWh/year) = Sum(64)m =			2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	23.7835	0.6800	0.7000	0.7700	51.0736	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	51.0736	88.7763	143.8339	211.6843	249.5125	273.8424	255.8751	224.3556	176.4207	111.0901	62.7325	42.2420	(83)
Total gains	469.8344	505.6456	549.0181	595.0545	611.9331	617.2952	588.2244	559.2798	522.4455	476.6813	451.9594	451.9591	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area	0.9423	0.9110	0.8276	0.6873	0.5181	0.3410	0.2408	0.2662	0.4570	0.7183	0.8953	0.9522	(86)
MIT	20.5838	20.6918	20.8527	20.9564	20.9929	20.9996	21.0000	20.9999	20.9974	20.9532	20.7668	20.5403	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house	0.9297	0.8933	0.7989	0.6483	0.4738	0.2953	0.1927	0.2157	0.4039	0.6719	0.8721	0.9414	(89)
MIT 2	19.7649	19.8929	20.0754	20.1827	20.2157	20.2205	20.2207	20.2207	20.2192	20.1822	19.9837	19.7127	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.1560	20.2745	20.4467	20.5523	20.5869	20.5926	20.5929	20.5929	20.5909	20.5504	20.3578	20.1080	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1560	20.2745	20.4467	20.5523	20.5869	20.5926	20.5929	20.5929	20.5909	20.5504	20.3578	20.1080	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9286	0.8946	0.8076	0.6652	0.4947	0.3172	0.2157	0.2398	0.4292	0.6920	0.8765	0.9397	(94)
Useful gains	436.2812	452.3702	443.3841	395.8357	302.7368	195.7885	126.8735	134.1312	224.2433	329.8652	396.1579	424.6918	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	565.0732	547.5815	488.4503	408.7382	304.6551	195.8867	126.8799	134.1441	224.8841	343.2869	467.0580	566.9598	(97)
Space heating kWh	95.8212	63.9820	33.5292	9.2898	1.4272	0.0000	0.0000	0.0000	0.0000	9.9857	51.0481	105.8474	(98a)
Space heating requirement - total per year (kWh/year)												370.9307	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	95.8212	63.9820	33.5292	9.2898	1.4272	0.0000	0.0000	0.0000	0.0000	9.9857	51.0481	105.8474	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												370.9307	
Space heating per m2											(98c) / (4) =	8.5547	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	95.8212	63.9820	33.5292	9.2898	1.4272	0.0000	0.0000	0.0000	0.0000	9.9857	51.0481	105.8474	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	143.7318	95.9730	50.2938	13.9348	2.1408	0.0000	0.0000	0.0000	0.0000	14.9786	76.5721	158.7711	
Space heating requirement	143.7318	95.9730	50.2938	13.9348	2.1408	0.0000	0.0000	0.0000	0.0000	14.9786	76.5721	158.7711	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												556.3960	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												5.5640	(313)
Space cooling fuel												0.0000	(321)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)

mechanical ventilation fans (SFP = 0.0920)	11.9235	(330a)
Total electricity for the above, kWh/year	11.9235	(331)
Electricity for lighting (calculated in Appendix L)	130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3980.4797	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	556.3960	6.5500	36.4439	(340a)
Space heating total			36.4439	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Total energy cost			395.9235	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1023.4332	0.1586	23.5289	(367)
Electrical energy for heat distribution (space & water)	5.5640	0.0000	5.5002	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			152.1725	(373)
Space and water heating			152.1725	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Total CO2, kg/year			172.6879	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1023.4332	1.5870	235.4676	(467)
Electrical energy for heat distribution (space & water)	5.5640	0.0000	58.7198	(472)
Overall CO2 factor for heat network			0.4233	(486)
Total CO2 associated with community systems			1624.5804	(473)
Space and water heating			1624.5804	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Total Primary energy kWh/year			1843.0624	(483)

SAP 10 EPC IMPROVEMENTS

Rev D - Be Clean

Current energy efficiency rating: B 81
Current environmental impact rating: A 97

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 81
Potential environmental impact rating: A 97

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£41	£41	£0
Community scheme	£355	£355	£0
Space heating	£144	£144	£0
Water heating	£215	£215	£0
Lighting	£37	£37	£0

Total cost of fuels	£396	£396	£0
Total cost of uses	£396	£396	£0
Delivered energy	92 kWh/m²	92 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	4 kg/m²	4 kg/m²	0 kg/m²
Primary energy	43 kWh/m²	43 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers													
	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths													
	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses													
	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m													
	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	460.9371	499.3751	541.0594	581.5362	605.2805	592.0631	569.0364	538.2350	504.0534	463.4913	441.8157	444.4008	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area													
	0.9506	0.9208	0.8509	0.7193	0.5517	0.3920	0.2808	0.3103	0.4941	0.7613	0.9132	0.9589	(86)
MIT	20.5418	20.6601	20.8196	20.9423	20.9895	20.9989	20.9999	20.9998	20.9957	20.9322	20.7241	20.4992	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.9397	0.9048	0.8249	0.6817	0.5076	0.3446	0.2311	0.2578	0.4397	0.7180	0.8932	0.9496	(89)
MIT 2	19.7141	19.8554	20.0390	20.1690	20.2129	20.2202	20.2207	20.2207	20.2182	20.1624	19.9346	19.6624	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.1094	20.2397	20.4119	20.5384	20.5838	20.5921	20.5929	20.5928	20.5896	20.5301	20.3117	20.0621	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1094	20.2397	20.4119	20.5384	20.5838	20.5921	20.5929	20.5928	20.5896	20.5301	20.3117	20.0621	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9380	0.9053	0.8316	0.6973	0.5283	0.3672	0.2549	0.2829	0.4656	0.7357	0.8958	0.9474	(94)
Useful gains	432.3420	452.0640	449.9610	405.5295	319.7866	217.4085	145.0207	152.2644	234.6742	341.0035	395.7573	421.0203	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	574.2773	557.2156	505.3480	422.7631	322.7042	217.6636	145.0408	152.3034	235.7337	360.7107	479.9145	576.1910	(97)
Space heating kWh	105.5999	70.6619	41.2080	12.4082	2.1707	0.0000	0.0000	0.0000	0.0000	14.6621	60.5932	115.4470	(98a)
Space heating requirement - total per year (kWh/year)												422.7510	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	105.5999	70.6619	41.2080	12.4082	2.1707	0.0000	0.0000	0.0000	0.0000	14.6621	60.5932	115.4470	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												422.7510	
Space heating per m2											(98c) / (4) =	9.7498	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		
105.5999 70.6619 41.2080 12.4082 2.1707 0.0000 0.0000 0.0000 0.0000 14.6621 60.5932	115.4470	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50		
307a 158.3998 105.9928 61.8120 18.6123 3.2561 0.0000 0.0000 0.0000 0.0000 21.9932 90.8898	173.1705	
Space heating requirement		
158.3998 105.9928 61.8120 18.6123 3.2561 0.0000 0.0000 0.0000 0.0000 21.9932 90.8898	173.1705	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.0000	(309)
Water heating		
Annual water heating requirement		
214.6882 190.1982 202.6545 179.3121 174.6530 158.2600 156.7058 162.3469 163.5105 181.2971 191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50		
310a 322.0323 285.2973 303.9818 268.9682 261.9796 237.3900 235.0587 243.5203 245.2657 271.9456 287.3375	318.7016	
Water heating fuel		
322.0323 285.2973 303.9818 268.9682 261.9796 237.3900 235.0587 243.5203 245.2657 271.9456 287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio	0.0000	(314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.0000	(315)
Pumps and Fa 1.0127 0.9147 1.0127 0.9800 1.0127 0.9800 1.0127 1.0127 0.9800 1.0127 0.9800	1.0127	(331)
Lighting 16.1924 12.9901 11.6962 8.5691 6.6190 5.4078 6.0381 7.8486 10.1945 13.3757 15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		
(333a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)		
(334a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)		
(335a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)		
(333b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)		
(334b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)		
(335b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.0000	(335b)
Annual totals kWh/year		
Space heating fuel - community heating	634.1264	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	6.3413	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(330a)
Total electricity for the above, kWh/year	11.9235	(331)
Electricity for lighting (calculated in Appendix L)	130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4058.2102	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	634.1264	4.4400	28.1552	(340a)
Space heating total			28.1552	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Total energy cost			289.3685	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1790	(357)
SAP value		80.8891	
SAP rating (Section 12)		81	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1044.1613	0.1581	26.7384	(367)
Electrical energy for heat distribution (space & water)	6.3413	0.0000	5.6206	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			155.5023	(373)
Space and water heating			155.5023	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Total CO2, kg/year			176.0177	(383)
CO2 emissions per m2			4.0600	(384)
EI value			97.3307	(384a)
EI rating			97	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume					(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)

Party Ceiling 1	43.3600	30.0000	1300.8000 (32b)
Internal TF Wall	68.4500	9.0000	616.0500 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982 (42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)											Total = Sum(45)m =	1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	23.7835	0.6800	0.7000	0.7700	51.0736	(80)

Solar gains	51.0736	88.7763	143.8339	211.6843	249.5125	273.8424	255.8751	224.3556	176.4207	111.0901	62.7325	42.2420	(83)
Total gains	469.8344	505.6456	549.0181	595.0545	611.9331	617.2952	588.2244	559.2798	522.4455	476.6813	451.9594	451.9591	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area	0.9423	0.9110	0.8276	0.6873	0.5181	0.3410	0.2408	0.2662	0.4570	0.7183	0.8953	0.9522	(86)
MIT	20.5838	20.6918	20.8527	20.9564	20.9929	20.9996	21.0000	20.9999	20.9974	20.9532	20.7668	20.5403	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house	0.9297	0.8933	0.7989	0.6483	0.4738	0.2953	0.1927	0.2157	0.4039	0.6719	0.8721	0.9414	(89)
MIT 2	19.7649	19.8929	20.0754	20.1827	20.2157	20.2205	20.2207	20.2207	20.2192	20.1822	19.9837	19.7127	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.1560	20.2745	20.4467	20.5523	20.5869	20.5926	20.5929	20.5929	20.5909	20.5504	20.3578	20.1080	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1560	20.2745	20.4467	20.5523	20.5869	20.5926	20.5929	20.5929	20.5909	20.5504	20.3578	20.1080	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9286	0.8946	0.8076	0.6652	0.4947	0.3172	0.2157	0.2398	0.4292	0.6920	0.8765	0.9397	(94)
Useful gains	436.2812	452.3702	443.3841	395.8357	302.7368	195.7885	126.8735	134.1312	224.2433	329.8652	396.1579	424.6918	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	565.0732	547.5815	488.4503	408.7382	304.6551	195.8867	126.8799	134.1441	224.8841	343.2869	467.0580	566.9598	(97)
Space heating kWh	95.8212	63.9820	33.5292	9.2898	1.4272	0.0000	0.0000	0.0000	0.0000	9.9857	51.0481	105.8474	(98a)
Space heating requirement - total per year (kWh/year)												370.9307	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	95.8212	63.9820	33.5292	9.2898	1.4272	0.0000	0.0000	0.0000	0.0000	9.9857	51.0481	105.8474	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												370.9307	
Space heating per m2										(98c) / (4) =		8.5547	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement

95.8212	63.9820	33.5292	9.2898	1.4272	0.0000	0.0000	0.0000	0.0000	9.9857	51.0481	105.8474	(98)

Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50

307a	143.7318	95.9730	50.2938	13.9348	2.1408	0.0000	0.0000	0.0000	0.0000	14.9786	76.5721	158.7711	
Space heating requirement	143.7318	95.9730	50.2938	13.9348	2.1408	0.0000	0.0000	0.0000	0.0000	14.9786	76.5721	158.7711	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating
Annual water heating requirement

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50

310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)

Cooling System Energy Efficiency Ratio 0.0000 (314)

Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)

Electricity generated by PVs (Appendix M) (negative quantity)

(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)

Electricity generated by PVs (Appendix M) (negative quantity)

(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year
Space heating fuel - community heating 556.3960 (307)
Space heating fuel - secondary 0.0000 (309)
Water heating fuel - community heating 3281.4784 (310)
Efficiency of water heater 0.0000 (311)
Electricity used for heat distribution 5.5640 (313)
Space cooling fuel 0.0000 (321)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)
mechanical ventilation fans (SFP = 0.0920) 11.9235 (330a)
Total electricity for the above, kWh/year 11.9235 (331)
Electricity for lighting (calculated in Appendix L) 130.6818 (332)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (333)
Wind generation 0.0000 (334)
Hydro-electric generation (Appendix N) 0.0000 (335a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (335)
Appendix Q - special features
Energy saved or generated -0.0000 (336)
Energy used 0.0000 (337)
Total delivered energy for all uses 3980.4797 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	556.3960	6.5500	36.4439	(340a)
Space heating total			36.4439	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Total energy cost			395.9235	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1023.4332	0.1586	23.5289	(367)
Electrical energy for heat distribution (space & water)	5.5640	0.0000	5.5002	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			152.1725	(373)
Space and water heating			152.1725	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Total CO2, kg/year			172.6879	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1023.4332	1.5870	235.4676	(467)
Electrical energy for heat distribution (space & water)	5.5640	0.0000	58.7198	(472)
Overall CO2 factor for heat network			0.4233	(486)
Total CO2 associated with community systems			1624.5804	(473)
Space and water heating			1624.5804	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Total Primary energy kWh/year			1843.0624	(483)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.39	**TER**	16.89
Environmental	99 A	**% DER < TER**			91.77
CO_2 Emissions (t/year)	0.04	**DFEE**	22.87	**TFEE**	37.04
Compliance Check	See BREL	**% DFEE < TFEE**			38.26
% DPER < TPER	72.76	**DPER**	24.85	**TPER**	91.21

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 10371.4500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	239.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	2.2962	(36)
Point Thermal bridges	(36a) = 0.0000	

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)

WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Total per year (kWh/year) = Sum(64)m = 2187.6523 (64)

12Total per year (kWh/year) 2188 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)

Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)

Water heating gains (Table 5)

130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)

Total internal gains

377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	419.7672	467.2558	506.0368	555.7052	584.1265	578.6970	555.6038	523.3987	486.8526	437.0989	410.7463	405.5434	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106

alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874		
util living area	0.9673	0.9391	0.8794	0.7447	0.5704	0.4010	0.2876	0.3191	0.5109	0.7927	0.9345	0.9729	(86)
MIT	20.4545	20.6028	20.7778	20.9302	20.9874	20.9988	20.9999	20.9998	20.9949	20.9148	20.6707	20.4133	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house	0.9595	0.9258	0.8561	0.7074	0.5252	0.3525	0.2367	0.2651	0.4549	0.7507	0.9180	0.9663	(89)
MIT 2	19.6081	19.7882	19.9933	20.1575	20.2113	20.2201	20.2207	20.2206	20.2177	20.1463	19.8733	19.5573	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0123	20.1773	20.3680	20.5265	20.5820	20.5920	20.5929	20.5928	20.5889	20.5134	20.2542	19.9662	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0123	20.1773	20.3680	20.5265	20.5820	20.5920	20.5929	20.5928	20.5889	20.5134	20.2542	19.9662	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9571	0.9250	0.8608	0.7224	0.5463	0.3756	0.2610	0.2909	0.4815	0.7671	0.9188	0.9637	(94)
Useful gains	401.7598	432.2106	435.6061	401.4579	319.1330	217.3690	145.0173	152.2566	234.4309	335.3008	377.3945	390.8402	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	570.7504	554.9474	503.7549	422.3338	322.6373	217.6595	145.0404	152.3026	235.7086	360.1025	477.8254	572.7063	(97)
Space heating kWh	125.7290	82.4791	50.7027	15.0307	2.6072	0.0000	0.0000	0.0000	0.0000	18.4524	72.3102	135.3084	(98a)
Space heating requirement - total per year (kWh/year)												502.6198	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	125.7290	82.4791	50.7027	15.0307	2.6072	0.0000	0.0000	0.0000	0.0000	18.4524	72.3102	135.3084	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												502.6198	
Space heating per m2											(98c) / (4) =	11.5918	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	125.7290	82.4791	50.7027	15.0307	2.6072	0.0000	0.0000	0.0000	0.0000	18.4524	72.3102	135.3084	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	188.5935	123.7187	76.0541	22.5460	3.9108	0.0000	0.0000	0.0000	0.0000	27.6786	108.4654	202.9626	
Space heating requirement	188.5935	123.7187	76.0541	22.5460	3.9108	0.0000	0.0000	0.0000	0.0000	27.6786	108.4654	202.9626	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												753.9297	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												7.5393	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3219.7925	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1076.1088	0.1580	31.7701	(367)
Electrical energy for heat distribution (space & water)	7.5393	0.0000	5.8093	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			160.7227	(373)
Space and water heating			160.7227	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			60.1950	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.3900	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1076.1088	1.5850	318.6517	(467)
Electrical energy for heat distribution (space & water)	7.5393	0.0000	61.8392	(472)
Overall CO2 factor for heat network			0.4240	(486)
Total CO2 associated with community systems			1710.8839	(473)
Space and water heating			1710.8839	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			1077.2891	(483)
Dwelling Primary energy Rate (DPER)			24.8500	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)

100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4004	(33)
Main dwelling						
Party Wall			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
E5 Ground floor (normal)	26.1200	0.1600	4.1792
P1 Party wall - Ground floor	6.7000	0.0800	0.5360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6300	0.7000	0.7700	39.0751	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	39.0751	76.4392	125.8845	183.5950	225.0025	230.3301	219.2837	188.3614	146.4088	90.7015	48.7221	32.1335	(83)
Total gains	408.2958	452.6009	487.6757	532.6961	557.8990	548.9788	526.8301	497.0792	463.7948	421.5301	398.4414	394.6229	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area	0.9835	0.9715	0.9453	0.8705	0.7337	0.5459	0.3986	0.4393	0.6725	0.8975	0.9688	0.9858	(86)
MIT	19.9106	20.0893	20.3508	20.6786	20.8917	20.9802	20.9966	20.9946	20.9463	20.6744	20.2495	19.8847	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house	0.9788	0.9636	0.9300	0.8369	0.6745	0.4660	0.3088	0.3457	0.5907	0.8627	0.9586	0.9817	(89)
MIT 2	18.7312	18.9566	19.2810	19.6746	19.8997	19.9839	19.9936	19.9945	19.9575	19.6814	19.1685	18.7054	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.2945	19.4976	19.7920	20.1541	20.3735	20.4597	20.4726	20.4722	20.4298	20.1557	19.6848	19.2687	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2945	19.4976	19.7920	20.1541	20.3735	20.4597	20.4726	20.4722	20.4298	20.1557	19.6848	19.2687	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9749	0.9591	0.9268	0.8431	0.6982	0.5036	0.3518	0.3904	0.6277	0.8693	0.9550	0.9781	(94)
Useful gains	398.0469	434.0923	451.9850	449.0967	389.5280	276.4737	185.3267	194.0822	291.1077	366.4217	380.5039	385.9848	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	742.0577	720.5526	654.4403	547.4923	420.9954	281.4218	185.9884	195.1855	305.2431	463.8155	613.6442	738.2617	(97)
Space heating kWh	255.9441	192.5013	150.6267	70.8448	23.4117	0.0000	0.0000	0.0000	0.0000	72.4610	167.8610	262.0940	(98a)
Space heating requirement - total per year (kWh/year)												1195.7446	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	255.9441	192.5013	150.6267	70.8448	23.4117	0.0000	0.0000	0.0000	0.0000	72.4610	167.8610	262.0940	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1195.7446	
Space heating per m2										(98c) / (4) =		27.5771	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	255.9441	192.5013	150.6267	70.8448	23.4117	0.0000	0.0000	0.0000	0.0000	72.4610	167.8610	262.0940	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	277.2959	208.5604	163.1925	76.7550	25.3648	0.0000	0.0000	0.0000	0.0000	78.5060	181.8645	283.9588	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.8067	84.4420	83.7496	82.4371	80.9080	79.8000	79.8000	79.8000	79.8000	82.4529	84.1107	84.8812	(217)
Fuel for water heating, kWh/month	216.3157	192.3305	206.6676	186.3399	185.2114	170.5061	169.2907	175.3325	176.4869	188.9442	195.0948	214.0019	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1295.4979	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2276.5223	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3417.0942	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1295.4979	0.2100	272.0546	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2276.5223	0.2100	478.0697	(264)
Space and water heating			750.1242	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			732.4217	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.8900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1295.4979	1.1300	1463.9126	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2276.5223	1.1300	2572.4702	(278)
Space and water heating			4036.3829	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3954.8804	(286)
Target Primary Energy Rate (TPER)			91.2100	(287)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.39	**TER**	16.89
Environmental	99 A	**% DER < TER**			91.77
CO_2 Emissions (t/year)	0.04	**DFEE**	22.87	**TFEE**	37.04
Compliance Check	See BREL	**% DFEE < TFEE**			38.26
% DPER < TPER	72.76	**DPER**	24.85	**TPER**	91.21

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2622	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	38.2833	38.2073	38.1327	37.7826	37.7171	37.4122	37.4122	37.3557	37.5296	37.7171	37.8496	37.9882	(39)
Average = Sum(39)m / 12 =												37.7823	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8829	0.8812	0.8794	0.8714	0.8699	0.8628	0.8628	0.8615	0.8655	0.8699	0.8729	0.8761	(40)
HLP (average)												0.8714	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
							Total per year (kWh/year) = Sum(64)m =				663.9767	(64)
12Total per year (kWh/year)											664	(64)

Electric shower(s)

39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
				Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							449.4572	(64a)

Heat gains from water heating, kWh/month

27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.4004	291.4783	279.0119	271.5070	258.2448	250.2442	241.2477	240.9702	247.9561	254.7841	268.8582	277.3654	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	325.5767	373.9841	414.8872	469.6730	501.1047	498.8545	477.9348	444.2810	405.9847	352.6842	321.4470	312.0492	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.2536	75.4034	75.5508	76.2509	76.3833	77.0059	77.0059	77.1223	76.7649	76.3833	76.1159	75.8383	
alpha	6.0169	6.0269	6.0367	6.0834	6.0922	6.1337	6.1337	6.1415	6.1177	6.0922	6.0744	6.0559	
util living area	0.9915	0.9799	0.9492	0.8470	0.6740	0.4772	0.3441	0.3861	0.6225	0.9003	0.9799	0.9932	(86)
MIT	20.1468	20.3294	20.5708	20.8396	20.9648	20.9962	20.9996	20.9992	20.9831	20.7981	20.4298	20.1140	(87)
Th 2	20.1820	20.1835	20.1850	20.1919	20.1932	20.1992	20.1992	20.2003	20.1969	20.1932	20.1906	20.1879	(88)
util rest of house	0.9890	0.9744	0.9359	0.8144	0.6235	0.4187	0.2817	0.3193	0.5561	0.8698	0.9734	0.9913	(89)

MIT 2	19.4111	19.5916	19.8248	20.0727	20.1718	20.1976	20.1991	20.2001	20.1887	20.0443	19.6975	19.3835	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.7625	19.9440	20.1811	20.4390	20.5506	20.5791	20.5814	20.5818	20.5681	20.4043	20.0472	19.7324	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7625	19.9440	20.1811	20.4390	20.5506	20.5791	20.5814	20.5818	20.5681	20.4043	20.0472	19.7324	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9875	0.9725	0.9358	0.8249	0.6463	0.4466	0.3115	0.3512	0.5873	0.8785	0.9720	0.9899	(94)
Useful gains	321.5005	363.6828	388.2693	387.4510	323.8803	222.7857	148.8737	156.0472	238.4372	309.8350	312.4541	308.9100	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	591.9551	574.7896	521.6975	435.9735	333.8190	223.6897	148.9541	156.2123	242.7460	369.7916	490.0479	590.0469	(97)
Space heating kWh	201.2182	141.8637	99.2706	34.9361	7.3944	0.0000	0.0000	0.0000	0.0000	44.6077	127.8675	209.1658	(98a)
Space heating requirement - total per year (kWh/year)												866.3242	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	201.2182	141.8637	99.2706	34.9361	7.3944	0.0000	0.0000	0.0000	0.0000	44.6077	127.8675	209.1658	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												866.3242	
Space heating per m2											(98c) / (4) =	19.9798	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	351.6746	276.8502	283.9035	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9766	0.9911	0.9854	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	343.4485	274.3912	279.7716	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	554.0542	531.1768	493.2464	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	151.6361	191.0485	158.8253	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	37.9090	47.7621	39.7063	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												125.3775	(107)
Energy for space heating												19.9798	(99)
Energy for space cooling												2.8915	(108)
Total												22.8713	(109)
Fabric Energy Efficiency (DFEE)												22.9	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4383 (18)
Number of sides sheltered		3 (19)
Shelter factor (20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =		0.3397 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4004			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
E5 Ground floor (normal)	26.1200	0.1600	4.1792
P1 Party wall - Ground floor	6.7000	0.0800	0.5360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)													
	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							449.4572	(64a)
Heat gains from water heating, kWh/month													
	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains													
	281.3655	289.2254	276.9770	269.4043	256.2100	248.1415	239.2128	238.9354	245.8534	252.7493	266.7555	275.3306	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6300	0.7000	0.7700	39.0751	(80)

Solar gains	39.0751	76.4392	125.8845	183.5950	225.0025	230.3301	219.2837	188.3614	146.4088	90.7015	48.7221	32.1335	(83)
Total gains	320.4406	365.6646	402.8615	452.9993	481.2125	478.4717	458.4965	427.2968	392.2623	343.4508	315.4775	307.4640	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area													
	0.9940	0.9878	0.9727	0.9201	0.8045	0.6154	0.4557	0.5067	0.7578	0.9473	0.9876	0.9951	(86)
MIT	19.6977	19.8879	20.1733	20.5578	20.8345	20.9666	20.9938	20.9898	20.9085	20.5380	20.0581	19.6712	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house													
	0.9921	0.9840	0.9640	0.8953	0.7498	0.5296	0.3543	0.4009	0.6774	0.9255	0.9831	0.9935	(89)
MIT 2	18.7944	18.9844	19.2662	19.6392	19.8786	19.9800	19.9931	19.9936	19.9436	19.6305	19.1631	18.7753	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.2258	19.4159	19.6995	20.0780	20.3352	20.4512	20.4711	20.4694	20.4044	20.0640	19.5906	19.2032	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2258	19.4159	19.6995	20.0780	20.3352	20.4512	20.4711	20.4694	20.4044	20.0640	19.5906	19.2032	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9903	0.9814	0.9612	0.8980	0.7700	0.5696	0.4028	0.4515	0.7124	0.9275	0.9809	0.9920	(94)
Useful gains	317.3388	358.8658	387.2348	406.7711	370.5136	272.5577	184.6948	192.9433	279.4651	318.5421	309.4535	304.9947	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	738.6574	716.5197	649.8882	543.7870	419.1347	281.0125	185.9127	195.0519	304.0221	459.3639	609.0488	735.0561	(97)
Space heating kWh													
	313.4610	240.3434	195.4141	98.6514	36.1741	0.0000	0.0000	0.0000	0.0000	104.7714	215.7086	319.9657	(98a)
Space heating requirement - total per year (kWh/year)												1524.4897	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	313.4610	240.3434	195.4141	98.6514	36.1741	0.0000	0.0000	0.0000	0.0000	104.7714	215.7086	319.9657	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1524.4897	
Space heating per m2											(98c) / (4) =	35.1589	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	451.4472	355.3946	364.2795	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8939	0.9440	0.9228	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	403.5707	335.4817	336.1678	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	532.5097	510.6427	475.5231	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	92.8361	130.3198	103.6803	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	23.2090	32.5800	25.9201	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												81.7091	(107)
Energy for space heating												35.1589	(99)
Energy for space cooling												1.8844	(108)
Total												37.0433	(109)
Fabric Energy Efficiency (TFEE)												37.0	(109)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.39	**TER**	16.89
Environmental	99 A	**% DER < TER**			91.77
CO_2 Emissions (t/year)	0.04	**DFEE**	22.87	**TFEE**	37.04
Compliance Check	See BREL	**% DFEE < TFEE**			38.26
% DPER < TPER	72.76	**DPER**	24.85	**TPER**	91.21

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 10371.4500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	239.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	2.2962	(36)
Point Thermal bridges	(36a) = 0.0000	

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)

WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Total per year (kWh/year) = Sum(64)m = 2187.6523 (64)

12Total per year (kWh/year) 2188 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)

Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)

Water heating gains (Table 5)

130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)

Total internal gains

377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	419.7672	467.2558	506.0368	555.7052	584.1265	578.6970	555.6038	523.3987	486.8526	437.0989	410.7463	405.5434	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106

alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874		
util living area	0.9673	0.9391	0.8794	0.7447	0.5704	0.4010	0.2876	0.3191	0.5109	0.7927	0.9345	0.9729	(86)
MIT	20.4545	20.6028	20.7778	20.9302	20.9874	20.9988	20.9999	20.9998	20.9949	20.9148	20.6707	20.4133	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house	0.9595	0.9258	0.8561	0.7074	0.5252	0.3525	0.2367	0.2651	0.4549	0.7507	0.9180	0.9663	(89)
MIT 2	19.6081	19.7882	19.9933	20.1575	20.2113	20.2201	20.2207	20.2206	20.2177	20.1463	19.8733	19.5573	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0123	20.1773	20.3680	20.5265	20.5820	20.5920	20.5929	20.5928	20.5889	20.5134	20.2542	19.9662	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0123	20.1773	20.3680	20.5265	20.5820	20.5920	20.5929	20.5928	20.5889	20.5134	20.2542	19.9662	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9571	0.9250	0.8608	0.7224	0.5463	0.3756	0.2610	0.2909	0.4815	0.7671	0.9188	0.9637	(94)
Useful gains	401.7598	432.2106	435.6061	401.4579	319.1330	217.3690	145.0173	152.2566	234.4309	335.3008	377.3945	390.8402	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	570.7504	554.9474	503.7549	422.3338	322.6373	217.6595	145.0404	152.3026	235.7086	360.1025	477.8254	572.7063	(97)
Space heating kWh	125.7290	82.4791	50.7027	15.0307	2.6072	0.0000	0.0000	0.0000	0.0000	18.4524	72.3102	135.3084	(98a)
Space heating requirement - total per year (kWh/year)												502.6198	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	125.7290	82.4791	50.7027	15.0307	2.6072	0.0000	0.0000	0.0000	0.0000	18.4524	72.3102	135.3084	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												502.6198	
Space heating per m2											(98c) / (4) =	11.5918	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	125.7290	82.4791	50.7027	15.0307	2.6072	0.0000	0.0000	0.0000	0.0000	18.4524	72.3102	135.3084	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	188.5935	123.7187	76.0541	22.5460	3.9108	0.0000	0.0000	0.0000	0.0000	27.6786	108.4654	202.9626	
Space heating requirement	188.5935	123.7187	76.0541	22.5460	3.9108	0.0000	0.0000	0.0000	0.0000	27.6786	108.4654	202.9626	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												753.9297	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												7.5393	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3219.7925	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1076.1088	0.1580	31.7701	(367)
Electrical energy for heat distribution (space & water)	7.5393	0.0000	5.8093	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			160.7227	(373)
Space and water heating			160.7227	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			60.1950	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.3900	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1076.1088	1.5850	318.6517	(467)
Electrical energy for heat distribution (space & water)	7.5393	0.0000	61.8392	(472)
Overall CO2 factor for heat network			0.4240	(486)
Total CO2 associated with community systems			1710.8839	(473)
Space and water heating			1710.8839	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			1077.2891	(483)
Dwelling Primary energy Rate (DPER)			24.8500	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)

100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4004	(33)
Main dwelling						
Party Wall			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
E5 Ground floor (normal)	26.1200	0.1600	4.1792
P1 Party wall - Ground floor	6.7000	0.0800	0.5360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6300	0.7000	0.7700	39.0751	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	39.0751	76.4392	125.8845	183.5950	225.0025	230.3301	219.2837	188.3614	146.4088	90.7015	48.7221	32.1335	(83)
Total gains	408.2958	452.6009	487.6757	532.6961	557.8990	548.9788	526.8301	497.0792	463.7948	421.5301	398.4414	394.6229	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area	0.9835	0.9715	0.9453	0.8705	0.7337	0.5459	0.3986	0.4393	0.6725	0.8975	0.9688	0.9858	(86)
MIT	19.9106	20.0893	20.3508	20.6786	20.8917	20.9802	20.9966	20.9946	20.9463	20.6744	20.2495	19.8847	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house	0.9788	0.9636	0.9300	0.8369	0.6745	0.4660	0.3088	0.3457	0.5907	0.8627	0.9586	0.9817	(89)
MIT 2	18.7312	18.9566	19.2810	19.6746	19.8997	19.9839	19.9936	19.9945	19.9575	19.6814	19.1685	18.7054	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.2945	19.4976	19.7920	20.1541	20.3735	20.4597	20.4726	20.4722	20.4298	20.1557	19.6848	19.2687	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2945	19.4976	19.7920	20.1541	20.3735	20.4597	20.4726	20.4722	20.4298	20.1557	19.6848	19.2687	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9749	0.9591	0.9268	0.8431	0.6982	0.5036	0.3518	0.3904	0.6277	0.8693	0.9550	0.9781	(94)
Useful gains	398.0469	434.0923	451.9850	449.0967	389.5280	276.4737	185.3267	194.0822	291.1077	366.4217	380.5039	385.9848	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	742.0577	720.5526	654.4403	547.4923	420.9954	281.4218	185.9884	195.1855	305.2431	463.8155	613.6442	738.2617	(97)
Space heating kWh	255.9441	192.5013	150.6267	70.8448	23.4117	0.0000	0.0000	0.0000	0.0000	72.4610	167.8610	262.0940	(98a)
Space heating requirement - total per year (kWh/year)												1195.7446	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	255.9441	192.5013	150.6267	70.8448	23.4117	0.0000	0.0000	0.0000	0.0000	72.4610	167.8610	262.0940	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1195.7446	
Space heating per m2										(98c) / (4) =		27.5771	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	255.9441	192.5013	150.6267	70.8448	23.4117	0.0000	0.0000	0.0000	0.0000	72.4610	167.8610	262.0940	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	277.2959	208.5604	163.1925	76.7550	25.3648	0.0000	0.0000	0.0000	0.0000	78.5060	181.8645	283.9588	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.8067	84.4420	83.7496	82.4371	80.9080	79.8000	79.8000	79.8000	79.8000	82.4529	84.1107	84.8812	(217)
Fuel for water heating, kWh/month	216.3157	192.3305	206.6676	186.3399	185.2114	170.5061	169.2907	175.3325	176.4869	188.9442	195.0948	214.0019	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1295.4979	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2276.5223	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3417.0942	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1295.4979	0.2100	272.0546	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2276.5223	0.2100	478.0697	(264)
Space and water heating			750.1242	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			732.4217	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.8900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1295.4979	1.1300	1463.9126	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2276.5223	1.1300	2572.4702	(278)
Space and water heating			4036.3829	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3954.8804	(286)
Target Primary Energy Rate (TPER)			91.2100	(287)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.39	**TER**	16.89
Environmental	99 A	**% DER < TER**			91.77
CO_2 Emissions (t/year)	0.04	**DFEE**	22.87	**TFEE**	37.04
Compliance Check	See BREL	**% DFEE < TFEE**			38.26
% DPER < TPER	72.76	**DPER**	24.85	**TPER**	91.21

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
						(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 10371.4500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	239.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	2.2962	(36)
Point Thermal bridges	(36a) = 0.0000	

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)
Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	460.9371	499.3751	541.0594	581.5362	605.2805	592.0631	569.0364	538.2350	504.0534	463.4913	441.8157	444.4008	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874

util living area													
	0.9506	0.9208	0.8509	0.7193	0.5517	0.3920	0.2808	0.3103	0.4941	0.7613	0.9132	0.9589	(86)
MIT	20.5418	20.6601	20.8196	20.9423	20.9895	20.9989	20.9999	20.9998	20.9957	20.9322	20.7241	20.4992	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.9397	0.9048	0.8249	0.6817	0.5076	0.3446	0.2311	0.2578	0.4397	0.7180	0.8932	0.9496	(89)
MIT 2	19.7141	19.8554	20.0390	20.1690	20.2129	20.2202	20.2207	20.2207	20.2182	20.1624	19.9346	19.6624	(90)
Living area fraction											fLA = Living area / (4) =	0.4776	(91)
MIT	20.1094	20.2397	20.4119	20.5384	20.5838	20.5921	20.5929	20.5928	20.5896	20.5301	20.3117	20.0621	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1094	20.2397	20.4119	20.5384	20.5838	20.5921	20.5929	20.5928	20.5896	20.5301	20.3117	20.0621	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9380	0.9053	0.8316	0.6973	0.5283	0.3672	0.2549	0.2829	0.4656	0.7357	0.8958	0.9474	(94)
Useful gains	432.3420	452.0640	449.9610	405.5295	319.7866	217.4085	145.0207	152.2644	234.6742	341.0035	395.7573	421.0203	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	574.2773	557.2156	505.3480	422.7631	322.7042	217.6636	145.0408	152.3034	235.7337	360.7107	479.9145	576.1910	(97)
Space heating kWh													
	105.5999	70.6619	41.2080	12.4082	2.1707	0.0000	0.0000	0.0000	0.0000	14.6621	60.5932	115.4470	(98a)
Space heating requirement - total per year (kWh/year)												422.7510	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	105.5999	70.6619	41.2080	12.4082	2.1707	0.0000	0.0000	0.0000	0.0000	14.6621	60.5932	115.4470	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												422.7510	
Space heating per m2											(98c) / (4) =	9.7498	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	105.5999	70.6619	41.2080	12.4082	2.1707	0.0000	0.0000	0.0000	0.0000	14.6621	60.5932	115.4470	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	158.3998	105.9928	61.8120	18.6123	3.2561	0.0000	0.0000	0.0000	0.0000	21.9932	90.8898	173.1705	
Space heating requirement													
	158.3998	105.9928	61.8120	18.6123	3.2561	0.0000	0.0000	0.0000	0.0000	21.9932	90.8898	173.1705	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												634.1264	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												6.3413	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3099.9892	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	634.1264	4.4400	28.1552	(340a)
Space heating total			28.1552	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			191.4886	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7802	(357)
SAP value		87.3534	
SAP rating (Section 12)		87	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1044.1613	0.1581	26.7384	(367)
Electrical energy for heat distribution (space & water)	6.3413	0.0000	5.6206	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			155.5023	(373)
Space and water heating			155.5023	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			54.9746	(383)
CO2 emissions per m2			1.2700	(384)
EI value			99.1663	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	43.3600 (1b)	x 2.4500 (2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)

Adj infilt rate

	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104 (22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 10371.4500 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

Thermal bridges (User defined value 0.030 * total exposed area) 2.2962 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)

Average = Sum(39)m / 12 = 36.3250

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Total per year (kWh/year) = Sum(64)m = 2187.6523 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)													

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	23.7835	0.6800	0.7000	0.7700	51.0736	(80)

Solar gains	51.0736	88.7763	143.8339	211.6843	249.5125	273.8424	255.8751	224.3556	176.4207	111.0901	62.7325	42.2420	(83)
Total gains	469.8344	505.6456	549.0181	595.0545	611.9331	617.2952	588.2244	559.2798	522.4455	476.6813	451.9594	451.9591	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area													
	0.9423	0.9110	0.8276	0.6873	0.5181	0.3410	0.2408	0.2662	0.4570	0.7183	0.8953	0.9522	(86)
MIT	20.5838	20.6918	20.8527	20.9564	20.9929	20.9996	21.0000	20.9999	20.9974	20.9532	20.7668	20.5403	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.9297	0.8933	0.7989	0.6483	0.4738	0.2953	0.1927	0.2157	0.4039	0.6719	0.8721	0.9414	(89)
MIT 2	19.7649	19.8929	20.0754	20.1827	20.2157	20.2205	20.2207	20.2207	20.2192	20.1822	19.9837	19.7127	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.1560	20.2745	20.4467	20.5523	20.5869	20.5926	20.5929	20.5929	20.5909	20.5504	20.3578	20.1080	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1560	20.2745	20.4467	20.5523	20.5869	20.5926	20.5929	20.5929	20.5909	20.5504	20.3578	20.1080	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9286	0.8946	0.8076	0.6652	0.4947	0.3172	0.2157	0.2398	0.4292	0.6920	0.8765	0.9397	(94)
Useful gains	436.2812	452.3702	443.3841	395.8357	302.7368	195.7885	126.8735	134.1312	224.2433	329.8652	396.1579	424.6918	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	565.0732	547.5815	488.4503	408.7382	304.6551	195.8867	126.8799	134.1441	224.8841	343.2869	467.0580	566.9598	(97)
Space heating kWh													
	95.8212	63.9820	33.5292	9.2898	1.4272	0.0000	0.0000	0.0000	0.0000	9.9857	51.0481	105.8474	(98a)
Space heating requirement - total per year (kWh/year)												370.9307	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	95.8212	63.9820	33.5292	9.2898	1.4272	0.0000	0.0000	0.0000	0.0000	9.9857	51.0481	105.8474	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												370.9307	
Space heating per m2											(98c) / (4) =	8.5547	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	95.8212	63.9820	33.5292	9.2898	1.4272	0.0000	0.0000	0.0000	0.0000	9.9857	51.0481	105.8474	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	143.7318	95.9730	50.2938	13.9348	2.1408	0.0000	0.0000	0.0000	0.0000	14.9786	76.5721	158.7711	
Space heating requirement													
	143.7318	95.9730	50.2938	13.9348	2.1408	0.0000	0.0000	0.0000	0.0000	14.9786	76.5721	158.7711	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year												
Space heating fuel - community heating											556.3960	(307)
Space heating fuel - secondary											0.0000	(309)
Water heating fuel - community heating											3281.4784	(310)
Efficiency of water heater											0.0000	(311)
Electricity used for heat distribution											5.5640	(313)
Space cooling fuel											0.0000	(321)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)												
mechanical ventilation fans (SFP = 0.0920)											11.9235	(330a)
Total electricity for the above, kWh/year											11.9235	(331)
Electricity for lighting (calculated in Appendix L)											130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											-1054.7470	(333)
Wind generation											0.0000	(334)
Hydro-electric generation (Appendix N)											0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)											0.0000	(335)
Appendix Q - special features												
Energy saved or generated											-0.0000	(336)
Energy used											0.0000	(337)
Total delivered energy for all uses											2925.7327	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	556.3960	6.5500	36.4439	(340a)
Space heating total			36.4439	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			236.8450	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1023.4332	0.1586	23.5289	(367)
Electrical energy for heat distribution (space & water)	5.5640	0.0000	5.5002	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			152.1725	(373)
Space and water heating			152.1725	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			39.4126	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1023.4332	1.5870	235.4676	(467)
Electrical energy for heat distribution (space & water)	5.5640	0.0000	58.7198	(472)
Overall CO2 factor for heat network			0.4233	(486)
Total CO2 associated with community systems			1624.5804	(473)
Space and water heating			1624.5804	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			920.2555	(483)

SAP 10 EPC IMPROVEMENTS

Rev D - Be Green

Current energy efficiency rating:	B 87
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 87
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£41	£41	£0
Community scheme	£355	£355	£0
Space heating	£144	£144	£0
Water heating	£215	£215	£0
Lighting	£37	£37	£0
Generated (PV)	-£159	-£159	£0
Total cost of fuels	£237	£237	£0
Total cost of uses	£237	£237	£0
Delivered energy	67 kWh/m²	67 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.0 tonnes	0.0 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	21 kWh/m²	21 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)

Total net area of external elements Aum(A, m2)	76.5400				(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	16.5005			(33)
Main dwelling					
Party Wall	31.3600	0.0000	0.0000	70.0000	2195.2000 (32)
Party Ceiling 1	43.3600			30.0000	1300.8000 (32b)
Internal TF Wall	68.4500			9.0000	616.0500 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	460.9371	499.3751	541.0594	581.5362	605.2805	592.0631	569.0364	538.2350	504.0534	463.4913	441.8157	444.4008	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area													
	0.9506	0.9208	0.8509	0.7193	0.5517	0.3920	0.2808	0.3103	0.4941	0.7613	0.9132	0.9589	(86)
MIT	20.5418	20.6601	20.8196	20.9423	20.9895	20.9989	20.9999	20.9998	20.9957	20.9322	20.7241	20.4992	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.9397	0.9048	0.8249	0.6817	0.5076	0.3446	0.2311	0.2578	0.4397	0.7180	0.8932	0.9496	(89)
MIT 2	19.7141	19.8554	20.0390	20.1690	20.2129	20.2202	20.2207	20.2207	20.2182	20.1624	19.9346	19.6624	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.1094	20.2397	20.4119	20.5384	20.5838	20.5921	20.5929	20.5928	20.5896	20.5301	20.3117	20.0621	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1094	20.2397	20.4119	20.5384	20.5838	20.5921	20.5929	20.5928	20.5896	20.5301	20.3117	20.0621	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9380	0.9053	0.8316	0.6973	0.5283	0.3672	0.2549	0.2829	0.4656	0.7357	0.8958	0.9474	(94)
Useful gains	432.3420	452.0640	449.9610	405.5295	319.7866	217.4085	145.0207	152.2644	234.6742	341.0035	395.7573	421.0203	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	574.2773	557.2156	505.3480	422.7631	322.7042	217.6636	145.0408	152.3034	235.7337	360.7107	479.9145	576.1910	(97)
Space heating kWh													
	105.5999	70.6619	41.2080	12.4082	2.1707	0.0000	0.0000	0.0000	0.0000	14.6621	60.5932	115.4470	(98a)
Space heating requirement - total per year (kWh/year)												422.7510	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	105.5999	70.6619	41.2080	12.4082	2.1707	0.0000	0.0000	0.0000	0.0000	14.6621	60.5932	115.4470	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												422.7510	
Space heating per m2											(98c) / (4) =	9.7498	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	105.5999	70.6619	41.2080	12.4082	2.1707	0.0000	0.0000	0.0000	0.0000	14.6621	60.5932	115.4470	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	158.3998	105.9928	61.8120	18.6123	3.2561	0.0000	0.0000	0.0000	0.0000	21.9932	90.8898	173.1705	
Space heating requirement													
	158.3998	105.9928	61.8120	18.6123	3.2561	0.0000	0.0000	0.0000	0.0000	21.9932	90.8898	173.1705	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												634.1264	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												6.3413	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)

Appendix Q - special features

Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3099.9892	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	634.1264	4.4400	28.1552	(340a)
Space heating total			28.1552	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			191.4886	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7802	(357)
SAP value		87.3534	
SAP rating (Section 12)		87	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1044.1613	0.1581	26.7384	(367)
Electrical energy for heat distribution (space & water)	6.3413	0.0000	5.6206	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			155.5023	(373)
Space and water heating			155.5023	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			54.9746	(383)
CO2 emissions per m2			1.2700	(384)
EI value			99.1663	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

Measured/design AP50 3.0000 (17)
Infiltration rate 0.1500 (18)
Number of sides sheltered 3 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.2962 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)

Average = Sum(39)m / 12 = 36.3250

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)											Total = Sum(45)m =	1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	23.7835	0.6800	0.7000	0.7700	51.0736	(80)

Solar gains	51.0736	88.7763	143.8339	211.6843	249.5125	273.8424	255.8751	224.3556	176.4207	111.0901	62.7325	42.2420	(83)
Total gains	469.8344	505.6456	549.0181	595.0545	611.9331	617.2952	588.2244	559.2798	522.4455	476.6813	451.9594	451.9591	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area													
	0.9423	0.9110	0.8276	0.6873	0.5181	0.3410	0.2408	0.2662	0.4570	0.7183	0.8953	0.9522	(86)
MIT	20.5838	20.6918	20.8527	20.9564	20.9929	20.9996	21.0000	20.9999	20.9974	20.9532	20.7668	20.5403	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.9297	0.8933	0.7989	0.6483	0.4738	0.2953	0.1927	0.2157	0.4039	0.6719	0.8721	0.9414	(89)
MIT 2	19.7649	19.8929	20.0754	20.1827	20.2157	20.2205	20.2207	20.2207	20.2192	20.1822	19.9837	19.7127	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.1560	20.2745	20.4467	20.5523	20.5869	20.5926	20.5929	20.5929	20.5909	20.5504	20.3578	20.1080	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1560	20.2745	20.4467	20.5523	20.5869	20.5926	20.5929	20.5929	20.5909	20.5504	20.3578	20.1080	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9286	0.8946	0.8076	0.6652	0.4947	0.3172	0.2157	0.2398	0.4292	0.6920	0.8765	0.9397	(94)
Useful gains	436.2812	452.3702	443.3841	395.8357	302.7368	195.7885	126.8735	134.1312	224.2433	329.8652	396.1579	424.6918	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	565.0732	547.5815	488.4503	408.7382	304.6551	195.8867	126.8799	134.1441	224.8841	343.2869	467.0580	566.9598	(97)
Space heating kWh													
	95.8212	63.9820	33.5292	9.2898	1.4272	0.0000	0.0000	0.0000	0.0000	9.9857	51.0481	105.8474	(98a)
Space heating requirement - total per year (kWh/year)												370.9307	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	95.8212	63.9820	33.5292	9.2898	1.4272	0.0000	0.0000	0.0000	0.0000	9.9857	51.0481	105.8474	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												370.9307	
Space heating per m2											(98c) / (4) =	8.5547	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement													
	95.8212	63.9820	33.5292	9.2898	1.4272	0.0000	0.0000	0.0000	0.0000	9.9857	51.0481	105.8474	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	143.7318	95.9730	50.2938	13.9348	2.1408	0.0000	0.0000	0.0000	0.0000	14.9786	76.5721	158.7711	
Space heating requirement													
	143.7318	95.9730	50.2938	13.9348	2.1408	0.0000	0.0000	0.0000	0.0000	14.9786	76.5721	158.7711	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)

Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	556.3960	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	5.5640	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(330a)
Total electricity for the above, kWh/year	11.9235	(331)
Electricity for lighting (calculated in Appendix L)	130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2925.7327	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	556.3960	6.5500	36.4439	(340a)
Space heating total			36.4439	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			236.8450	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1023.4332	0.1586	23.5289	(367)
Electrical energy for heat distribution (space & water)	5.5640	0.0000	5.5002	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			152.1725	(373)
Space and water heating			152.1725	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			39.4126	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1023.4332	1.5870	235.4676	(467)
Electrical energy for heat distribution (space & water)	5.5640	0.0000	58.7198	(472)
Overall CO2 factor for heat network			0.4233	(486)
Total CO2 associated with community systems			1624.5804	(473)
Space and water heating			1624.5804	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			920.2555	(483)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	13.53	**TER**	17.45
Environmental	91 B	**% DER < TER**			22.46
CO_2 Emissions (t/year)	0.55	**DFEE**	22.87	**TFEE**	37.04
Compliance Check	See BREL	**% DFEE < TFEE**			38.26
% DPER < TPER	18.47	**DPER**	76.80	**TPER**	94.20

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			10371.4500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							239.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.1391	12.7569	14.0957	13.5903	14.0106	13.5270	13.9607	13.9788	13.5484	14.0374	13.6339	14.1338	(61)
Total heat required for water heating calculated for each month	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
										Total per year (kWh/year) = Sum(64)m =		1702.2253	(64)
12Total per year (kWh/year)												1702	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	56.5391	49.8293	52.5270	45.2322	43.1953	38.2165	37.2153	39.0955	39.9677	45.4111	49.3150	55.7994	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	75.9934	74.1507	70.6008	62.8225	58.0581	53.0785	50.0206	52.5477	55.5107	61.0364	68.4930	74.9992	(72)
Total internal gains	325.9046	333.0584	318.4605	305.8206	289.5371	275.3462	264.1703	265.3477	274.0909	287.4783	306.4540	319.1715	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)
Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	368.0809	415.5642	454.3358	503.9866	532.3970	523.9565	500.8574	468.6585	432.1195	385.3784	359.0429	353.8553	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area	0.9825	0.9632	0.9177	0.7974	0.6207	0.4422	0.3189	0.3562	0.5719	0.8540	0.9631	0.9861	(86)
MIT	20.3337	20.4980	20.7015	20.8975	20.9800	20.9979	20.9998	20.9996	20.9905	20.8677	20.5672	20.2892	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)

util rest of house													
	0.9780	0.9542	0.8993	0.7619	0.5732	0.3890	0.2626	0.2960	0.5107	0.8172	0.9524	0.9824	(89)
MIT 2	19.4587	19.6623	19.9073	20.1256	20.2055	20.2196	20.2207	20.2206	20.2149	20.1002	19.7508	19.4029	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.8766	20.0614	20.2866	20.4943	20.5754	20.5913	20.5928	20.5926	20.5854	20.4668	20.1407	19.8262	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.7266	19.9114	20.1366	20.3443	20.4254	20.4413	20.4428	20.4426	20.4354	20.3168	19.9907	19.6762	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9744	0.9500	0.8971	0.7678	0.5859	0.4041	0.2786	0.3132	0.5278	0.8221	0.9487	0.9791	(94)
Useful gains	358.6496	394.7802	407.5851	386.9437	311.9174	211.7554	139.5565	146.7803	228.0629	316.8254	340.6142	346.4629	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	560.3713	545.2907	495.3496	415.7138	316.9517	212.1855	139.5892	146.8487	230.1317	352.9611	468.2544	562.1732	(97)
Space heating kWh	150.0809	101.1431	65.2968	20.7145	3.7455	0.0000	0.0000	0.0000	0.0000	26.8849	91.9009	160.4885	(98a)
Space heating requirement - total per year (kWh/year)												620.2552	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	150.0809	101.1431	65.2968	20.7145	3.7455	0.0000	0.0000	0.0000	0.0000	26.8849	91.9009	160.4885	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												620.2552	
Space heating per m2											(98c) / (4) =	14.3048	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	150.0809	101.1431	65.2968	20.7145	3.7455	0.0000	0.0000	0.0000	0.0000	26.8849	91.9009	160.4885	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	168.6302	113.6439	73.3672	23.2747	4.2085	0.0000	0.0000	0.0000	0.0000	30.2078	103.2595	180.3241	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0802	87.9686	87.7828	87.5163	87.3456	87.3000	87.3000	87.3000	87.3000	87.5694	87.9337	88.1141	(217)
Fuel for water heating, kWh/month	197.0369	173.9570	183.9465	159.2947	152.7117	135.5021	132.1761	138.6584	141.5408	159.9392	172.5148	194.4352	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.3168	7.5119	8.3168	8.0485	8.3168	8.0485	8.3168	8.3168	8.0485	8.3168	8.0485	8.3168	(231)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	696.9159	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	1941.7135	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	97.9235	(231)
Electricity for lighting (calculated in Appendix L)	130.6818	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2867.2347	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	696.9159	0.2100	146.3523	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1941.7135	0.2100	407.7598	(264)
Space and water heating			554.1122	(265)
Pumps, fans and electric keep-hot	97.9235	0.1387	13.5832	(267)
Energy for lighting	130.6818	0.1443	18.8614	(268)
Total CO2, kg/year			586.5568	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.5300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	696.9159	1.1300	787.5150	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1941.7135	1.1300	2194.1362	(278)
Space and water heating			2981.6512	(279)
Pumps, fans and electric keep-hot	97.9235	1.5128	148.1386	(281)
Energy for lighting	130.6818	1.5338	200.4441	(282)
Total Primary energy kWh/year			3330.2340	(286)
Dwelling Primary energy Rate (DPER)			76.8000	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4004			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380

E4 Jamb	23.1600	0.0500	1.1580	
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284	
E16 Corner (normal)	5.0000	0.0900	0.4500	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000	
E18 Party wall between dwellings	5.0000	0.0600	0.3000	
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000	
E5 Ground floor (normal)	26.1200	0.1600	4.1792	
P1 Party wall - Ground floor	6.7000	0.0800	0.5360	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	45.3396	48.8639	45.3249	45.1888	42.0176	42.7373	44.0650	43.9987	47.3242	47.7907	50.9589	(61)
Total heat required for water heating calculated for each month	210.3703	185.6104	196.2416	171.1433	164.5651	146.7839	144.1663	151.1351	154.0155	173.3445	185.8554	208.1498	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	187.8142	165.6616	175.3524	153.8462	148.4448	132.9897	131.2364	137.3854	139.7435	156.5194	166.7945	186.0115	(64)
										Total per year (kWh/year) = Sum(64)m =		1881.7996	(64)
12Total per year (kWh/year)												1882	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	65.7440	57.9749	61.2191	53.1659	50.9898	45.3392	44.4095	46.6171	47.5803	53.7328	57.8542	65.0057	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	88.3656	86.2722	82.2837	73.8415	68.5347	62.9711	59.6902	62.6573	66.0837	72.2215	80.3530	87.3733	(72)
Total internal gains	336.2419	342.9271	328.1085	314.7368	297.9788	283.1360	271.8050	273.4225	282.5612	296.6285	316.2113	329.5107	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6300	0.7000	0.7700	39.0751	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	39.0751	76.4392	125.8845	183.5950	225.0025	230.3301	219.2837	188.3614	146.4088	90.7015	48.7221	32.1335	(83)
Total gains	375.3170	419.3663	453.9930	498.3318	522.9813	513.4662	491.0887	461.7839	428.9701	387.3301	364.9334	361.6442	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area													
	0.9883	0.9788	0.9575	0.8930	0.7656	0.5792	0.4267	0.4712	0.7129	0.9211	0.9777	0.9901	(86)
MIT	19.8321	20.0143	20.2833	20.6303	20.8687	20.9743	20.9954	20.9926	20.9305	20.6189	20.1745	19.8052	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house													
	0.9848	0.9726	0.9449	0.8629	0.7079	0.4963	0.3311	0.3716	0.6309	0.8918	0.9701	0.9872	(89)
MIT 2	18.6324	18.8637	19.2002	19.6224	19.8795	19.9805	19.9932	19.9938	19.9464	19.6213	19.0764	18.6051	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.2054	19.4132	19.7175	20.1038	20.3519	20.4552	20.4719	20.4709	20.4165	20.0978	19.6009	19.1783	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2054	19.4132	19.7175	20.1038	20.3519	20.4552	20.4719	20.4709	20.4165	20.0978	19.6009	19.1783	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9815	0.9684	0.9412	0.8668	0.7299	0.5351	0.3768	0.4193	0.6672	0.8956	0.9666	0.9842	(94)
Useful gains	368.3736	406.1307	427.2971	431.9745	381.7212	274.7586	185.0480	193.6050	286.1914	346.8843	352.7304	355.9160	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	737.6468	716.3870	650.7740	545.0458	419.9496	281.2023	185.9507	195.1220	304.6013	461.0046	609.5491	733.8340	(97)
Space heating kWh													
	274.7393	208.4922	166.2668	81.4113	28.4419	0.0000	0.0000	0.0000	0.0000	84.9055	184.9095	281.1710	(98a)
Space heating requirement - total per year (kWh/year)												1310.3375	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	274.7393	208.4922	166.2668	81.4113	28.4419	0.0000	0.0000	0.0000	0.0000	84.9055	184.9095	281.1710	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1310.3375	
Space heating per m2											(98c) / (4) =	30.2200	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	274.7393	208.4922	166.2668	81.4113	28.4419	0.0000	0.0000	0.0000	0.0000	84.9055	184.9095	281.1710	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	297.3369	225.6409	179.9424	88.1075	30.7813	0.0000	0.0000	0.0000	0.0000	91.8891	200.1185	304.2976	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	187.8142	165.6616	175.3524	153.8462	148.4448	132.9897	131.2364	137.3854	139.7435	156.5194	166.7945	186.0115	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.1952	84.8753	84.2675	83.0813	81.5688	80.3000	80.3000	80.3000	80.3000	83.1281	84.6029	85.2642	(217)
Fuel for water heating, kWh/month													
	220.4516	195.1824	208.0902	185.1756	181.9873	165.6160	163.4327	171.0902	174.0267	188.2869	197.1498	218.1590	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1418.1142	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2268.6484	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-357.1961	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)

Energy used	0.0000	(237)
Total delivered energy for all uses	3531.8366	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1418.1142	0.2100	297.8040	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2268.6484	0.2100	476.4162	(264)
Space and water heating			774.2201	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			756.5176	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			17.4500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1418.1142	1.1300	1602.4690	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2268.6484	1.1300	2563.5727	(278)
Space and water heating			4166.0417	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			4084.5393	(286)
Target Primary Energy Rate (TPER)			94.2000	(287)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	13.53	**TER**	17.45
Environmental	91 B	**% DER < TER**			22.46
CO_2 Emissions (t/year)	0.55	**DFEE**	22.87	**TFEE**	37.04
Compliance Check	See BREL	**% DFEE < TFEE**			38.26
% DPER < TPER	18.47	**DPER**	76.80	**TPER**	94.20

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2622	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	38.2833	38.2073	38.1327	37.7826	37.7171	37.4122	37.4122	37.3557	37.5296	37.7171	37.8496	37.9882	(39)
Average = Sum(39)m / 12 =												37.7823	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8829	0.8812	0.8794	0.8714	0.8699	0.8628	0.8628	0.8615	0.8655	0.8699	0.8729	0.8761	(40)
HLP (average)												0.8714	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
							Total per year (kWh/year) = Sum(64)m =				663.9767	(64)
12Total per year (kWh/year)											664	(64)

Electric shower(s)

39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
				Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							449.4572	(64a)

Heat gains from water heating, kWh/month

27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.4004	291.4783	279.0119	271.5070	258.2448	250.2442	241.2477	240.9702	247.9561	254.7841	268.8582	277.3654	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	325.5767	373.9841	414.8872	469.6730	501.1047	498.8545	477.9348	444.2810	405.9847	352.6842	321.4470	312.0492	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.2536	75.4034	75.5508	76.2509	76.3833	77.0059	77.0059	77.1223	76.7649	76.3833	76.1159	75.8383	
alpha	6.0169	6.0269	6.0367	6.0834	6.0922	6.1337	6.1337	6.1415	6.1177	6.0922	6.0744	6.0559	
util living area	0.9915	0.9799	0.9492	0.8470	0.6740	0.4772	0.3441	0.3861	0.6225	0.9003	0.9799	0.9932	(86)
MIT	20.1468	20.3294	20.5708	20.8396	20.9648	20.9962	20.9996	20.9992	20.9831	20.7981	20.4298	20.1140	(87)
Th 2	20.1820	20.1835	20.1850	20.1919	20.1932	20.1992	20.1992	20.2003	20.1969	20.1932	20.1906	20.1879	(88)
util rest of house	0.9890	0.9744	0.9359	0.8144	0.6235	0.4187	0.2817	0.3193	0.5561	0.8698	0.9734	0.9913	(89)

MIT 2	19.4111	19.5916	19.8248	20.0727	20.1718	20.1976	20.1991	20.2001	20.1887	20.0443	19.6975	19.3835	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.7625	19.9440	20.1811	20.4390	20.5506	20.5791	20.5814	20.5818	20.5681	20.4043	20.0472	19.7324	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7625	19.9440	20.1811	20.4390	20.5506	20.5791	20.5814	20.5818	20.5681	20.4043	20.0472	19.7324	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9875	0.9725	0.9358	0.8249	0.6463	0.4466	0.3115	0.3512	0.5873	0.8785	0.9720	0.9899	(94)
Useful gains	321.5005	363.6828	388.2693	387.4510	323.8803	222.7857	148.8737	156.0472	238.4372	309.8350	312.4541	308.9100	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	591.9551	574.7896	521.6975	435.9735	333.8190	223.6897	148.9541	156.2123	242.7460	369.7916	490.0479	590.0469	(97)
Space heating kWh	201.2182	141.8637	99.2706	34.9361	7.3944	0.0000	0.0000	0.0000	0.0000	44.6077	127.8675	209.1658	(98a)
Space heating requirement - total per year (kWh/year)												866.3242	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	201.2182	141.8637	99.2706	34.9361	7.3944	0.0000	0.0000	0.0000	0.0000	44.6077	127.8675	209.1658	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												866.3242	
Space heating per m2											(98c) / (4) =	19.9798	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	351.6746	276.8502	283.9035	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9766	0.9911	0.9854	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	343.4485	274.3912	279.7716	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	554.0542	531.1768	493.2464	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	151.6361	191.0485	158.8253	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	37.9090	47.7621	39.7063	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												125.3775	(107)
Energy for space heating												19.9798	(99)
Energy for space cooling												2.8915	(108)
Total												22.8713	(109)
Fabric Energy Efficiency (DFEE)												22.9	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4383 (18)
Number of sides sheltered		3 (19)
Shelter factor (20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =		0.3397 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4004			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
E5 Ground floor (normal)	26.1200	0.1600	4.1792
P1 Party wall - Ground floor	6.7000	0.0800	0.5360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)													
	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							449.4572	(64a)
Heat gains from water heating, kWh/month													
	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains													
	281.3655	289.2254	276.9770	269.4043	256.2100	248.1415	239.2128	238.9354	245.8534	252.7493	266.7555	275.3306	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6300	0.7000	0.7700	39.0751	(80)

Solar gains	39.0751	76.4392	125.8845	183.5950	225.0025	230.3301	219.2837	188.3614	146.4088	90.7015	48.7221	32.1335	(83)
Total gains	320.4406	365.6646	402.8615	452.9993	481.2125	478.4717	458.4965	427.2968	392.2623	343.4508	315.4775	307.4640	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area													
	0.9940	0.9878	0.9727	0.9201	0.8045	0.6154	0.4557	0.5067	0.7578	0.9473	0.9876	0.9951	(86)
MIT	19.6977	19.8879	20.1733	20.5578	20.8345	20.9666	20.9938	20.9898	20.9085	20.5380	20.0581	19.6712	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house													
	0.9921	0.9840	0.9640	0.8953	0.7498	0.5296	0.3543	0.4009	0.6774	0.9255	0.9831	0.9935	(89)
MIT 2	18.7944	18.9844	19.2662	19.6392	19.8786	19.9800	19.9931	19.9936	19.9436	19.6305	19.1631	18.7753	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.2258	19.4159	19.6995	20.0780	20.3352	20.4512	20.4711	20.4694	20.4044	20.0640	19.5906	19.2032	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2258	19.4159	19.6995	20.0780	20.3352	20.4512	20.4711	20.4694	20.4044	20.0640	19.5906	19.2032	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9903	0.9814	0.9612	0.8980	0.7700	0.5696	0.4028	0.4515	0.7124	0.9275	0.9809	0.9920	(94)
Useful gains	317.3388	358.8658	387.2348	406.7711	370.5136	272.5577	184.6948	192.9433	279.4651	318.5421	309.4535	304.9947	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	738.6574	716.5197	649.8882	543.7870	419.1347	281.0125	185.9127	195.0519	304.0221	459.3639	609.0488	735.0561	(97)
Space heating kWh													
	313.4610	240.3434	195.4141	98.6514	36.1741	0.0000	0.0000	0.0000	0.0000	104.7714	215.7086	319.9657	(98a)
Space heating requirement - total per year (kWh/year)												1524.4897	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	313.4610	240.3434	195.4141	98.6514	36.1741	0.0000	0.0000	0.0000	0.0000	104.7714	215.7086	319.9657	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1524.4897	
Space heating per m2											(98c) / (4) =	35.1589	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	451.4472	355.3946	364.2795	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8939	0.9440	0.9228	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	403.5707	335.4817	336.1678	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	532.5097	510.6427	475.5231	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	92.8361	130.3198	103.6803	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	23.2090	32.5800	25.9201	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												81.7091	(107)
Energy for space heating												35.1589	(99)
Energy for space cooling												1.8844	(108)
Total												37.0433	(109)
Fabric Energy Efficiency (TFEE)												37.0	(109)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	13.53	**TER**	17.45
Environmental	91 B	**% DER < TER**			22.46
CO_2 Emissions (t/year)	0.55	**DFEE**	22.87	**TFEE**	37.04
Compliance Check	See BREL	**% DFEE < TFEE**			38.26
% DPER < TPER	18.47	**DPER**	76.80	**TPER**	94.20

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			10371.4500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							239.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.1391	12.7569	14.0957	13.5903	14.0106	13.5270	13.9607	13.9788	13.5484	14.0374	13.6339	14.1338	(61)
Total heat required for water heating calculated for each month	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
										Total per year (kWh/year) = Sum(64)m =		1702.2253	(64)
12Total per year (kWh/year)												1702	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	56.5391	49.8293	52.5270	45.2322	43.1953	38.2165	37.2153	39.0955	39.9677	45.4111	49.3150	55.7994	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	75.9934	74.1507	70.6008	62.8225	58.0581	53.0785	50.0206	52.5477	55.5107	61.0364	68.4930	74.9992	(72)
Total internal gains	325.9046	333.0584	318.4605	305.8206	289.5371	275.3462	264.1703	265.3477	274.0909	287.4783	306.4540	319.1715	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)
Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	368.0809	415.5642	454.3358	503.9866	532.3970	523.9565	500.8574	468.6585	432.1195	385.3784	359.0429	353.8553	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area	0.9825	0.9632	0.9177	0.7974	0.6207	0.4422	0.3189	0.3562	0.5719	0.8540	0.9631	0.9861	(86)
MIT	20.3337	20.4980	20.7015	20.8975	20.9800	20.9979	20.9998	20.9996	20.9905	20.8677	20.5672	20.2892	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)

util rest of house													
	0.9780	0.9542	0.8993	0.7619	0.5732	0.3890	0.2626	0.2960	0.5107	0.8172	0.9524	0.9824	(89)
MIT 2	19.4587	19.6623	19.9073	20.1256	20.2055	20.2196	20.2207	20.2206	20.2149	20.1002	19.7508	19.4029	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.8766	20.0614	20.2866	20.4943	20.5754	20.5913	20.5928	20.5926	20.5854	20.4668	20.1407	19.8262	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.7266	19.9114	20.1366	20.3443	20.4254	20.4413	20.4428	20.4426	20.4354	20.3168	19.9907	19.6762	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9744	0.9500	0.8971	0.7678	0.5859	0.4041	0.2786	0.3132	0.5278	0.8221	0.9487	0.9791	(94)
Useful gains	358.6496	394.7802	407.5851	386.9437	311.9174	211.7554	139.5565	146.7803	228.0629	316.8254	340.6142	346.4629	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	560.3713	545.2907	495.3496	415.7138	316.9517	212.1855	139.5892	146.8487	230.1317	352.9611	468.2544	562.1732	(97)
Space heating kWh	150.0809	101.1431	65.2968	20.7145	3.7455	0.0000	0.0000	0.0000	0.0000	26.8849	91.9009	160.4885	(98a)
Space heating requirement - total per year (kWh/year)												620.2552	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	150.0809	101.1431	65.2968	20.7145	3.7455	0.0000	0.0000	0.0000	0.0000	26.8849	91.9009	160.4885	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												620.2552	
Space heating per m2											(98c) / (4) =	14.3048	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	150.0809	101.1431	65.2968	20.7145	3.7455	0.0000	0.0000	0.0000	0.0000	26.8849	91.9009	160.4885	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	168.6302	113.6439	73.3672	23.2747	4.2085	0.0000	0.0000	0.0000	0.0000	30.2078	103.2595	180.3241	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0802	87.9686	87.7828	87.5163	87.3456	87.3000	87.3000	87.3000	87.3000	87.5694	87.9337	88.1141	(217)
Fuel for water heating, kWh/month	197.0369	173.9570	183.9465	159.2947	152.7117	135.5021	132.1761	138.6584	141.5408	159.9392	172.5148	194.4352	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.3168	7.5119	8.3168	8.0485	8.3168	8.0485	8.3168	8.3168	8.0485	8.3168	8.0485	8.3168	(231)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	696.9159	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	1941.7135	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	97.9235	(231)
Electricity for lighting (calculated in Appendix L)	130.6818	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2867.2347	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	696.9159	0.2100	146.3523	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1941.7135	0.2100	407.7598	(264)
Space and water heating			554.1122	(265)
Pumps, fans and electric keep-hot	97.9235	0.1387	13.5832	(267)
Energy for lighting	130.6818	0.1443	18.8614	(268)
Total CO2, kg/year			586.5568	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.5300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	696.9159	1.1300	787.5150	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1941.7135	1.1300	2194.1362	(278)
Space and water heating			2981.6512	(279)
Pumps, fans and electric keep-hot	97.9235	1.5128	148.1386	(281)
Energy for lighting	130.6818	1.5338	200.4441	(282)
Total Primary energy kWh/year			3330.2340	(286)
Dwelling Primary energy Rate (DPER)			76.8000	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4004			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380

E4 Jamb	23.1600	0.0500	1.1580	
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284	
E16 Corner (normal)	5.0000	0.0900	0.4500	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000	
E18 Party wall between dwellings	5.0000	0.0600	0.3000	
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000	
E5 Ground floor (normal)	26.1200	0.1600	4.1792	
P1 Party wall - Ground floor	6.7000	0.0800	0.5360	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	45.3396	48.8639	45.3249	45.1888	42.0176	42.7373	44.0650	43.9987	47.3242	47.7907	50.9589	(61)
Total heat required for water heating calculated for each month	210.3703	185.6104	196.2416	171.1433	164.5651	146.7839	144.1663	151.1351	154.0155	173.3445	185.8554	208.1498	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	187.8142	165.6616	175.3524	153.8462	148.4448	132.9897	131.2364	137.3854	139.7435	156.5194	166.7945	186.0115	(64)
										Total per year (kWh/year) = Sum(64)m =		1881.7996	(64)
12Total per year (kWh/year)												1882	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	65.7440	57.9749	61.2191	53.1659	50.9898	45.3392	44.4095	46.6171	47.5803	53.7328	57.8542	65.0057	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	88.3656	86.2722	82.2837	73.8415	68.5347	62.9711	59.6902	62.6573	66.0837	72.2215	80.3530	87.3733	(72)
Total internal gains	336.2419	342.9271	328.1085	314.7368	297.9788	283.1360	271.8050	273.4225	282.5612	296.6285	316.2113	329.5107	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6300	0.7000	0.7700	39.0751	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	39.0751	76.4392	125.8845	183.5950	225.0025	230.3301	219.2837	188.3614	146.4088	90.7015	48.7221	32.1335	(83)
Total gains	375.3170	419.3663	453.9930	498.3318	522.9813	513.4662	491.0887	461.7839	428.9701	387.3301	364.9334	361.6442	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area													
	0.9883	0.9788	0.9575	0.8930	0.7656	0.5792	0.4267	0.4712	0.7129	0.9211	0.9777	0.9901	(86)
MIT	19.8321	20.0143	20.2833	20.6303	20.8687	20.9743	20.9954	20.9926	20.9305	20.6189	20.1745	19.8052	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house													
	0.9848	0.9726	0.9449	0.8629	0.7079	0.4963	0.3311	0.3716	0.6309	0.8918	0.9701	0.9872	(89)
MIT 2	18.6324	18.8637	19.2002	19.6224	19.8795	19.9805	19.9932	19.9938	19.9464	19.6213	19.0764	18.6051	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.2054	19.4132	19.7175	20.1038	20.3519	20.4552	20.4719	20.4709	20.4165	20.0978	19.6009	19.1783	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2054	19.4132	19.7175	20.1038	20.3519	20.4552	20.4719	20.4709	20.4165	20.0978	19.6009	19.1783	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9815	0.9684	0.9412	0.8668	0.7299	0.5351	0.3768	0.4193	0.6672	0.8956	0.9666	0.9842	(94)
Useful gains	368.3736	406.1307	427.2971	431.9745	381.7212	274.7586	185.0480	193.6050	286.1914	346.8843	352.7304	355.9160	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	737.6468	716.3870	650.7740	545.0458	419.9496	281.2023	185.9507	195.1220	304.6013	461.0046	609.5491	733.8340	(97)
Space heating kWh													
	274.7393	208.4922	166.2668	81.4113	28.4419	0.0000	0.0000	0.0000	0.0000	84.9055	184.9095	281.1710	(98a)
Space heating requirement - total per year (kWh/year)												1310.3375	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	274.7393	208.4922	166.2668	81.4113	28.4419	0.0000	0.0000	0.0000	0.0000	84.9055	184.9095	281.1710	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1310.3375	
Space heating per m2											(98c) / (4) =	30.2200	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	274.7393	208.4922	166.2668	81.4113	28.4419	0.0000	0.0000	0.0000	0.0000	84.9055	184.9095	281.1710	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	297.3369	225.6409	179.9424	88.1075	30.7813	0.0000	0.0000	0.0000	0.0000	91.8891	200.1185	304.2976	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	187.8142	165.6616	175.3524	153.8462	148.4448	132.9897	131.2364	137.3854	139.7435	156.5194	166.7945	186.0115	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.1952	84.8753	84.2675	83.0813	81.5688	80.3000	80.3000	80.3000	80.3000	83.1281	84.6029	85.2642	(217)
Fuel for water heating, kWh/month													
	220.4516	195.1824	208.0902	185.1756	181.9873	165.6160	163.4327	171.0902	174.0267	188.2869	197.1498	218.1590	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1418.1142	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2268.6484	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-357.1961	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)

Energy used	0.0000	(237)
Total delivered energy for all uses	3531.8366	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1418.1142	0.2100	297.8040	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2268.6484	0.2100	476.4162	(264)
Space and water heating			774.2201	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			756.5176	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			17.4500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1418.1142	1.1300	1602.4690	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2268.6484	1.1300	2563.5727	(278)
Space and water heating			4166.0417	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			4084.5393	(286)
Target Primary Energy Rate (TPER)			94.2000	(287)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	13.53	**TER**	17.45
Environmental	91 B	**% DER < TER**			22.46
CO_2 Emissions (t/year)	0.55	**DFEE**	22.87	**TFEE**	37.04
Compliance Check	See BREL	**% DFEE < TFEE**			38.26
% DPER < TPER	18.47	**DPER**	76.80	**TPER**	94.20

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600 (1b)	x	2.4500 (2b)	=	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		10371.4500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							239.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges					(36a) =		0.0000	

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.1391	12.7569	14.0957	13.5903	14.0106	13.5270	13.9607	13.9788	13.5484	14.0374	13.6339	14.1338	(61)
Total heat required for water heating calculated for each month	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
										Total per year (kWh/year) = Sum(64)m =		1702.2253	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	56.5391	49.8293	52.5270	45.2322	43.1953	38.2165	37.2153	39.0955	39.9677	45.4111	49.3150	55.7994	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	75.9934	74.1507	70.6008	62.8225	58.0581	53.0785	50.0206	52.5477	55.5107	61.0364	68.4930	74.9992	(72)
Total internal gains	367.0744	365.1778	353.4832	331.6516	310.6911	288.7122	277.6029	280.1839	291.2917	313.8707	337.5234	358.0289	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	409.2507	447.6836	489.3585	529.8176	553.5510	537.3225	514.2901	483.4947	449.3203	411.7708	390.1123	392.7127	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area	0.9710	0.9490	0.8924	0.7709	0.5993	0.4314	0.3106	0.3453	0.5515	0.8230	0.9470	0.9768	(86)
MIT	20.4308	20.5649	20.7552	20.9154	20.9835	20.9981	20.9998	20.9996	20.9922	20.8942	20.6315	20.3835	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													

	0.9639	0.9374	0.8705	0.7342	0.5527	0.3794	0.2557	0.2870	0.4918	0.7831	0.9329	0.9709	(89)
MIT 2	19.5790	19.7431	19.9681	20.1432	20.2082	20.2197	20.2207	20.2206	20.2160	20.1264	19.8275	19.5204	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.9859	20.1356	20.3440	20.5120	20.5785	20.5915	20.5928	20.5927	20.5867	20.4931	20.2115	19.9326	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.8359	19.9856	20.1940	20.3620	20.4285	20.4415	20.4428	20.4427	20.4367	20.3431	20.0615	19.7826	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9597	0.9334	0.8697	0.7411	0.5653	0.3942	0.2714	0.3036	0.5085	0.7897	0.9296	0.9670	(94)
Useful gains	392.7490	417.8609	425.6121	392.6718	312.9166	211.8199	139.5620	146.7935	228.4949	325.1952	362.6307	379.7350	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	564.3405	547.9842	497.4345	416.3574	317.0636	212.1932	139.5899	146.8505	230.1821	353.9184	470.8262	566.0389	(97)
Space heating kWh	127.6641	87.4428	53.4359	17.0537	3.0853	0.0000	0.0000	0.0000	0.0000	21.3701	77.9008	138.6101	(98a)
Space heating requirement - total per year (kWh/year)												526.5627	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	127.6641	87.4428	53.4359	17.0537	3.0853	0.0000	0.0000	0.0000	0.0000	21.3701	77.9008	138.6101	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												526.5627	
Space heating per m2											(98c) / (4) =	12.1440	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	127.6641	87.4428	53.4359	17.0537	3.0853	0.0000	0.0000	0.0000	0.0000	21.3701	77.9008	138.6101	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	143.4428	98.2504	60.0403	19.1614	3.4667	0.0000	0.0000	0.0000	0.0000	24.0113	87.5289	155.7417	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0125	87.9106	87.7166	87.4821	87.3377	87.3000	87.3000	87.3000	87.3000	87.5213	87.8695	88.0522	(217)
Fuel for water heating, kWh/month	197.1885	174.0719	184.0854	159.3569	152.7254	135.5021	132.1761	138.6584	141.5408	160.0270	172.6408	194.5718	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.3168	7.5119	8.3168	8.0485	8.3168	8.0485	8.3168	8.3168	8.0485	8.3168	8.0485	8.3168	(231)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	591.6435	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	1942.5451	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	97.9235	(231)
Electricity for lighting (calculated in Appendix L)	130.6818	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2762.7939	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	591.6435	3.6400	21.5358	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1942.5451	3.6400	70.7086	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	97.9235	16.4900	16.1476	(249)
Energy for lighting	130.6818	16.4900	21.5494	(250)
Additional standing charges			92.0000	(251)
Total energy cost			221.9415	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9042	(257)
SAP value		85.3422	
SAP rating (Section 12)		85	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	591.6435	0.2100	124.2451	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1942.5451	0.2100	407.9345	(264)
Space and water heating			532.1796	(265)
Pumps, fans and electric keep-hot	97.9235	0.1387	13.5832	(267)
Energy for lighting	130.6818	0.1443	18.8614	(268)
Total CO2, kg/year			564.6242	(272)
CO2 emissions per m2			13.0200	(273)
EI value			91.4373	
EI rating			91	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.4982 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day)		92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.1391	12.7569	14.0957	13.5903	14.0106	13.5270	13.9607	13.9788	13.5484	14.0374	13.6339	14.1338	(61)
Total heat required for water heating calculated for each month	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
										Total per year (kWh/year) = Sum(64)m =		1702.2253	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	56.5391	49.8293	52.5270	45.2322	43.1953	38.2165	37.2153	39.0955	39.9677	45.4111	49.3150	55.7994	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	75.9934	74.1507	70.6008	62.8225	58.0581	53.0785	50.0206	52.5477	55.5107	61.0364	68.4930	74.9992	(72)
Total internal gains	367.0744	365.1778	353.4832	331.6516	310.6911	288.7122	277.6029	280.1839	291.2917	313.8707	337.5234	358.0289	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	23.7835	0.6800	0.7000	0.7700	51.0736	(80)

Solar gains	51.0736	88.7763	143.8339	211.6843	249.5125	273.8424	255.8751	224.3556	176.4207	111.0901	62.7325	42.2420 (83)
Total gains	418.1480	453.9541	497.3171	543.3359	560.2036	562.5546	533.4780	504.5395	467.7124	424.9608	400.2559	400.2709 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area	0.9652	0.9416	0.8722	0.7386	0.5633	0.3740	0.2655	0.2951	0.5088	0.7815	0.9336	0.9723	(86)
MIT	20.4774	20.6015	20.7966	20.9355	20.9888	20.9993	20.9999	20.9999	20.9952	20.9252	20.6826	20.4283	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house	0.9567	0.9284	0.8473	0.6998	0.5160	0.3240	0.2125	0.2391	0.4504	0.7367	0.9164	0.9654	(89)
MIT 2	19.6366	19.7874	20.0152	20.1632	20.2127	20.2204	20.2207	20.2207	20.2180	20.1571	19.8882	19.5763	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0382	20.1762	20.3884	20.5321	20.5834	20.5924	20.5929	20.5928	20.5892	20.5240	20.2676	19.9833	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.8882	20.0262	20.2384	20.3821	20.4334	20.4424	20.4429	20.4428	20.4392	20.3740	20.1176	19.8333	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9525	0.9247	0.8479	0.7081	0.5290	0.3383	0.2276	0.2550	0.4669	0.7460	0.9138	0.9613	(94)
Useful gains	398.2859	419.7628	421.6565	384.7237	296.3545	190.2908	121.4220	128.6761	218.3723	317.0118	365.7730	384.7674	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	555.3428	538.5625	480.8856	402.5564	299.0778	190.4297	121.4305	128.6940	219.3740	336.8765	458.3356	556.9806	(97)
Space heating kWh	116.8503	79.8334	44.0665	12.8395	2.0261	0.0000	0.0000	0.0000	0.0000	14.7793	66.6450	128.1266	(98a)
Space heating requirement - total per year (kWh/year)												465.1669	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	116.8503	79.8334	44.0665	12.8395	2.0261	0.0000	0.0000	0.0000	0.0000	14.7793	66.6450	128.1266	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												465.1669	
Space heating per m2											(98c) / (4) =	10.7280	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	116.8503	79.8334	44.0665	12.8395	2.0261	0.0000	0.0000	0.0000	0.0000	14.7793	66.6450	128.1266	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	131.2925	89.7005	49.5129	14.4264	2.2766	0.0000	0.0000	0.0000	0.0000	16.6060	74.8821	143.9625	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
Efficiency of water heater												87.3000	(216)
(217)m	87.9762	87.8755	87.6590	87.4409	87.3250	87.3000	87.3000	87.3000	87.3000	87.4595	87.8120	88.0194	(217)
Fuel for water heating, kWh/month	197.2699	174.1415	184.2064	159.4321	152.7477	135.5021	132.1761	138.6584	141.5408	160.1402	172.7539	194.6444	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.3168	7.5119	8.3168	8.0485	8.3168	8.0485	8.3168	8.3168	8.0485	8.3168	8.0485	8.3168	(231)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	522.6594	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	1943.2135	(219)
Space cooling fuel	0.0000	(221)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)

mechanical ventilation fans (SFP = 0.0920) 11.9235 (230a)

central heating pump		41.0000 (230c)
main heating flue fan		45.0000 (230e)
Total electricity for the above, kWh/year		97.9235 (231)
Electricity for lighting (calculated in Appendix L)		130.6818 (232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation		0.0000 (233)
Wind generation		0.0000 (234)
Hydro-electric generation (Appendix N)		0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)		0.0000 (235)
Appendix Q - special features		
Energy saved or generated		-0.0000 (236)
Energy used		0.0000 (237)
Total delivered energy for all uses		2694.4781 (238)

10a. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	522.6594	6.5500	34.2342	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1943.2135	6.5500	127.2805	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	97.9235	28.4300	27.8396	(249)
Energy for lighting	130.6818	28.4300	37.1528	(250)
Additional standing charges			104.0000	(251)
Total energy cost			330.5072	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	522.6594	0.2100	109.7585	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1943.2135	0.2100	408.0748	(264)
Space and water heating			517.8333	(265)
Pumps, fans and electric keep-hot	97.9235	0.1387	13.5832	(267)
Energy for lighting	130.6818	0.1443	18.8614	(268)
Total CO2, kg/year			550.2779	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	522.6594	1.1300	590.6051	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1943.2135	1.1300	2195.8312	(278)
Space and water heating			2786.4363	(279)
Pumps, fans and electric keep-hot	97.9235	1.5128	148.1386	(281)
Energy for lighting	130.6818	1.5338	200.4441	(282)
Total Primary energy kWh/year			3135.0191	(286)

SAP 10 EPC IMPROVEMENTS

Rev D - Be Lean

Current energy efficiency rating: B 85
Current environmental impact rating: B 91

N	Solar water heating		Not applicable
U	Solar photovoltaic panels		Not applicable
V2	Wind turbine		Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 85
Potential environmental impact rating: B 91

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£65	£65	£0
Mains gas	£266	£266	£0
Space heating	£166	£166	£0
Water heating	£127	£127	£0
Lighting	£37	£37	£0
Total cost of fuels	£331	£331	£0
Total cost of uses	£330	£330	£0
Delivered energy	62 kWh/m²	62 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.6 tonnes	0.6 tonnes	0.0 tonnes
CO2 emissions per m²	13 kg/m²	13 kg/m²	0 kg/m²
Primary energy	72 kWh/m²	72 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4982	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)

Hot water usage for other uses

	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m													
	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.1391	12.7569	14.0957	13.5903	14.0106	13.5270	13.9607	13.9788	13.5484	14.0374	13.6339	14.1338	(61)
Total heat required for water heating calculated for each month													
	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
										Total per year (kWh/year) = Sum(64)m =		1702.2253	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)											0.0000	
Space heating kWh												
	127.6641	87.4428	53.4359	17.0537	3.0853	0.0000	0.0000	0.0000	0.0000	21.3701	77.9008	138.6101 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)											526.5627	
Space heating per m2										(98c) / (4) =	12.1440	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)											0.0000	(201)
Fraction of space heat from main system(s)											1.0000	(202)
Efficiency of main space heating system 1 (in %)											89.0000	(206)
Efficiency of main space heating system 2 (in %)											0.0000	(207)
Efficiency of secondary/supplementary heating system, %											0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	127.6641	87.4428	53.4359	17.0537	3.0853	0.0000	0.0000	0.0000	0.0000	21.3701	77.9008	138.6101	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	143.4428	98.2504	60.0403	19.1614	3.4667	0.0000	0.0000	0.0000	0.0000	24.0113	87.5289	155.7417	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0125	87.9106	87.7166	87.4821	87.3377	87.3000	87.3000	87.3000	87.3000	87.5213	87.8695	88.0522	(217)
Fuel for water heating, kWh/month													
	197.1885	174.0719	184.0854	159.3569	152.7254	135.5021	132.1761	138.6584	141.5408	160.0270	172.6408	194.5718	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.3168	7.5119	8.3168	8.0485	8.3168	8.0485	8.3168	8.3168	8.0485	8.3168	8.0485	8.3168	(231)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1											591.6435	(211)	
Space heating fuel - main system 2											0.0000	(213)	
Space heating fuel - secondary											0.0000	(215)	
Efficiency of water heater											87.3000		
Water heating fuel used											1942.5451	(219)	
Space cooling fuel											0.0000	(221)	
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)											11.9235	(230a)	
central heating pump											41.0000	(230c)	
main heating flue fan											45.0000	(230e)	
Total electricity for the above, kWh/year											97.9235	(231)	
Electricity for lighting (calculated in Appendix L)											130.6818	(232)	
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation											0.0000	(233)	
Wind generation											0.0000	(234)	
Hydro-electric generation (Appendix N)											0.0000	(235a)	
Electricity generated - Micro CHP (Appendix N)											0.0000	(235)	
Appendix Q - special features													
Energy saved or generated											-0.0000	(236)	
Energy used											0.0000	(237)	
Total delivered energy for all uses											2762.7939	(238)	

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	591.6435	3.6400	21.5358	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1942.5451	3.6400	70.7086	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	97.9235	16.4900	16.1476	(249)
Energy for lighting	130.6818	16.4900	21.5494	(250)
Additional standing charges			92.0000	(251)
Total energy cost			221.9415	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9042	(257)
SAP value		85.3422	
SAP rating (Section 12)		85	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	591.6435	0.2100	124.2451	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1942.5451	0.2100	407.9345	(264)
Space and water heating			532.1796	(265)
Pumps, fans and electric keep-hot	97.9235	0.1387	13.5832	(267)
Energy for lighting	130.6818	0.1443	18.8614	(268)
Total CO2, kg/year			564.6242	(272)
CO2 emissions per m2			13.0200	(273)
EI value			91.4373	
EI rating			91	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff													
	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers													
	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths													
	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses													
	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m													
	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.1391	12.7569	14.0957	13.5903	14.0106	13.5270	13.9607	13.9788	13.5484	14.0374	13.6339	14.1338	(61)
Total heat required for water heating calculated for each month													
	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
										Total per year (kWh/year) = Sum(64)m =		1702.2253	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	56.5391	49.8293	52.5270	45.2322	43.1953	38.2165	37.2153	39.0955	39.9677	45.4111	49.3150	55.7994	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	75.9934	74.1507	70.6008	62.8225	58.0581	53.0785	50.0206	52.5477	55.5107	61.0364	68.4930	74.9992	(72)
Total internal gains													
	367.0744	365.1778	353.4832	331.6516	310.6911	288.7122	277.6029	280.1839	291.2917	313.8707	337.5234	358.0289	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	23.7835	0.6800	0.7000	0.7700	51.0736	(80)

Solar gains	51.0736	88.7763	143.8339	211.6843	249.5125	273.8424	255.8751	224.3556	176.4207	111.0901	62.7325	42.2420	(83)
Total gains	418.1480	453.9541	497.3171	543.3359	560.2036	562.5546	533.4780	504.5395	467.7124	424.9608	400.2559	400.2709	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area													
	0.9652	0.9416	0.8722	0.7386	0.5633	0.3740	0.2655	0.2951	0.5088	0.7815	0.9336	0.9723	(86)
MIT	20.4774	20.6015	20.7966	20.9355	20.9888	20.9993	20.9999	20.9999	20.9952	20.9252	20.6826	20.4283	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.9567	0.9284	0.8473	0.6998	0.5160	0.3240	0.2125	0.2391	0.4504	0.7367	0.9164	0.9654	(89)
MIT 2	19.6366	19.7874	20.0152	20.1632	20.2127	20.2204	20.2207	20.2207	20.2180	20.1571	19.8882	19.5763	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0382	20.1762	20.3884	20.5321	20.5834	20.5924	20.5929	20.5928	20.5892	20.5240	20.2676	19.9833	(92)

Temperature adjustment												-0.1500	
adjusted MIT	19.8882	20.0262	20.2384	20.3821	20.4334	20.4424	20.4429	20.4428	20.4392	20.3740	20.1176	19.8333	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9525	0.9247	0.8479	0.7081	0.5290	0.3383	0.2276	0.2550	0.4669	0.7460	0.9138	0.9613	(94)
Useful gains	398.2859	419.7628	421.6565	384.7237	296.3545	190.2908	121.4220	128.6761	218.3723	317.0118	365.7730	384.7674	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	555.3428	538.5625	480.8856	402.5564	299.0778	190.4297	121.4305	128.6940	219.3740	336.8765	458.3356	556.9806	(97)
Space heating kWh	116.8503	79.8334	44.0665	12.8395	2.0261	0.0000	0.0000	0.0000	0.0000	14.7793	66.6450	128.1266	(98a)
Space heating requirement - total per year (kWh/year)												465.1669	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	116.8503	79.8334	44.0665	12.8395	2.0261	0.0000	0.0000	0.0000	0.0000	14.7793	66.6450	128.1266	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												465.1669	
Space heating per m2											(98c) / (4) =	10.7280	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	116.8503	79.8334	44.0665	12.8395	2.0261	0.0000	0.0000	0.0000	0.0000	14.7793	66.6450	128.1266	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	131.2925	89.7005	49.5129	14.4264	2.2766	0.0000	0.0000	0.0000	0.0000	16.6060	74.8821	143.9625	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
Efficiency of water heater												87.3000	(216)
(217)m	87.9762	87.8755	87.6590	87.4409	87.3250	87.3000	87.3000	87.3000	87.3000	87.4595	87.8120	88.0194	(217)
Fuel for water heating, kWh/month	197.2699	174.1415	184.2064	159.4321	152.7477	135.5021	132.1761	138.6584	141.5408	160.1402	172.7539	194.6444	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.3168	7.5119	8.3168	8.0485	8.3168	8.0485	8.3168	8.3168	8.0485	8.3168	8.0485	8.3168	(231)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	522.6594	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	1943.2135	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	97.9235	(231)
Electricity for lighting (calculated in Appendix L)	130.6818	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2694.4781	(238)

10a. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	522.6594	6.5500	34.2342	(240)

Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1943.2135	6.5500	127.2805	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	97.9235	28.4300	27.8396	(249)
Energy for lighting	130.6818	28.4300	37.1528	(250)
Additional standing charges			104.0000	(251)
Total energy cost			330.5072	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	522.6594	0.2100	109.7585	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1943.2135	0.2100	408.0748	(264)
Space and water heating			517.8333	(265)
Pumps, fans and electric keep-hot	97.9235	0.1387	13.5832	(267)
Energy for lighting	130.6818	0.1443	18.8614	(268)
Total CO2, kg/year			550.2779	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	522.6594	1.1300	590.6051	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1943.2135	1.1300	2195.8312	(278)
Space and water heating			2786.4363	(279)
Pumps, fans and electric keep-hot	97.9235	1.5128	148.1386	(281)
Energy for lighting	130.6818	1.5338	200.4441	(282)
Total Primary energy kWh/year			3135.0191	(286)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.39	**TER**	16.89
Environmental	99 A	**% DER < TER**			91.77
CO_2 Emissions (t/year)	0.04	**DFEE**	22.87	**TFEE**	37.04
Compliance Check	See BREL	**% DFEE < TFEE**			38.26
% DPER < TPER	72.76	**DPER**	24.85	**TPER**	91.21

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		10371.4500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							239.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges					(36a) =		0.0000	

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)

WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Total per year (kWh/year) = Sum(64)m = 2187.6523 (64)

12Total per year (kWh/year) 2188 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)

Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)

Water heating gains (Table 5)

130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)

Total internal gains

377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	419.7672	467.2558	506.0368	555.7052	584.1265	578.6970	555.6038	523.3987	486.8526	437.0989	410.7463	405.5434	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106

alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874		
util living area	0.9673	0.9391	0.8794	0.7447	0.5704	0.4010	0.2876	0.3191	0.5109	0.7927	0.9345	0.9729	(86)
MIT	20.4545	20.6028	20.7778	20.9302	20.9874	20.9988	20.9999	20.9998	20.9949	20.9148	20.6707	20.4133	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house	0.9595	0.9258	0.8561	0.7074	0.5252	0.3525	0.2367	0.2651	0.4549	0.7507	0.9180	0.9663	(89)
MIT 2	19.6081	19.7882	19.9933	20.1575	20.2113	20.2201	20.2207	20.2206	20.2177	20.1463	19.8733	19.5573	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0123	20.1773	20.3680	20.5265	20.5820	20.5920	20.5929	20.5928	20.5889	20.5134	20.2542	19.9662	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0123	20.1773	20.3680	20.5265	20.5820	20.5920	20.5929	20.5928	20.5889	20.5134	20.2542	19.9662	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9571	0.9250	0.8608	0.7224	0.5463	0.3756	0.2610	0.2909	0.4815	0.7671	0.9188	0.9637	(94)
Useful gains	401.7598	432.2106	435.6061	401.4579	319.1330	217.3690	145.0173	152.2566	234.4309	335.3008	377.3945	390.8402	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	570.7504	554.9474	503.7549	422.3338	322.6373	217.6595	145.0404	152.3026	235.7086	360.1025	477.8254	572.7063	(97)
Space heating kWh	125.7290	82.4791	50.7027	15.0307	2.6072	0.0000	0.0000	0.0000	0.0000	18.4524	72.3102	135.3084	(98a)
Space heating requirement - total per year (kWh/year)												502.6198	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	125.7290	82.4791	50.7027	15.0307	2.6072	0.0000	0.0000	0.0000	0.0000	18.4524	72.3102	135.3084	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												502.6198	
Space heating per m2											(98c) / (4) =	11.5918	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	125.7290	82.4791	50.7027	15.0307	2.6072	0.0000	0.0000	0.0000	0.0000	18.4524	72.3102	135.3084	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	188.5935	123.7187	76.0541	22.5460	3.9108	0.0000	0.0000	0.0000	0.0000	27.6786	108.4654	202.9626	
Space heating requirement	188.5935	123.7187	76.0541	22.5460	3.9108	0.0000	0.0000	0.0000	0.0000	27.6786	108.4654	202.9626	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												753.9297	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												7.5393	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3219.7925	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1076.1088	0.1580	31.7701	(367)
Electrical energy for heat distribution (space & water)	7.5393	0.0000	5.8093	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			160.7227	(373)
Space and water heating			160.7227	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			60.1950	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.3900	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1076.1088	1.5850	318.6517	(467)
Electrical energy for heat distribution (space & water)	7.5393	0.0000	61.8392	(472)
Overall CO2 factor for heat network			0.4240	(486)
Total CO2 associated with community systems			1710.8839	(473)
Space and water heating			1710.8839	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			1077.2891	(483)
Dwelling Primary energy Rate (DPER)			24.8500	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)

100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4004	(33)
Main dwelling						
Party Wall			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
E5 Ground floor (normal)	26.1200	0.1600	4.1792
P1 Party wall - Ground floor	6.7000	0.0800	0.5360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6300	0.7000	0.7700	39.0751	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	39.0751	76.4392	125.8845	183.5950	225.0025	230.3301	219.2837	188.3614	146.4088	90.7015	48.7221	32.1335	(83)
Total gains	408.2958	452.6009	487.6757	532.6961	557.8990	548.9788	526.8301	497.0792	463.7948	421.5301	398.4414	394.6229	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area	0.9835	0.9715	0.9453	0.8705	0.7337	0.5459	0.3986	0.4393	0.6725	0.8975	0.9688	0.9858	(86)
MIT	19.9106	20.0893	20.3508	20.6786	20.8917	20.9802	20.9966	20.9946	20.9463	20.6744	20.2495	19.8847	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house	0.9788	0.9636	0.9300	0.8369	0.6745	0.4660	0.3088	0.3457	0.5907	0.8627	0.9586	0.9817	(89)
MIT 2	18.7312	18.9566	19.2810	19.6746	19.8997	19.9839	19.9936	19.9945	19.9575	19.6814	19.1685	18.7054	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.2945	19.4976	19.7920	20.1541	20.3735	20.4597	20.4726	20.4722	20.4298	20.1557	19.6848	19.2687	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2945	19.4976	19.7920	20.1541	20.3735	20.4597	20.4726	20.4722	20.4298	20.1557	19.6848	19.2687	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9749	0.9591	0.9268	0.8431	0.6982	0.5036	0.3518	0.3904	0.6277	0.8693	0.9550	0.9781	(94)
Useful gains	398.0469	434.0923	451.9850	449.0967	389.5280	276.4737	185.3267	194.0822	291.1077	366.4217	380.5039	385.9848	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	742.0577	720.5526	654.4403	547.4923	420.9954	281.4218	185.9884	195.1855	305.2431	463.8155	613.6442	738.2617	(97)
Space heating kWh	255.9441	192.5013	150.6267	70.8448	23.4117	0.0000	0.0000	0.0000	0.0000	72.4610	167.8610	262.0940	(98a)
Space heating requirement - total per year (kWh/year)												1195.7446	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	255.9441	192.5013	150.6267	70.8448	23.4117	0.0000	0.0000	0.0000	0.0000	72.4610	167.8610	262.0940	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1195.7446	
Space heating per m2										(98c) / (4) =		27.5771	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	255.9441	192.5013	150.6267	70.8448	23.4117	0.0000	0.0000	0.0000	0.0000	72.4610	167.8610	262.0940	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	277.2959	208.5604	163.1925	76.7550	25.3648	0.0000	0.0000	0.0000	0.0000	78.5060	181.8645	283.9588	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.8067	84.4420	83.7496	82.4371	80.9080	79.8000	79.8000	79.8000	79.8000	82.4529	84.1107	84.8812	(217)
Fuel for water heating, kWh/month	216.3157	192.3305	206.6676	186.3399	185.2114	170.5061	169.2907	175.3325	176.4869	188.9442	195.0948	214.0019	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1295.4979	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2276.5223	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3417.0942	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1295.4979	0.2100	272.0546	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2276.5223	0.2100	478.0697	(264)
Space and water heating			750.1242	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			732.4217	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.8900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1295.4979	1.1300	1463.9126	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2276.5223	1.1300	2572.4702	(278)
Space and water heating			4036.3829	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3954.8804	(286)
Target Primary Energy Rate (TPER)			91.2100	(287)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.39	**TER**	16.89
Environmental	99 A	**% DER < TER**			91.77
CO_2 Emissions (t/year)	0.04	**DFEE**	22.87	**TFEE**	37.04
Compliance Check	See BREL	**% DFEE < TFEE**			38.26
% DPER < TPER	72.76	**DPER**	24.85	**TPER**	91.21

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.3383 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2622 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	38.2833	38.2073	38.1327	37.7826	37.7171	37.4122	37.4122	37.3557	37.5296	37.7171	37.8496	37.9882	(39)
Average = Sum(39)m / 12 =												37.7823	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8829	0.8812	0.8794	0.8714	0.8699	0.8628	0.8628	0.8615	0.8655	0.8699	0.8729	0.8761	(40)
HLP (average)												0.8714	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
							Total per year (kWh/year) = Sum(64)m =				663.9767	(64)
12Total per year (kWh/year)											664	(64)

Electric shower(s)

39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
				Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							449.4572	(64a)

Heat gains from water heating, kWh/month

27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.4004	291.4783	279.0119	271.5070	258.2448	250.2442	241.2477	240.9702	247.9561	254.7841	268.8582	277.3654	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	325.5767	373.9841	414.8872	469.6730	501.1047	498.8545	477.9348	444.2810	405.9847	352.6842	321.4470	312.0492	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.2536	75.4034	75.5508	76.2509	76.3833	77.0059	77.0059	77.1223	76.7649	76.3833	76.1159	75.8383	
alpha	6.0169	6.0269	6.0367	6.0834	6.0922	6.1337	6.1337	6.1415	6.1177	6.0922	6.0744	6.0559	
util living area	0.9915	0.9799	0.9492	0.8470	0.6740	0.4772	0.3441	0.3861	0.6225	0.9003	0.9799	0.9932	(86)
MIT	20.1468	20.3294	20.5708	20.8396	20.9648	20.9962	20.9996	20.9992	20.9831	20.7981	20.4298	20.1140	(87)
Th 2	20.1820	20.1835	20.1850	20.1919	20.1932	20.1992	20.1992	20.2003	20.1969	20.1932	20.1906	20.1879	(88)
util rest of house	0.9890	0.9744	0.9359	0.8144	0.6235	0.4187	0.2817	0.3193	0.5561	0.8698	0.9734	0.9913	(89)

MIT 2	19.4111	19.5916	19.8248	20.0727	20.1718	20.1976	20.1991	20.2001	20.1887	20.0443	19.6975	19.3835	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.7625	19.9440	20.1811	20.4390	20.5506	20.5791	20.5814	20.5818	20.5681	20.4043	20.0472	19.7324	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7625	19.9440	20.1811	20.4390	20.5506	20.5791	20.5814	20.5818	20.5681	20.4043	20.0472	19.7324	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9875	0.9725	0.9358	0.8249	0.6463	0.4466	0.3115	0.3512	0.5873	0.8785	0.9720	0.9899	(94)
Useful gains	321.5005	363.6828	388.2693	387.4510	323.8803	222.7857	148.8737	156.0472	238.4372	309.8350	312.4541	308.9100	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	591.9551	574.7896	521.6975	435.9735	333.8190	223.6897	148.9541	156.2123	242.7460	369.7916	490.0479	590.0469	(97)
Space heating kWh	201.2182	141.8637	99.2706	34.9361	7.3944	0.0000	0.0000	0.0000	0.0000	44.6077	127.8675	209.1658	(98a)
Space heating requirement - total per year (kWh/year)												866.3242	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	201.2182	141.8637	99.2706	34.9361	7.3944	0.0000	0.0000	0.0000	0.0000	44.6077	127.8675	209.1658	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												866.3242	
Space heating per m2											(98c) / (4) =	19.9798	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	351.6746	276.8502	283.9035	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9766	0.9911	0.9854	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	343.4485	274.3912	279.7716	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	554.0542	531.1768	493.2464	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	151.6361	191.0485	158.8253	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	37.9090	47.7621	39.7063	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												125.3775	(107)
Energy for space heating												19.9798	(99)
Energy for space cooling												2.8915	(108)
Total												22.8713	(109)
Fabric Energy Efficiency (DFEE)												22.9	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4383 (18)
Number of sides sheltered		3 (19)
Shelter factor (20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =		0.3397 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4004			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
E5 Ground floor (normal)	26.1200	0.1600	4.1792
P1 Party wall - Ground floor	6.7000	0.0800	0.5360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)													
	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							449.4572	(64a)
Heat gains from water heating, kWh/month													
	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains													
	281.3655	289.2254	276.9770	269.4043	256.2100	248.1415	239.2128	238.9354	245.8534	252.7493	266.7555	275.3306	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6300	0.7000	0.7700	39.0751	(80)

Solar gains	39.0751	76.4392	125.8845	183.5950	225.0025	230.3301	219.2837	188.3614	146.4088	90.7015	48.7221	32.1335	(83)
Total gains	320.4406	365.6646	402.8615	452.9993	481.2125	478.4717	458.4965	427.2968	392.2623	343.4508	315.4775	307.4640	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area													
	0.9940	0.9878	0.9727	0.9201	0.8045	0.6154	0.4557	0.5067	0.7578	0.9473	0.9876	0.9951	(86)
MIT	19.6977	19.8879	20.1733	20.5578	20.8345	20.9666	20.9938	20.9898	20.9085	20.5380	20.0581	19.6712	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house													
	0.9921	0.9840	0.9640	0.8953	0.7498	0.5296	0.3543	0.4009	0.6774	0.9255	0.9831	0.9935	(89)
MIT 2	18.7944	18.9844	19.2662	19.6392	19.8786	19.9800	19.9931	19.9936	19.9436	19.6305	19.1631	18.7753	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.2258	19.4159	19.6995	20.0780	20.3352	20.4512	20.4711	20.4694	20.4044	20.0640	19.5906	19.2032	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2258	19.4159	19.6995	20.0780	20.3352	20.4512	20.4711	20.4694	20.4044	20.0640	19.5906	19.2032	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9903	0.9814	0.9612	0.8980	0.7700	0.5696	0.4028	0.4515	0.7124	0.9275	0.9809	0.9920	(94)
Useful gains	317.3388	358.8658	387.2348	406.7711	370.5136	272.5577	184.6948	192.9433	279.4651	318.5421	309.4535	304.9947	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	738.6574	716.5197	649.8882	543.7870	419.1347	281.0125	185.9127	195.0519	304.0221	459.3639	609.0488	735.0561	(97)
Space heating kWh													
	313.4610	240.3434	195.4141	98.6514	36.1741	0.0000	0.0000	0.0000	0.0000	104.7714	215.7086	319.9657	(98a)
Space heating requirement - total per year (kWh/year)												1524.4897	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	313.4610	240.3434	195.4141	98.6514	36.1741	0.0000	0.0000	0.0000	0.0000	104.7714	215.7086	319.9657	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1524.4897	
Space heating per m2											(98c) / (4) =	35.1589	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	451.4472	355.3946	364.2795	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8939	0.9440	0.9228	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	403.5707	335.4817	336.1678	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	532.5097	510.6427	475.5231	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	92.8361	130.3198	103.6803	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	23.2090	32.5800	25.9201	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												81.7091	(107)
Energy for space heating												35.1589	(99)
Energy for space cooling												1.8844	(108)
Total												37.0433	(109)
Fabric Energy Efficiency (TFEE)												37.0	(109)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.39	**TER**	16.89
Environmental	99 A	**% DER < TER**			91.77
CO_2 Emissions (t/year)	0.04	**DFEE**	22.87	**TFEE**	37.04
Compliance Check	See BREL	**% DFEE < TFEE**			38.26
% DPER < TPER	72.76	**DPER**	24.85	**TPER**	91.21

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		10371.4500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							239.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges					(36a) =		0.0000	

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)

WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Total per year (kWh/year) = Sum(64)m = 2187.6523 (64)

12Total per year (kWh/year) 2188 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)

Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)

Water heating gains (Table 5)

130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)

Total internal gains

377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	419.7672	467.2558	506.0368	555.7052	584.1265	578.6970	555.6038	523.3987	486.8526	437.0989	410.7463	405.5434	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106

alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874		
util living area	0.9673	0.9391	0.8794	0.7447	0.5704	0.4010	0.2876	0.3191	0.5109	0.7927	0.9345	0.9729	(86)
MIT	20.4545	20.6028	20.7778	20.9302	20.9874	20.9988	20.9999	20.9998	20.9949	20.9148	20.6707	20.4133	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house	0.9595	0.9258	0.8561	0.7074	0.5252	0.3525	0.2367	0.2651	0.4549	0.7507	0.9180	0.9663	(89)
MIT 2	19.6081	19.7882	19.9933	20.1575	20.2113	20.2201	20.2207	20.2206	20.2177	20.1463	19.8733	19.5573	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0123	20.1773	20.3680	20.5265	20.5820	20.5920	20.5929	20.5928	20.5889	20.5134	20.2542	19.9662	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0123	20.1773	20.3680	20.5265	20.5820	20.5920	20.5929	20.5928	20.5889	20.5134	20.2542	19.9662	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9571	0.9250	0.8608	0.7224	0.5463	0.3756	0.2610	0.2909	0.4815	0.7671	0.9188	0.9637	(94)
Useful gains	401.7598	432.2106	435.6061	401.4579	319.1330	217.3690	145.0173	152.2566	234.4309	335.3008	377.3945	390.8402	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	570.7504	554.9474	503.7549	422.3338	322.6373	217.6595	145.0404	152.3026	235.7086	360.1025	477.8254	572.7063	(97)
Space heating kWh	125.7290	82.4791	50.7027	15.0307	2.6072	0.0000	0.0000	0.0000	0.0000	18.4524	72.3102	135.3084	(98a)
Space heating requirement - total per year (kWh/year)												502.6198	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	125.7290	82.4791	50.7027	15.0307	2.6072	0.0000	0.0000	0.0000	0.0000	18.4524	72.3102	135.3084	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												502.6198	
Space heating per m2											(98c) / (4) =	11.5918	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	125.7290	82.4791	50.7027	15.0307	2.6072	0.0000	0.0000	0.0000	0.0000	18.4524	72.3102	135.3084	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	188.5935	123.7187	76.0541	22.5460	3.9108	0.0000	0.0000	0.0000	0.0000	27.6786	108.4654	202.9626	
Space heating requirement	188.5935	123.7187	76.0541	22.5460	3.9108	0.0000	0.0000	0.0000	0.0000	27.6786	108.4654	202.9626	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												753.9297	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												7.5393	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3219.7925	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1076.1088	0.1580	31.7701	(367)
Electrical energy for heat distribution (space & water)	7.5393	0.0000	5.8093	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			160.7227	(373)
Space and water heating			160.7227	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			60.1950	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.3900	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1076.1088	1.5850	318.6517	(467)
Electrical energy for heat distribution (space & water)	7.5393	0.0000	61.8392	(472)
Overall CO2 factor for heat network			0.4240	(486)
Total CO2 associated with community systems			1710.8839	(473)
Space and water heating			1710.8839	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			1077.2891	(483)
Dwelling Primary energy Rate (DPER)			24.8500	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)

100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4004	(33)
Main dwelling						
Party Wall			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
E5 Ground floor (normal)	26.1200	0.1600	4.1792
P1 Party wall - Ground floor	6.7000	0.0800	0.5360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6300	0.7000	0.7700	39.0751	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	39.0751	76.4392	125.8845	183.5950	225.0025	230.3301	219.2837	188.3614	146.4088	90.7015	48.7221	32.1335	(83)
Total gains	408.2958	452.6009	487.6757	532.6961	557.8990	548.9788	526.8301	497.0792	463.7948	421.5301	398.4414	394.6229	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area	0.9835	0.9715	0.9453	0.8705	0.7337	0.5459	0.3986	0.4393	0.6725	0.8975	0.9688	0.9858	(86)
MIT	19.9106	20.0893	20.3508	20.6786	20.8917	20.9802	20.9966	20.9946	20.9463	20.6744	20.2495	19.8847	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house	0.9788	0.9636	0.9300	0.8369	0.6745	0.4660	0.3088	0.3457	0.5907	0.8627	0.9586	0.9817	(89)
MIT 2	18.7312	18.9566	19.2810	19.6746	19.8997	19.9839	19.9936	19.9945	19.9575	19.6814	19.1685	18.7054	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.2945	19.4976	19.7920	20.1541	20.3735	20.4597	20.4726	20.4722	20.4298	20.1557	19.6848	19.2687	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2945	19.4976	19.7920	20.1541	20.3735	20.4597	20.4726	20.4722	20.4298	20.1557	19.6848	19.2687	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9749	0.9591	0.9268	0.8431	0.6982	0.5036	0.3518	0.3904	0.6277	0.8693	0.9550	0.9781	(94)
Useful gains	398.0469	434.0923	451.9850	449.0967	389.5280	276.4737	185.3267	194.0822	291.1077	366.4217	380.5039	385.9848	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	742.0577	720.5526	654.4403	547.4923	420.9954	281.4218	185.9884	195.1855	305.2431	463.8155	613.6442	738.2617	(97)
Space heating kWh	255.9441	192.5013	150.6267	70.8448	23.4117	0.0000	0.0000	0.0000	0.0000	72.4610	167.8610	262.0940	(98a)
Space heating requirement - total per year (kWh/year)												1195.7446	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	255.9441	192.5013	150.6267	70.8448	23.4117	0.0000	0.0000	0.0000	0.0000	72.4610	167.8610	262.0940	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1195.7446	
Space heating per m2										(98c) / (4) =		27.5771	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	255.9441	192.5013	150.6267	70.8448	23.4117	0.0000	0.0000	0.0000	0.0000	72.4610	167.8610	262.0940	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	277.2959	208.5604	163.1925	76.7550	25.3648	0.0000	0.0000	0.0000	0.0000	78.5060	181.8645	283.9588	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.8067	84.4420	83.7496	82.4371	80.9080	79.8000	79.8000	79.8000	79.8000	82.4529	84.1107	84.8812	(217)
Fuel for water heating, kWh/month	216.3157	192.3305	206.6676	186.3399	185.2114	170.5061	169.2907	175.3325	176.4869	188.9442	195.0948	214.0019	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1295.4979	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2276.5223	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3417.0942	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1295.4979	0.2100	272.0546	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2276.5223	0.2100	478.0697	(264)
Space and water heating			750.1242	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			732.4217	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.8900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1295.4979	1.1300	1463.9126	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2276.5223	1.1300	2572.4702	(278)
Space and water heating			4036.3829	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3954.8804	(286)
Target Primary Energy Rate (TPER)			91.2100	(287)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.39	**TER**	16.89
Environmental	99 A	**% DER < TER**			91.77
CO_2 Emissions (t/year)	0.04	**DFEE**	22.87	**TFEE**	37.04
Compliance Check	See BREL	**% DFEE < TFEE**			38.26
% DPER < TPER	72.76	**DPER**	24.85	**TPER**	91.21

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)
Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	460.9371	499.3751	541.0594	581.5362	605.2805	592.0631	569.0364	538.2350	504.0534	463.4913	441.8157	444.4008	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874

util living area													
	0.9506	0.9208	0.8509	0.7193	0.5517	0.3920	0.2808	0.3103	0.4941	0.7613	0.9132	0.9589	(86)
MIT	20.5418	20.6601	20.8196	20.9423	20.9895	20.9989	20.9999	20.9998	20.9957	20.9322	20.7241	20.4992	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.9397	0.9048	0.8249	0.6817	0.5076	0.3446	0.2311	0.2578	0.4397	0.7180	0.8932	0.9496	(89)
MIT 2	19.7141	19.8554	20.0390	20.1690	20.2129	20.2202	20.2207	20.2207	20.2182	20.1624	19.9346	19.6624	(90)
Living area fraction											fLA = Living area / (4) =	0.4776	(91)
MIT	20.1094	20.2397	20.4119	20.5384	20.5838	20.5921	20.5929	20.5928	20.5896	20.5301	20.3117	20.0621	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1094	20.2397	20.4119	20.5384	20.5838	20.5921	20.5929	20.5928	20.5896	20.5301	20.3117	20.0621	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9380	0.9053	0.8316	0.6973	0.5283	0.3672	0.2549	0.2829	0.4656	0.7357	0.8958	0.9474	(94)
Useful gains	432.3420	452.0640	449.9610	405.5295	319.7866	217.4085	145.0207	152.2644	234.6742	341.0035	395.7573	421.0203	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	574.2773	557.2156	505.3480	422.7631	322.7042	217.6636	145.0408	152.3034	235.7337	360.7107	479.9145	576.1910	(97)
Space heating kWh													
	105.5999	70.6619	41.2080	12.4082	2.1707	0.0000	0.0000	0.0000	0.0000	14.6621	60.5932	115.4470	(98a)
Space heating requirement - total per year (kWh/year)												422.7510	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	105.5999	70.6619	41.2080	12.4082	2.1707	0.0000	0.0000	0.0000	0.0000	14.6621	60.5932	115.4470	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												422.7510	
Space heating per m2											(98c) / (4) =	9.7498	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	105.5999	70.6619	41.2080	12.4082	2.1707	0.0000	0.0000	0.0000	0.0000	14.6621	60.5932	115.4470	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	158.3998	105.9928	61.8120	18.6123	3.2561	0.0000	0.0000	0.0000	0.0000	21.9932	90.8898	173.1705	
Space heating requirement													
	158.3998	105.9928	61.8120	18.6123	3.2561	0.0000	0.0000	0.0000	0.0000	21.9932	90.8898	173.1705	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												634.1264	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												6.3413	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3099.9892	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	634.1264	4.4400	28.1552	(340a)
Space heating total			28.1552	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			191.4886	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7802	(357)
SAP value		87.3534	
SAP rating (Section 12)		87	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1044.1613	0.1581	26.7384	(367)
Electrical energy for heat distribution (space & water)	6.3413	0.0000	5.6206	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			155.5023	(373)
Space and water heating			155.5023	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			54.9746	(383)
CO2 emissions per m2			1.2700	(384)
EI value			99.1663	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	43.3600 (1b)	x 2.4500 (2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)

Adj infilt rate

	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104 (22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 10371.4500 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

Thermal bridges (User defined value 0.030 * total exposed area) 2.2962 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)

Average = Sum(39)m / 12 = 36.3250

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Total per year (kWh/year) = Sum(64)m = 2187.6523 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)													

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)												
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874 (72)
Total internal gains												
	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	23.7835	0.6800	0.7000	0.7700	51.0736	(80)

Solar gains	51.0736	88.7763	143.8339	211.6843	249.5125	273.8424	255.8751	224.3556	176.4207	111.0901	62.7325	42.2420 (83)
Total gains	469.8344	505.6456	549.0181	595.0545	611.9331	617.2952	588.2244	559.2798	522.4455	476.6813	451.9594	451.9591 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area	0.9423	0.9110	0.8276	0.6873	0.5181	0.3410	0.2408	0.2662	0.4570	0.7183	0.8953	0.9522	(86)
MIT	20.5838	20.6918	20.8527	20.9564	20.9929	20.9996	21.0000	20.9999	20.9974	20.9532	20.7668	20.5403	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house	0.9297	0.8933	0.7989	0.6483	0.4738	0.2953	0.1927	0.2157	0.4039	0.6719	0.8721	0.9414	(89)
MIT 2	19.7649	19.8929	20.0754	20.1827	20.2157	20.2205	20.2207	20.2207	20.2192	20.1822	19.9837	19.7127	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.1560	20.2745	20.4467	20.5523	20.5869	20.5926	20.5929	20.5929	20.5909	20.5504	20.3578	20.1080	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1560	20.2745	20.4467	20.5523	20.5869	20.5926	20.5929	20.5929	20.5909	20.5504	20.3578	20.1080	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9286	0.8946	0.8076	0.6652	0.4947	0.3172	0.2157	0.2398	0.4292	0.6920	0.8765	0.9397	(94)
Useful gains	436.2812	452.3702	443.3841	395.8357	302.7368	195.7885	126.8735	134.1312	224.2433	329.8652	396.1579	424.6918	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	565.0732	547.5815	488.4503	408.7382	304.6551	195.8867	126.8799	134.1441	224.8841	343.2869	467.0580	566.9598	(97)
Space heating kWh	95.8212	63.9820	33.5292	9.2898	1.4272	0.0000	0.0000	0.0000	0.0000	9.9857	51.0481	105.8474	(98a)
Space heating requirement - total per year (kWh/year)												370.9307	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	95.8212	63.9820	33.5292	9.2898	1.4272	0.0000	0.0000	0.0000	0.0000	9.9857	51.0481	105.8474	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												370.9307	
Space heating per m2											(98c) / (4) =	8.5547	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												1.5000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement												
	95.8212	63.9820	33.5292	9.2898	1.4272	0.0000	0.0000	0.0000	0.0000	9.9857	51.0481	105.8474 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	143.7318	95.9730	50.2938	13.9348	2.1408	0.0000	0.0000	0.0000	0.0000	14.9786	76.5721	158.7711
Space heating requirement												
	143.7318	95.9730	50.2938	13.9348	2.1408	0.0000	0.0000	0.0000	0.0000	14.9786	76.5721	158.7711 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement												
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016
Water heating fuel												
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127 (331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	556.3960	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	5.5640	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(330a)
Total electricity for the above, kWh/year	11.9235	(331)
Electricity for lighting (calculated in Appendix L)	130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2925.7327	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	556.3960	6.5500	36.4439	(340a)
Space heating total			36.4439	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			236.8450	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1023.4332	0.1586	23.5289	(367)
Electrical energy for heat distribution (space & water)	5.5640	0.0000	5.5002	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			152.1725	(373)
Space and water heating			152.1725	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			39.4126	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1023.4332	1.5870	235.4676	(467)
Electrical energy for heat distribution (space & water)	5.5640	0.0000	58.7198	(472)
Overall CO2 factor for heat network			0.4233	(486)
Total CO2 associated with community systems			1624.5804	(473)
Space and water heating			1624.5804	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			920.2555	(483)

SAP 10 EPC IMPROVEMENTS

Rev D - East

Current energy efficiency rating:	B 87
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 87
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£41	£41	£0
Community scheme	£355	£355	£0
Space heating	£144	£144	£0
Water heating	£215	£215	£0
Lighting	£37	£37	£0
Generated (PV)	-£159	-£159	£0
Total cost of fuels	£237	£237	£0
Total cost of uses	£237	£237	£0
Delivered energy	67 kWh/m²	67 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.0 tonnes	0.0 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	21 kWh/m²	21 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)

Total net area of external elements Aum(A, m2)	76.5400				(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	16.5005			(33)
Main dwelling					
Party Wall	31.3600	0.0000	0.0000	70.0000	2195.2000 (32)
Party Ceiling 1	43.3600			30.0000	1300.8000 (32b)
Internal TF Wall	68.4500			9.0000	616.0500 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	460.9371	499.3751	541.0594	581.5362	605.2805	592.0631	569.0364	538.2350	504.0534	463.4913	441.8157	444.4008	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area													
	0.9506	0.9208	0.8509	0.7193	0.5517	0.3920	0.2808	0.3103	0.4941	0.7613	0.9132	0.9589	(86)
MIT	20.5418	20.6601	20.8196	20.9423	20.9895	20.9989	20.9999	20.9998	20.9957	20.9322	20.7241	20.4992	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.9397	0.9048	0.8249	0.6817	0.5076	0.3446	0.2311	0.2578	0.4397	0.7180	0.8932	0.9496	(89)
MIT 2	19.7141	19.8554	20.0390	20.1690	20.2129	20.2202	20.2207	20.2207	20.2182	20.1624	19.9346	19.6624	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.1094	20.2397	20.4119	20.5384	20.5838	20.5921	20.5929	20.5928	20.5896	20.5301	20.3117	20.0621	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1094	20.2397	20.4119	20.5384	20.5838	20.5921	20.5929	20.5928	20.5896	20.5301	20.3117	20.0621	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9380	0.9053	0.8316	0.6973	0.5283	0.3672	0.2549	0.2829	0.4656	0.7357	0.8958	0.9474	(94)
Useful gains	432.3420	452.0640	449.9610	405.5295	319.7866	217.4085	145.0207	152.2644	234.6742	341.0035	395.7573	421.0203	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	574.2773	557.2156	505.3480	422.7631	322.7042	217.6636	145.0408	152.3034	235.7337	360.7107	479.9145	576.1910	(97)
Space heating kWh													
	105.5999	70.6619	41.2080	12.4082	2.1707	0.0000	0.0000	0.0000	0.0000	14.6621	60.5932	115.4470	(98a)
Space heating requirement - total per year (kWh/year)												422.7510	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	105.5999	70.6619	41.2080	12.4082	2.1707	0.0000	0.0000	0.0000	0.0000	14.6621	60.5932	115.4470	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												422.7510	
Space heating per m2											(98c) / (4) =	9.7498	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	105.5999	70.6619	41.2080	12.4082	2.1707	0.0000	0.0000	0.0000	0.0000	14.6621	60.5932	115.4470	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	158.3998	105.9928	61.8120	18.6123	3.2561	0.0000	0.0000	0.0000	0.0000	21.9932	90.8898	173.1705	
Space heating requirement													
	158.3998	105.9928	61.8120	18.6123	3.2561	0.0000	0.0000	0.0000	0.0000	21.9932	90.8898	173.1705	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												634.1264	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												6.3413	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)

Appendix Q - special features

Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3099.9892	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	634.1264	4.4400	28.1552	(340a)
Space heating total			28.1552	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			191.4886	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7802	(357)
SAP value		87.3534	
SAP rating (Section 12)		87	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1044.1613	0.1581	26.7384	(367)
Electrical energy for heat distribution (space & water)	6.3413	0.0000	5.6206	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			155.5023	(373)
Space and water heating			155.5023	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			54.9746	(383)
CO2 emissions per m2			1.2700	(384)
EI value			99.1663	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

Measured/design AP50 3.0000 (17)
Infiltration rate 0.1500 (18)
Number of sides sheltered 3 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.2962 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)
Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
									Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	23.7835	0.6800	0.7000	0.7700	51.0736	(80)

Solar gains	51.0736	88.7763	143.8339	211.6843	249.5125	273.8424	255.8751	224.3556	176.4207	111.0901	62.7325	42.2420	(83)
Total gains	469.8344	505.6456	549.0181	595.0545	611.9331	617.2952	588.2244	559.2798	522.4455	476.6813	451.9594	451.9591	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area													
	0.9423	0.9110	0.8276	0.6873	0.5181	0.3410	0.2408	0.2662	0.4570	0.7183	0.8953	0.9522	(86)
MIT	20.5838	20.6918	20.8527	20.9564	20.9929	20.9996	21.0000	20.9999	20.9974	20.9532	20.7668	20.5403	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.9297	0.8933	0.7989	0.6483	0.4738	0.2953	0.1927	0.2157	0.4039	0.6719	0.8721	0.9414	(89)
MIT 2	19.7649	19.8929	20.0754	20.1827	20.2157	20.2205	20.2207	20.2207	20.2192	20.1822	19.9837	19.7127	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.1560	20.2745	20.4467	20.5523	20.5869	20.5926	20.5929	20.5929	20.5909	20.5504	20.3578	20.1080	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1560	20.2745	20.4467	20.5523	20.5869	20.5926	20.5929	20.5929	20.5909	20.5504	20.3578	20.1080	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9286	0.8946	0.8076	0.6652	0.4947	0.3172	0.2157	0.2398	0.4292	0.6920	0.8765	0.9397	(94)
Useful gains	436.2812	452.3702	443.3841	395.8357	302.7368	195.7885	126.8735	134.1312	224.2433	329.8652	396.1579	424.6918	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	565.0732	547.5815	488.4503	408.7382	304.6551	195.8867	126.8799	134.1441	224.8841	343.2869	467.0580	566.9598	(97)
Space heating kWh													
	95.8212	63.9820	33.5292	9.2898	1.4272	0.0000	0.0000	0.0000	0.0000	9.9857	51.0481	105.8474	(98a)
Space heating requirement - total per year (kWh/year)												370.9307	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	95.8212	63.9820	33.5292	9.2898	1.4272	0.0000	0.0000	0.0000	0.0000	9.9857	51.0481	105.8474	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												370.9307	
Space heating per m2											(98c) / (4) =	8.5547	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement													
	95.8212	63.9820	33.5292	9.2898	1.4272	0.0000	0.0000	0.0000	0.0000	9.9857	51.0481	105.8474	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	143.7318	95.9730	50.2938	13.9348	2.1408	0.0000	0.0000	0.0000	0.0000	14.9786	76.5721	158.7711	
Space heating requirement													
	143.7318	95.9730	50.2938	13.9348	2.1408	0.0000	0.0000	0.0000	0.0000	14.9786	76.5721	158.7711	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)

Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	556.3960	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	5.5640	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(330a)
Total electricity for the above, kWh/year	11.9235	(331)
Electricity for lighting (calculated in Appendix L)	130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2925.7327	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	556.3960	6.5500	36.4439	(340a)
Space heating total			36.4439	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			236.8450	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1023.4332	0.1586	23.5289	(367)
Electrical energy for heat distribution (space & water)	5.5640	0.0000	5.5002	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			152.1725	(373)
Space and water heating			152.1725	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			39.4126	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1023.4332	1.5870	235.4676	(467)
Electrical energy for heat distribution (space & water)	5.5640	0.0000	58.7198	(472)
Overall CO2 factor for heat network			0.4233	(486)
Total CO2 associated with community systems			1624.5804	(473)
Space and water heating			1624.5804	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			920.2555	(483)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.18	**TER**	15.98
Environmental	99 A	**% DER < TER**			92.62
CO_2 Emissions (t/year)	0.03	**DFEE**	18.33	**TFEE**	32.15
Compliance Check	See BREL	**% DFEE < TFEE**			43.00
% DPER < TPER	73.60	**DPER**	22.79	**TPER**	86.33

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			10371.4500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							239.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)

WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Total per year (kWh/year) = Sum(64)m = 2187.6523 (64)

12Total per year (kWh/year) 2188 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)

Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)

Water heating gains (Table 5)

130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)

Total internal gains

377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.5100	46.7521	0.6800	0.7000	0.7700	100.3973	(78)

Solar gains	100.3973	164.4249	209.4481	236.7219	246.6788	237.3948	231.9492	225.2548	218.7933	177.3477	119.0050	86.7525	(83)
Total gains	477.9882	549.1749	579.6096	594.2610	587.9455	567.4815	550.8658	545.3428	547.6173	516.5465	477.1624	457.6122	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106

alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area	0.9425	0.8884	0.8182	0.7071	0.5669	0.4088	0.2901	0.3063	0.4559	0.7007	0.8859	0.9533 (86)
MIT	20.5753	20.7363	20.8573	20.9474	20.9878	20.9986	20.9999	20.9998	20.9973	20.9570	20.7764	20.5267 (87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207 (88)
util rest of house	0.9302	0.8684	0.7900	0.6694	0.5220	0.3594	0.2387	0.2545	0.4052	0.6566	0.8623	0.9430 (89)
MIT 2	19.7542	19.9429	20.0793	20.1739	20.2116	20.2200	20.2207	20.2207	20.2191	20.1848	19.9933	19.6957 (90)
Living area fraction										fLA = Living area / (4) =		0.4776 (91)
MIT	20.1464	20.3218	20.4509	20.5433	20.5823	20.5919	20.5928	20.5928	20.5908	20.5536	20.3674	20.0926 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1464	20.3218	20.4509	20.5433	20.5823	20.5919	20.5928	20.5928	20.5908	20.5536	20.3674	20.0926 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9289	0.8712	0.7987	0.6853	0.5430	0.3830	0.2633	0.2792	0.4293	0.6759	0.8670	0.9410	(94)
Useful gains	444.0247	478.4401	462.9137	407.2570	319.2611	217.3309	145.0160	152.2677	235.1054	349.1254	413.7157	430.6345	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	575.6202	560.1985	506.7672	422.9444	322.6504	217.6555	145.0402	152.3038	235.7782	361.5659	481.9365	577.2991	(97)
Space heating kWh	97.9070	54.9416	32.6270	11.2949	2.5217	0.0000	0.0000	0.0000	0.0000	9.2557	49.1190	109.1185	(98a)
Space heating requirement - total per year (kWh/year)												366.7854	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	97.9070	54.9416	32.6270	11.2949	2.5217	0.0000	0.0000	0.0000	0.0000	9.2557	49.1190	109.1185	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												366.7854	
Space heating per m2											(98c) / (4) =	8.4591	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	97.9070	54.9416	32.6270	11.2949	2.5217	0.0000	0.0000	0.0000	0.0000	9.2557	49.1190	109.1185	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	146.8605	82.4125	48.9405	16.9423	3.7825	0.0000	0.0000	0.0000	0.0000	13.8835	73.6786	163.6777	
Space heating requirement	146.8605	82.4125	48.9405	16.9423	3.7825	0.0000	0.0000	0.0000	0.0000	13.8835	73.6786	163.6777	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												550.1781	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												5.5018	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3016.0409	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1021.7751	0.1585	23.2606	(367)
Electrical energy for heat distribution (space & water)	5.5018	0.0000	5.4901	(372)
Overall CO2 factor for heat network			0.0396	(386)
Total CO2 associated with community systems			151.8941	(373)
Space and water heating			151.8941	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			51.3664	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.1800	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1021.7751	1.5868	232.8132	(467)
Electrical energy for heat distribution (space & water)	5.5018	0.0000	58.6202	(472)
Overall CO2 factor for heat network			0.4233	(486)
Total CO2 associated with community systems			1621.8265	(473)
Space and water heating			1621.8265	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			988.2317	(483)
Dwelling Primary energy Rate (DPER)			22.7900	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)

100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4004	(33)
Main dwelling						
Party Wall			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
E5 Ground floor (normal)	26.1200	0.1600	4.1792
P1 Party wall - Ground floor	6.7000	0.0800	0.5360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

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6. Solar gains

Full SAP Calculation Printout

elmhurst energy

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.5100	46.7521	0.6300	0.7000	0.7700	93.0151	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	93.0151	152.3348	194.0475	219.3158	228.5407	219.9393	214.8941	208.6919	202.7056	164.3074	110.2547	80.3736	(83)
Total gains	462.2358	528.4965	555.8388	568.4169	561.4371	538.5879	522.4405	517.4097	520.0915	495.1360	459.9740	442.8631	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area	0.9733	0.9499	0.9158	0.8461	0.7305	0.5553	0.4019	0.4227	0.6130	0.8401	0.9474	0.9775	(86)
MIT	20.0345	20.2492	20.4742	20.7228	20.8938	20.9786	20.9965	20.9954	20.9641	20.7712	20.3775	19.9975	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house	0.9660	0.9372	0.8948	0.8092	0.6712	0.4745	0.3114	0.3323	0.5337	0.7956	0.9318	0.9714	(89)
MIT 2	18.8854	19.1515	19.4254	19.7213	19.9015	19.9830	19.9935	19.9948	19.9694	19.7816	19.3225	18.8464	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.4343	19.6758	19.9263	20.1997	20.3754	20.4585	20.4726	20.4727	20.4445	20.2543	19.8264	19.3962	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4343	19.6758	19.9263	20.1997	20.3754	20.4585	20.4726	20.4727	20.4445	20.2543	19.8264	19.3962	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9614	0.9330	0.8937	0.8177	0.6951	0.5125	0.3547	0.3755	0.5703	0.8084	0.9290	0.9670	(94)
Useful gains	444.4117	493.0710	496.7770	464.7697	390.2344	276.0242	185.2976	194.2872	296.6072	400.2729	427.3358	428.2607	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	748.9730	729.3456	661.0564	549.7079	421.0894	281.3643	185.9845	195.2128	305.9542	468.6005	620.5476	744.5090	(97)
Space heating kWh	226.5936	158.7765	122.2238	61.1555	22.9561	0.0000	0.0000	0.0000	0.0000	50.8358	139.1125	235.2887	(98a)
Space heating requirement - total per year (kWh/year)												1016.9426	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	226.5936	158.7765	122.2238	61.1555	22.9561	0.0000	0.0000	0.0000	0.0000	50.8358	139.1125	235.2887	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1016.9426	
Space heating per m2										(98c) / (4) =		23.4535	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 92.3000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	226.5936	158.7765	122.2238	61.1555	22.9561	0.0000	0.0000	0.0000	0.0000	50.8358	139.1125	235.2887	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	245.4969	172.0223	132.4202	66.2573	24.8712	0.0000	0.0000	0.0000	0.0000	55.0767	150.7178	254.9173	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.5346	84.0091	83.2940	82.1715	80.8891	79.8000	79.8000	79.8000	79.8000	81.8407	83.6917	84.6411	(217)
Fuel for water heating, kWh/month	217.0120	193.3216	207.7981	186.9423	185.2548	170.5061	169.2907	175.3325	176.4869	190.3576	196.0716	214.6091	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1101.7796	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2282.9834	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3229.8370	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1101.7796	0.2100	231.3737	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2282.9834	0.2100	479.4265	(264)
Space and water heating			710.8002	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			693.0977	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.9800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1101.7796	1.1300	1245.0110	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2282.9834	1.1300	2579.7712	(278)
Space and water heating			3824.7822	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3743.2798	(286)
Target Primary Energy Rate (TPER)			86.3300	(287)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.18	**TER**	15.98
Environmental	99 A	**% DER < TER**			92.62
CO_2 Emissions (t/year)	0.03	**DFEE**	18.33	**TFEE**	32.15
Compliance Check	See BREL	**% DFEE < TFEE**			43.00
% DPER < TPER	73.60	**DPER**	22.79	**TPER**	86.33

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2622	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	38.2833	38.2073	38.1327	37.7826	37.7171	37.4122	37.4122	37.3557	37.5296	37.7171	37.8496	37.9882	(39)
Average = Sum(39)m / 12 =												37.7823	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8829	0.8812	0.8794	0.8714	0.8699	0.8628	0.8628	0.8615	0.8655	0.8699	0.8729	0.8761	(40)
HLP (average)												0.8714	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												449.4572	(64a)
Heat gains from water heating, kWh/month	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.4004	291.4783	279.0119	271.5070	258.2448	250.2442	241.2477	240.9702	247.9561	254.7841	268.8582	277.3654	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.5100	46.7521	0.6800	0.7000	0.7700	100.3973	(78)

Solar gains	100.3973	164.4249	209.4481	236.7219	246.6788	237.3948	231.9492	225.2548	218.7933	177.3477	119.0050	86.7525	(83)
Total gains	383.7977	455.9032	488.4600	508.2289	504.9237	487.6390	473.1968	466.2250	466.7494	432.1318	387.8632	364.1179	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.2536	75.4034	75.5508	76.2509	76.3833	77.0059	77.0059	77.1223	76.7649	76.3833	76.1159	75.8383	
alpha	6.0169	6.0269	6.0367	6.0834	6.0922	6.1337	6.1337	6.1415	6.1177	6.0922	6.0744	6.0559	
util living area	0.9809	0.9515	0.9052	0.8096	0.6698	0.4878	0.3475	0.3681	0.5480	0.8142	0.9534	0.9854	(86)
MIT	20.2915	20.5111	20.7012	20.8765	20.9660	20.9958	20.9996	20.9994	20.9914	20.8908	20.5778	20.2458	(87)
Th 2	20.1820	20.1835	20.1850	20.1919	20.1932	20.1992	20.1992	20.2003	20.1969	20.1932	20.1906	20.1879	(88)
util rest of house	0.9759	0.9402	0.8846	0.7740	0.6193	0.4282	0.2845	0.3044	0.4870	0.7728	0.9404	0.9814	(89)

MIT 2	19.5527	19.7647	19.9429	20.1021	20.1726	20.1974	20.1991	20.2001	20.1928	20.1179	19.8375	19.5131	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.9056	20.1212	20.3051	20.4720	20.5515	20.5787	20.5814	20.5819	20.5742	20.4871	20.1911	19.8631	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9056	20.1212	20.3051	20.4720	20.5515	20.5787	20.5814	20.5819	20.5742	20.4871	20.1911	19.8631	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9739	0.9392	0.8879	0.7869	0.6422	0.4566	0.3146	0.3348	0.5159	0.7887	0.9404	0.9795	(94)
Useful gains	373.7740	428.1779	433.7046	399.9209	324.2459	222.6570	148.8684	156.0910	240.8086	340.8017	364.7411	356.6654	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	597.4331	581.5605	526.4269	437.2192	333.8543	223.6771	148.9535	156.2170	242.9763	372.9115	495.4918	595.0111	(97)
Space heating kWh	166.4024	103.0731	68.9854	26.8548	7.1487	0.0000	0.0000	0.0000	0.0000	23.8897	94.1405	177.3293	(98a)
Space heating requirement - total per year (kWh/year)												667.8239	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	166.4024	103.0731	68.9854	26.8548	7.1487	0.0000	0.0000	0.0000	0.0000	23.8897	94.1405	177.3293	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												667.8239	
Space heating per m2											(98c) / (4) =	15.4018	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	351.6746	276.8502	283.9035	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9739	0.9906	0.9887	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	342.4787	274.2560	280.6933	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	540.9452	525.6389	518.8953	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	142.8958	187.0289	177.2222	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	35.7240	46.7572	44.3056	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												126.7867	(107)
Energy for space heating												15.4018	(99)
Energy for space cooling												2.9240	(108)
Total												18.3259	(109)
Fabric Energy Efficiency (DFEE)												18.3	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		2 * 10 =	20.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		20.0000 / (5) =	0.1883	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			5.0000	(17)
Infiltration rate			0.4383	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4004			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
E5 Ground floor (normal)	26.1200	0.1600	4.1792
P1 Party wall - Ground floor	6.7000	0.0800	0.5360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)													
	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							449.4572	(64a)
Heat gains from water heating, kWh/month													
	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains													
	281.3655	289.2254	276.9770	269.4043	256.2100	248.1415	239.2128	238.9354	245.8534	252.7493	266.7555	275.3306	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.5100	46.7521	0.6300	0.7000	0.7700	93.0151	(78)

Solar gains	93.0151	152.3348	194.0475	219.3158	228.5407	219.9393	214.8941	208.6919	202.7056	164.3074	110.2547	80.3736	(83)
Total gains	374.3806	441.5603	471.0246	488.7202	484.7506	468.0808	454.1069	447.6273	448.5590	417.0567	377.0101	355.7042	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area													
	0.9884	0.9741	0.9515	0.8990	0.8012	0.6267	0.4599	0.4852	0.6899	0.9007	0.9747	0.9908	(86)
MIT	19.8298	20.0647	20.3179	20.6158	20.8377	20.9638	20.9936	20.9915	20.9399	20.6675	20.2019	19.7907	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house													
	0.9850	0.9668	0.9376	0.8700	0.7462	0.5403	0.3576	0.3831	0.6078	0.8666	0.9662	0.9880	(89)
MIT 2	18.9248	19.1565	19.4029	19.6896	19.8809	19.9786	19.9930	19.9941	19.9614	19.7427	19.3023	18.8935	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.3570	19.5903	19.8400	20.1320	20.3379	20.4492	20.4709	20.4705	20.4288	20.1844	19.7320	19.3220	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3570	19.5903	19.8400	20.1320	20.3379	20.4492	20.4709	20.4705	20.4288	20.1844	19.7320	19.3220	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9824	0.9635	0.9355	0.8747	0.7666	0.5805	0.4066	0.4320	0.6449	0.8741	0.9637	0.9858	(94)
Useful gains	367.7927	425.4308	440.6329	427.4746	371.6032	271.7378	184.6356	193.3723	289.2897	364.5598	363.3213	350.6364	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	745.1514	725.1255	656.8038	546.4145	419.2676	280.9155	185.9052	195.1055	305.1959	465.2097	615.9438	740.8742	(97)
Space heating kWh													
	280.7549	201.3948	160.8311	85.6367	35.4624	0.0000	0.0000	0.0000	0.0000	74.8835	181.8882	290.3369	(98a)
Space heating requirement - total per year (kWh/year)												1311.1885	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	280.7549	201.3948	160.8311	85.6367	35.4624	0.0000	0.0000	0.0000	0.0000	74.8835	181.8882	290.3369	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1311.1885	
Space heating per m2											(98c) / (4) =	30.2396	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	451.4472	355.3946	364.2795	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8865	0.9420	0.9343	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	400.2093	334.7720	340.3606	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	520.3646	505.5120	499.2860	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	86.5118	127.0305	118.2405	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	21.6280	31.7576	29.5601	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												82.9457	(107)
Energy for space heating												30.2396	(99)
Energy for space cooling												1.9130	(108)
Total												32.1525	(109)
Fabric Energy Efficiency (TFEE)												32.2	(109)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.18	**TER**	15.98
Environmental	99 A	**% DER < TER**			92.62
CO_2 Emissions (t/year)	0.03	**DFEE**	18.33	**TFEE**	32.15
Compliance Check	See BREL	**% DFEE < TFEE**			43.00
% DPER < TPER	73.60	**DPER**	22.79	**TPER**	86.33

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			10371.4500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							239.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)

WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Total per year (kWh/year) = Sum(64)m = 2187.6523 (64)

12Total per year (kWh/year) 2188 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)

Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)

Water heating gains (Table 5)

130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)

Total internal gains

377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.5100	46.7521	0.6800	0.7000	0.7700	100.3973	(78)

Solar gains	100.3973	164.4249	209.4481	236.7219	246.6788	237.3948	231.9492	225.2548	218.7933	177.3477	119.0050	86.7525	(83)
Total gains	477.9882	549.1749	579.6096	594.2610	587.9455	567.4815	550.8658	545.3428	547.6173	516.5465	477.1624	457.6122	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106

alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area	0.9425	0.8884	0.8182	0.7071	0.5669	0.4088	0.2901	0.3063	0.4559	0.7007	0.8859	0.9533 (86)
MIT	20.5753	20.7363	20.8573	20.9474	20.9878	20.9986	20.9999	20.9998	20.9973	20.9570	20.7764	20.5267 (87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207 (88)
util rest of house	0.9302	0.8684	0.7900	0.6694	0.5220	0.3594	0.2387	0.2545	0.4052	0.6566	0.8623	0.9430 (89)
MIT 2	19.7542	19.9429	20.0793	20.1739	20.2116	20.2200	20.2207	20.2207	20.2191	20.1848	19.9933	19.6957 (90)
Living area fraction										fLA = Living area / (4) =		0.4776 (91)
MIT	20.1464	20.3218	20.4509	20.5433	20.5823	20.5919	20.5928	20.5928	20.5908	20.5536	20.3674	20.0926 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1464	20.3218	20.4509	20.5433	20.5823	20.5919	20.5928	20.5928	20.5908	20.5536	20.3674	20.0926 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9289	0.8712	0.7987	0.6853	0.5430	0.3830	0.2633	0.2792	0.4293	0.6759	0.8670	0.9410	(94)
Useful gains	444.0247	478.4401	462.9137	407.2570	319.2611	217.3309	145.0160	152.2677	235.1054	349.1254	413.7157	430.6345	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	575.6202	560.1985	506.7672	422.9444	322.6504	217.6555	145.0402	152.3038	235.7782	361.5659	481.9365	577.2991	(97)
Space heating kWh	97.9070	54.9416	32.6270	11.2949	2.5217	0.0000	0.0000	0.0000	0.0000	9.2557	49.1190	109.1185	(98a)
Space heating requirement - total per year (kWh/year)												366.7854	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	97.9070	54.9416	32.6270	11.2949	2.5217	0.0000	0.0000	0.0000	0.0000	9.2557	49.1190	109.1185	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												366.7854	
Space heating per m2											(98c) / (4) =	8.4591	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	97.9070	54.9416	32.6270	11.2949	2.5217	0.0000	0.0000	0.0000	0.0000	9.2557	49.1190	109.1185	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	146.8605	82.4125	48.9405	16.9423	3.7825	0.0000	0.0000	0.0000	0.0000	13.8835	73.6786	163.6777	
Space heating requirement	146.8605	82.4125	48.9405	16.9423	3.7825	0.0000	0.0000	0.0000	0.0000	13.8835	73.6786	163.6777	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												550.1781	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												5.5018	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3016.0409	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1021.7751	0.1585	23.2606	(367)
Electrical energy for heat distribution (space & water)	5.5018	0.0000	5.4901	(372)
Overall CO2 factor for heat network			0.0396	(386)
Total CO2 associated with community systems			151.8941	(373)
Space and water heating			151.8941	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			51.3664	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.1800	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1021.7751	1.5868	232.8132	(467)
Electrical energy for heat distribution (space & water)	5.5018	0.0000	58.6202	(472)
Overall CO2 factor for heat network			0.4233	(486)
Total CO2 associated with community systems			1621.8265	(473)
Space and water heating			1621.8265	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			988.2317	(483)
Dwelling Primary energy Rate (DPER)			22.7900	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)

100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4004	(33)
Main dwelling						
Party Wall			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
E5 Ground floor (normal)	26.1200	0.1600	4.1792
P1 Party wall - Ground floor	6.7000	0.0800	0.5360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

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6. Solar gains

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elmhurst energy

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.5100	46.7521	0.6300	0.7000	0.7700	93.0151	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	93.0151	152.3348	194.0475	219.3158	228.5407	219.9393	214.8941	208.6919	202.7056	164.3074	110.2547	80.3736	(83)
Total gains	462.2358	528.4965	555.8388	568.4169	561.4371	538.5879	522.4405	517.4097	520.0915	495.1360	459.9740	442.8631	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area	0.9733	0.9499	0.9158	0.8461	0.7305	0.5553	0.4019	0.4227	0.6130	0.8401	0.9474	0.9775	(86)
MIT	20.0345	20.2492	20.4742	20.7228	20.8938	20.9786	20.9965	20.9954	20.9641	20.7712	20.3775	19.9975	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house	0.9660	0.9372	0.8948	0.8092	0.6712	0.4745	0.3114	0.3323	0.5337	0.7956	0.9318	0.9714	(89)
MIT 2	18.8854	19.1515	19.4254	19.7213	19.9015	19.9830	19.9935	19.9948	19.9694	19.7816	19.3225	18.8464	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.4343	19.6758	19.9263	20.1997	20.3754	20.4585	20.4726	20.4727	20.4445	20.2543	19.8264	19.3962	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4343	19.6758	19.9263	20.1997	20.3754	20.4585	20.4726	20.4727	20.4445	20.2543	19.8264	19.3962	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9614	0.9330	0.8937	0.8177	0.6951	0.5125	0.3547	0.3755	0.5703	0.8084	0.9290	0.9670	(94)
Useful gains	444.4117	493.0710	496.7770	464.7697	390.2344	276.0242	185.2976	194.2872	296.6072	400.2729	427.3358	428.2607	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	748.9730	729.3456	661.0564	549.7079	421.0894	281.3643	185.9845	195.2128	305.9542	468.6005	620.5476	744.5090	(97)
Space heating kWh	226.5936	158.7765	122.2238	61.1555	22.9561	0.0000	0.0000	0.0000	0.0000	50.8358	139.1125	235.2887	(98a)
Space heating requirement - total per year (kWh/year)												1016.9426	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	226.5936	158.7765	122.2238	61.1555	22.9561	0.0000	0.0000	0.0000	0.0000	50.8358	139.1125	235.2887	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1016.9426	
Space heating per m2										(98c) / (4) =		23.4535	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 92.3000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	226.5936	158.7765	122.2238	61.1555	22.9561	0.0000	0.0000	0.0000	0.0000	50.8358	139.1125	235.2887	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	245.4969	172.0223	132.4202	66.2573	24.8712	0.0000	0.0000	0.0000	0.0000	55.0767	150.7178	254.9173	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.5346	84.0091	83.2940	82.1715	80.8891	79.8000	79.8000	79.8000	79.8000	81.8407	83.6917	84.6411	(217)
Fuel for water heating, kWh/month	217.0120	193.3216	207.7981	186.9423	185.2548	170.5061	169.2907	175.3325	176.4869	190.3576	196.0716	214.6091	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1101.7796	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2282.9834	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3229.8370	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1101.7796	0.2100	231.3737	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2282.9834	0.2100	479.4265	(264)
Space and water heating			710.8002	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			693.0977	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.9800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1101.7796	1.1300	1245.0110	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2282.9834	1.1300	2579.7712	(278)
Space and water heating			3824.7822	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3743.2798	(286)
Target Primary Energy Rate (TPER)			86.3300	(287)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.18	**TER**	15.98
Environmental	99 A	**% DER < TER**			92.62
CO_2 Emissions (t/year)	0.03	**DFEE**	18.33	**TFEE**	32.15
Compliance Check	See BREL	**% DFEE < TFEE**			43.00
% DPER < TPER	73.60	**DPER**	22.79	**TPER**	86.33

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	

Distribution loss (46)m = 0.15 x (45)m

23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)	
									Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)	

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.5100	46.7521	0.6800	0.7000	0.7700	100.3973	(78)

Solar gains	100.3973	164.4249	209.4481	236.7219	246.6788	237.3948	231.9492	225.2548	218.7933	177.3477	119.0050	86.7525	(83)
Total gains	519.1581	581.2942	614.6323	620.0921	609.0995	580.8476	564.2984	560.1790	564.8181	542.9389	508.2319	496.4696	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874

util living area													
	0.9202	0.8654	0.7882	0.6830	0.5485	0.3995	0.2832	0.2982	0.4423	0.6725	0.8599	0.9345	(86)
MIT	20.6494	20.7775	20.8850	20.9565	20.9898	20.9988	20.9999	20.9998	20.9977	20.9656	20.8154	20.6020	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.9047	0.8433	0.7585	0.6454	0.5046	0.3512	0.2331	0.2477	0.3930	0.6287	0.8336	0.9211	(89)
MIT 2	19.8415	19.9893	20.1083	20.1823	20.2131	20.2201	20.2207	20.2207	20.2194	20.1924	20.0359	19.7857	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.2274	20.3658	20.4793	20.5520	20.5841	20.5920	20.5929	20.5928	20.5911	20.5617	20.4082	20.1756	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2274	20.3658	20.4793	20.5520	20.5841	20.5920	20.5929	20.5928	20.5911	20.5617	20.4082	20.1756	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9048	0.8476	0.7686	0.6616	0.5252	0.3742	0.2570	0.2718	0.4165	0.6482	0.8403	0.9203	(94)
Useful gains	469.7488	492.7185	472.4299	410.2818	319.8910	217.3757	145.0196	152.2736	235.2238	351.9283	427.0487	456.8819	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	578.5619	561.7936	507.7969	423.2603	322.7149	217.6602	145.0406	152.3044	235.7904	361.8578	483.4202	580.3139	(97)
Space heating kWh													
	80.9569	46.4184	26.3131	9.3445	2.1010	0.0000	0.0000	0.0000	0.0000	7.3875	40.5875	91.8334	(98a)
Space heating requirement - total per year (kWh/year)												304.9425	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	80.9569	46.4184	26.3131	9.3445	2.1010	0.0000	0.0000	0.0000	0.0000	7.3875	40.5875	91.8334	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												304.9425	
Space heating per m2											(98c) / (4) =	7.0328	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	80.9569	46.4184	26.3131	9.3445	2.1010	0.0000	0.0000	0.0000	0.0000	7.3875	40.5875	91.8334	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	121.4354	69.6276	39.4697	14.0168	3.1515	0.0000	0.0000	0.0000	0.0000	11.0813	60.8812	137.7501	
Space heating requirement													
	121.4354	69.6276	39.4697	14.0168	3.1515	0.0000	0.0000	0.0000	0.0000	11.0813	60.8812	137.7501	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												457.4137	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												4.5741	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2923.2765	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	457.4137	4.4400	20.3092	(340a)
Space heating total			20.3092	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			183.6426	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7482 (357)
SAP value		87.8716
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	997.0379	0.1586	19.3459	(367)
Electrical energy for heat distribution (space & water)	4.5741	0.0000	5.3433	(372)
Overall CO2 factor for heat network			0.0395	(386)
Total CO2 associated with community systems			147.8326	(373)
Space and water heating			147.8326	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			47.3049	(383)
CO2 emissions per m2			1.0900	(384)
EI value			99.2826	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	43.3600 (1b)	x 2.4500 (2b)	= 106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)

Adj infilt rate

	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104 (22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 10371.4500 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

Thermal bridges (User defined value 0.030 * total exposed area) 2.2962 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)

Average = Sum(39)m / 12 = 36.3250

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Total per year (kWh/year) = Sum(64)m = 2187.6523 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)													

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)												
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874 (72)
Total internal gains												
	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.5100	54.0600	0.6800	0.7000	0.7700	116.0907	(78)

Solar gains	116.0907	168.5106	211.2321	242.6142	245.5697	254.7378	243.6962	239.4271	233.1629	191.5744	135.4309	100.9920 (83)
Total gains	534.8514	585.3799	616.4162	625.9844	607.9903	598.1906	576.0455	574.3513	579.1877	557.1656	524.6578	510.7091 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area	0.9046	0.8541	0.7679	0.6586	0.5213	0.3519	0.2459	0.2593	0.4130	0.6302	0.8320	0.9215	(86)
MIT	20.6957	20.7989	20.9042	20.9654	20.9927	20.9995	21.0000	20.9999	20.9985	20.9769	20.8534	20.6498	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house	0.8869	0.8306	0.7363	0.6200	0.4767	0.3048	0.1968	0.2100	0.3646	0.5852	0.8024	0.9060	(89)
MIT 2	19.8959	20.0135	20.1287	20.1908	20.2155	20.2205	20.2207	20.2207	20.2199	20.2025	20.0774	19.8425	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.2779	20.3886	20.4991	20.5608	20.5867	20.5926	20.5929	20.5929	20.5918	20.5724	20.4480	20.2281	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2779	20.3886	20.4991	20.5608	20.5867	20.5926	20.5929	20.5929	20.5918	20.5724	20.4480	20.2281	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8883	0.8360	0.7479	0.6371	0.4978	0.3273	0.2202	0.2335	0.3877	0.6058	0.8114	0.9061	(94)
Useful gains	475.1131	489.3503	461.0241	398.8225	302.6622	195.7665	126.8725	134.1334	224.5567	337.5332	425.7292	462.7705	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	569.5008	551.7256	490.3556	409.0487	304.6475	195.8844	126.8798	134.1444	224.9166	344.0842	470.3374	571.3231	(97)
Space heating kWh	70.2244	41.9162	21.8226	7.3628	1.4771	0.0000	0.0000	0.0000	0.0000	4.8739	32.1179	80.7631	(98a)
Space heating requirement - total per year (kWh/year)												260.5581	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	70.2244	41.9162	21.8226	7.3628	1.4771	0.0000	0.0000	0.0000	0.0000	4.8739	32.1179	80.7631	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												260.5581	
Space heating per m2											(98c) / (4) =	6.0092	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	70.2244	41.9162	21.8226	7.3628	1.4771	0.0000	0.0000	0.0000	0.0000	4.8739	32.1179	80.7631	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	105.3366	62.8743	32.7339	11.0442	2.2156	0.0000	0.0000	0.0000	0.0000	7.3109	48.1769	121.1447	
Space heating requirement													
	105.3366	62.8743	32.7339	11.0442	2.2156	0.0000	0.0000	0.0000	0.0000	7.3109	48.1769	121.1447	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year												
Space heating fuel - community heating											390.8371	(307)
Space heating fuel - secondary											0.0000	(309)
Water heating fuel - community heating											3281.4784	(310)
Efficiency of water heater											0.0000	(311)
Electricity used for heat distribution											3.9084	(313)
Space cooling fuel											0.0000	(321)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)												
mechanical ventilation fans (SFP = 0.0920)											11.9235	(330a)
Total electricity for the above, kWh/year											11.9235	(331)
Electricity for lighting (calculated in Appendix L)											130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											-1054.7470	(333)
Wind generation											0.0000	(334)
Hydro-electric generation (Appendix N)											0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)											0.0000	(335)
Appendix Q - special features												
Energy saved or generated											-0.0000	(336)
Energy used											0.0000	(337)
Total delivered energy for all uses											2760.1739	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	390.8371	6.5500	25.5998	(340a)
Space heating total			25.5998	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			226.0009	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	979.2842	0.1590	16.5668	(367)
Electrical energy for heat distribution (space & water)	3.9084	0.0000	5.2391	(372)
Overall CO2 factor for heat network			0.0395	(386)
Total CO2 associated with community systems			144.9493	(373)
Space and water heating			144.9493	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			32.1894	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	979.2842	1.5884	165.5462	(467)
Electrical energy for heat distribution (space & water)	3.9084	0.0000	56.0977	(472)
Overall CO2 factor for heat network			0.4226	(486)
Total CO2 associated with community systems			1552.0370	(473)
Space and water heating			1552.0370	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			847.7120	(483)

SAP 10 EPC IMPROVEMENTS

Rev D - North

Current energy efficiency rating:	B 88
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£41	£41	£0
Community scheme	£345	£345	£0
Space heating	£133	£133	£0
Water heating	£215	£215	£0
Lighting	£37	£37	£0
Generated (PV)	-£159	-£159	£0
Total cost of fuels	£227	£227	£0
Total cost of uses	£226	£226	£0
Delivered energy	64 kWh/m²	64 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.0 tonnes	0.0 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	20 kWh/m²	20 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)

Total net area of external elements Aum(A, m2)	76.5400				(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	16.5005			(33)
Main dwelling					
Party Wall	31.3600	0.0000	0.0000	70.0000	2195.2000 (32)
Party Ceiling 1	43.3600			30.0000	1300.8000 (32b)
Internal TF Wall	68.4500			9.0000	616.0500 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.5100	46.7521	0.6800	0.7000	0.7700	100.3973	(78)

Solar gains	100.3973	164.4249	209.4481	236.7219	246.6788	237.3948	231.9492	225.2548	218.7933	177.3477	119.0050	86.7525	(83)
Total gains	519.1581	581.2942	614.6323	620.0921	609.0995	580.8476	564.2984	560.1790	564.8181	542.9389	508.2319	496.4696	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area	0.9202	0.8654	0.7882	0.6830	0.5485	0.3995	0.2832	0.2982	0.4423	0.6725	0.8599	0.9345	(86)
MIT	20.6494	20.7775	20.8850	20.9565	20.9898	20.9988	20.9999	20.9998	20.9977	20.9656	20.8154	20.6020	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house	0.9047	0.8433	0.7585	0.6454	0.5046	0.3512	0.2331	0.2477	0.3930	0.6287	0.8336	0.9211	(89)
MIT 2	19.8415	19.9893	20.1083	20.1823	20.2131	20.2201	20.2207	20.2207	20.2194	20.1924	20.0359	19.7857	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.2274	20.3658	20.4793	20.5520	20.5841	20.5920	20.5929	20.5928	20.5911	20.5617	20.4082	20.1756	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2274	20.3658	20.4793	20.5520	20.5841	20.5920	20.5929	20.5928	20.5911	20.5617	20.4082	20.1756	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9048	0.8476	0.7686	0.6616	0.5252	0.3742	0.2570	0.2718	0.4165	0.6482	0.8403	0.9203	(94)
Useful gains	469.7488	492.7185	472.4299	410.2818	319.8910	217.3757	145.0196	152.2736	235.2238	351.9283	427.0487	456.8819	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	578.5619	561.7936	507.7969	423.2603	322.7149	217.6602	145.0406	152.3044	235.7904	361.8578	483.4202	580.3139	(97)
Space heating kWh	80.9569	46.4184	26.3131	9.3445	2.1010	0.0000	0.0000	0.0000	0.0000	7.3875	40.5875	91.8334	(98a)
Space heating requirement - total per year (kWh/year)												304.9425	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	80.9569	46.4184	26.3131	9.3445	2.1010	0.0000	0.0000	0.0000	0.0000	7.3875	40.5875	91.8334	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												304.9425	
Space heating per m2										(98c) / (4) =		7.0328	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

Space heating:

Space heating requirement

	80.9569	46.4184	26.3131	9.3445	2.1010	0.0000	0.0000	0.0000	0.0000	7.3875	40.5875	91.8334	(98)

Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50

307a	121.4354	69.6276	39.4697	14.0168	3.1515	0.0000	0.0000	0.0000	0.0000	11.0813	60.8812	137.7501	
Space heating requirement	121.4354	69.6276	39.4697	14.0168	3.1515	0.0000	0.0000	0.0000	0.0000	11.0813	60.8812	137.7501	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)

Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement

	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50

310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)

Cooling System Energy Efficiency Ratio 0.0000 (314)

Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)

Electricity generated by PVs (Appendix M) (negative quantity)

(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)

Electricity generated by PVs (Appendix M) (negative quantity)

(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year

Space heating fuel - community heating 457.4137 (307)
Space heating fuel - secondary 0.0000 (309)
Water heating fuel - community heating 3281.4784 (310)
Efficiency of water heater 0.0000 (311)
Electricity used for heat distribution 4.5741 (313)
Space cooling fuel 0.0000 (321)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)
mechanical ventilation fans (SFP = 0.0920) 11.9235 (330a)
Total electricity for the above, kWh/year 11.9235 (331)
Electricity for lighting (calculated in Appendix L) 130.6818 (332)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation -958.2209 (333)
Wind generation 0.0000 (334)
Hydro-electric generation (Appendix N) 0.0000 (335a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (335)

Appendix Q - special features

Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2923.2765	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	457.4137	4.4400	20.3092	(340a)
Space heating total			20.3092	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			183.6426	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7482	(357)
SAP value		87.8716	
SAP rating (Section 12)		88	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	997.0379	0.1586	19.3459	(367)
Electrical energy for heat distribution (space & water)	4.5741	0.0000	5.3433	(372)
Overall CO2 factor for heat network			0.0395	(386)
Total CO2 associated with community systems			147.8326	(373)
Space and water heating			147.8326	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			47.3049	(383)
CO2 emissions per m2			1.0900	(384)
EI value			99.2826	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

Measured/design AP50 3.0000 (17)
Infiltration rate 0.1500 (18)
Number of sides sheltered 3 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.2962 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)
Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
									Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.5100	54.0600	0.6800	0.7000	0.7700	116.0907	(78)

Solar gains	116.0907	168.5106	211.2321	242.6142	245.5697	254.7378	243.6962	239.4271	233.1629	191.5744	135.4309	100.9920	(83)
Total gains	534.8514	585.3799	616.4162	625.9844	607.9903	598.1906	576.0455	574.3513	579.1877	557.1656	524.6578	510.7091	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area													
	0.9046	0.8541	0.7679	0.6586	0.5213	0.3519	0.2459	0.2593	0.4130	0.6302	0.8320	0.9215	(86)
MIT	20.6957	20.7989	20.9042	20.9654	20.9927	20.9995	21.0000	20.9999	20.9985	20.9769	20.8534	20.6498	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.8869	0.8306	0.7363	0.6200	0.4767	0.3048	0.1968	0.2100	0.3646	0.5852	0.8024	0.9060	(89)
MIT 2	19.8959	20.0135	20.1287	20.1908	20.2155	20.2205	20.2207	20.2207	20.2199	20.2025	20.0774	19.8425	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.2779	20.3886	20.4991	20.5608	20.5867	20.5926	20.5929	20.5929	20.5918	20.5724	20.4480	20.2281	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2779	20.3886	20.4991	20.5608	20.5867	20.5926	20.5929	20.5929	20.5918	20.5724	20.4480	20.2281	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8883	0.8360	0.7479	0.6371	0.4978	0.3273	0.2202	0.2335	0.3877	0.6058	0.8114	0.9061	(94)
Useful gains	475.1131	489.3503	461.0241	398.8225	302.6622	195.7665	126.8725	134.1334	224.5567	337.5332	425.7292	462.7705	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	569.5008	551.7256	490.3556	409.0487	304.6475	195.8844	126.8798	134.1444	224.9166	344.0842	470.3374	571.3231	(97)
Space heating kWh													
	70.2244	41.9162	21.8226	7.3628	1.4771	0.0000	0.0000	0.0000	0.0000	4.8739	32.1179	80.7631	(98a)
Space heating requirement - total per year (kWh/year)												260.5581	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	70.2244	41.9162	21.8226	7.3628	1.4771	0.0000	0.0000	0.0000	0.0000	4.8739	32.1179	80.7631	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												260.5581	
Space heating per m2										(98c) / (4) =		6.0092	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement													
	70.2244	41.9162	21.8226	7.3628	1.4771	0.0000	0.0000	0.0000	0.0000	4.8739	32.1179	80.7631	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	105.3366	62.8743	32.7339	11.0442	2.2156	0.0000	0.0000	0.0000	0.0000	7.3109	48.1769	121.1447	
Space heating requirement													
	105.3366	62.8743	32.7339	11.0442	2.2156	0.0000	0.0000	0.0000	0.0000	7.3109	48.1769	121.1447	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)

Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	390.8371	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	3.9084	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(330a)
Total electricity for the above, kWh/year	11.9235	(331)
Electricity for lighting (calculated in Appendix L)	130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2760.1739	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	390.8371	6.5500	25.5998	(340a)
Space heating total			25.5998	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			226.0009	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	979.2842	0.1590	16.5668	(367)
Electrical energy for heat distribution (space & water)	3.9084	0.0000	5.2391	(372)
Overall CO2 factor for heat network			0.0395	(386)
Total CO2 associated with community systems			144.9493	(373)
Space and water heating			144.9493	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			32.1894	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	979.2842	1.5884	165.5462	(467)
Electrical energy for heat distribution (space & water)	3.9084	0.0000	56.0977	(472)
Overall CO2 factor for heat network			0.4226	(486)
Total CO2 associated with community systems			1552.0370	(473)
Space and water heating			1552.0370	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			847.7120	(483)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.25	**TER**	16.29
Environmental	99 A	**% DER < TER**			92.33
CO_2 Emissions (t/year)	0.03	**DFEE**	19.97	**TFEE**	33.89
Compliance Check	See BREL	**% DFEE < TFEE**			41.07
% DPER < TPER	73.32	**DPER**	23.46	**TPER**	87.95

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		10371.4500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							239.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges					(36a) =		0.0000	

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	

Distribution loss (46)m = 0.15 x (45)m

23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
									Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)

12Total per year (kWh/year) 2188 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)

Water heating gains (Table 5)

130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)

Total internal gains

377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	6.5100	36.7938	0.6800	0.7000	0.7700	79.0126	(79)

Solar gains	79.0126	134.5876	184.1487	228.1691	255.5685	253.7203	244.6135	224.1724	199.3941	148.7480	94.6389	67.6183	(83)
Total gains	456.6035	519.3376	554.3102	585.7083	596.8351	583.8070	563.5301	544.2603	528.2181	487.9469	452.7963	438.4780	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106

alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874		
util living area	0.9526	0.9084	0.8398	0.7153	0.5591	0.3975	0.2835	0.3069	0.4722	0.7328	0.9050	0.9613	(86)
MIT	20.5331	20.6924	20.8335	20.9440	20.9887	20.9988	20.9999	20.9998	20.9967	20.9451	20.7413	20.4866	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house	0.9420	0.8907	0.8129	0.6776	0.5145	0.3494	0.2334	0.2550	0.4199	0.6889	0.8839	0.9524	(89)
MIT 2	19.7035	19.8929	20.0540	20.1707	20.2123	20.2201	20.2207	20.2207	20.2188	20.1742	19.9541	19.6471	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0997	20.2748	20.4263	20.5400	20.5831	20.5920	20.5929	20.5928	20.5903	20.5424	20.3301	20.0481	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0997	20.2748	20.4263	20.5400	20.5831	20.5920	20.5929	20.5928	20.5903	20.5424	20.3301	20.0481	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9402	0.8920	0.8204	0.6934	0.5354	0.3724	0.2573	0.2798	0.4448	0.7075	0.8871	0.9501	(94)
Useful gains	429.2788	463.2740	454.7311	406.1147	319.5415	217.3848	145.0194	152.2672	234.9404	345.2280	401.6656	416.6003	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	573.9246	558.4883	505.8728	422.8246	322.6792	217.6611	145.0406	152.3037	235.7612	361.1572	480.5824	575.6811	(97)
Space heating kWh	107.6165	63.9840	38.0495	12.0311	2.3344	0.0000	0.0000	0.0000	0.0000	11.8513	56.8201	118.3561	(98a)
Space heating requirement - total per year (kWh/year)												411.0430	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	107.6165	63.9840	38.0495	12.0311	2.3344	0.0000	0.0000	0.0000	0.0000	11.8513	56.8201	118.3561	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												411.0430	
Space heating per m2											(98c) / (4) =	9.4798	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	107.6165	63.9840	38.0495	12.0311	2.3344	0.0000	0.0000	0.0000	0.0000	11.8513	56.8201	118.3561	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	161.4248	95.9761	57.0742	18.0467	3.5016	0.0000	0.0000	0.0000	0.0000	17.7770	85.2301	177.5341	
Space heating requirement	161.4248	95.9761	57.0742	18.0467	3.5016	0.0000	0.0000	0.0000	0.0000	17.7770	85.2301	177.5341	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												616.5645	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												6.1656	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3082.4273	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1039.4781	0.1584	26.0451	(367)
Electrical energy for heat distribution (space & water)	6.1656	0.0000	5.5946	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			154.7831	(373)
Space and water heating			154.7831	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			54.2553	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.2500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1039.4781	1.5864	260.8247	(467)
Electrical energy for heat distribution (space & water)	6.1656	0.0000	59.6707	(472)
Overall CO2 factor for heat network			0.4235	(486)
Total CO2 associated with community systems			1650.8884	(473)
Space and water heating			1650.8884	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			1017.2936	(483)
Dwelling Primary energy Rate (DPER)			23.4600	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)

100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4004	(33)
Main dwelling						
Party Wall			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
E5 Ground floor (normal)	26.1200	0.1600	4.1792
P1 Party wall - Ground floor	6.7000	0.0800	0.5360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	6.5100	36.7938	0.6300	0.7000	0.7700	73.2028	(79)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	73.2028	124.6915	170.6083	211.3920	236.7767	235.0644	226.6272	207.6891	184.7327	137.8107	87.6801	62.6464	(83)
Total gains	442.4235	500.8532	532.3996	560.4931	569.6731	553.7131	534.1736	516.4068	502.1187	468.6393	437.3995	425.1358	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area	0.9774	0.9586	0.9266	0.8516	0.7232	0.5417	0.3933	0.4235	0.6312	0.8615	0.9560	0.9809	(86)
MIT	19.9898	20.1930	20.4338	20.7135	20.8985	20.9808	20.9968	20.9954	20.9593	20.7398	20.3322	19.9566	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house	0.9712	0.9477	0.9075	0.8153	0.6637	0.4623	0.3046	0.3329	0.5509	0.8201	0.9424	0.9755	(89)
MIT 2	18.8299	19.0835	19.3787	19.7116	19.9055	19.9843	19.9936	19.9948	19.9662	19.7498	19.2684	18.7954	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.3839	19.6134	19.8826	20.1901	20.3798	20.4603	20.4728	20.4727	20.4405	20.2226	19.7765	19.3500	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3839	19.6134	19.8826	20.1901	20.3798	20.4603	20.4728	20.4727	20.4405	20.2226	19.7765	19.3500	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9668	0.9432	0.9056	0.8233	0.6878	0.4997	0.3470	0.3762	0.5877	0.8307	0.9392	0.9714	(94)
Useful gains	427.7199	472.4186	482.1656	461.4724	391.8230	276.6658	185.3725	194.2781	295.1172	389.3110	410.8150	412.9816	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	746.4808	726.2679	658.9053	549.2439	421.3005	281.4463	185.9946	195.2116	305.7622	467.0652	618.1145	742.2485	(97)
Space heating kWh	237.1581	170.5867	131.4944	63.1954	21.9313	0.0000	0.0000	0.0000	0.0000	57.8491	149.2557	244.9746	(98a)
Space heating requirement - total per year (kWh/year)												1076.4453	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	237.1581	170.5867	131.4944	63.1954	21.9313	0.0000	0.0000	0.0000	0.0000	57.8491	149.2557	244.9746	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1076.4453	
Space heating per m2										(98c) / (4) =		24.8258	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	237.1581	170.5867	131.4944	63.1954	21.9313	0.0000	0.0000	0.0000	0.0000	57.8491	149.2557	244.9746	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	256.9427	184.8177	142.4641	68.4674	23.7608	0.0000	0.0000	0.0000	0.0000	62.6751	161.7071	265.4112	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.6367	84.1701	83.4515	82.2292	80.8461	79.8000	79.8000	79.8000	79.8000	82.0518	83.8478	84.7312	(217)
Fuel for water heating, kWh/month	216.7502	192.9517	207.4059	186.8110	185.3533	170.5061	169.2907	175.3325	176.4869	189.8679	195.7065	214.3809	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1166.2462 (211)
Space heating fuel - main system 2	0.0000 (213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2280.8436	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3292.1638	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1166.2462	0.2100	244.9117	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2280.8436	0.2100	478.9772	(264)
Space and water heating			723.8889	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			706.1863	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.2900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1166.2462	1.1300	1317.8582	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2280.8436	1.1300	2577.3533	(278)
Space and water heating			3895.2115	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3813.7091	(286)
Target Primary Energy Rate (TPER)			87.9500	(287)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.25	**TER**	16.29
Environmental	99 A	**% DER < TER**			92.33
CO_2 Emissions (t/year)	0.03	**DFEE**	19.97	**TFEE**	33.89
Compliance Check	See BREL	**% DFEE < TFEE**			41.07
% DPER < TPER	73.32	**DPER**	23.46	**TPER**	87.95

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2622	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	38.2833	38.2073	38.1327	37.7826	37.7171	37.4122	37.4122	37.3557	37.5296	37.7171	37.8496	37.9882	(39)
Average = Sum(39)m / 12 =												37.7823	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8829	0.8812	0.8794	0.8714	0.8699	0.8628	0.8628	0.8615	0.8655	0.8699	0.8729	0.8761	(40)
HLP (average)												0.8714	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												449.4572	(64a)
Heat gains from water heating, kWh/month	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.4004	291.4783	279.0119	271.5070	258.2448	250.2442	241.2477	240.9702	247.9561	254.7841	268.8582	277.3654	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	6.5100	36.7938	0.6800	0.7000	0.7700	79.0126	(79)

Solar gains	79.0126	134.5876	184.1487	228.1691	255.5685	253.7203	244.6135	224.1724	199.3941	148.7480	94.6389	67.6183	(83)
Total gains	362.4129	426.0660	463.1606	499.6762	513.8133	503.9646	485.8611	465.1426	447.3502	403.5322	363.4970	344.9837	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.2536	75.4034	75.5508	76.2509	76.3833	77.0059	77.0059	77.1223	76.7649	76.3833	76.1159	75.8383	
alpha	6.0169	6.0269	6.0367	6.0834	6.0922	6.1337	6.1337	6.1415	6.1177	6.0922	6.0744	6.0559	
util living area	0.9855	0.9636	0.9218	0.8179	0.6600	0.4725	0.3385	0.3689	0.5701	0.8465	0.9647	0.9888	(86)
MIT	20.2394	20.4484	20.6602	20.8691	20.9685	20.9964	20.9996	20.9994	20.9894	20.8631	20.5262	20.1981	(87)
Th 2	20.1820	20.1835	20.1850	20.1919	20.1932	20.1992	20.1992	20.2003	20.1969	20.1932	20.1906	20.1879	(88)
util rest of house	0.9816	0.9546	0.9037	0.7830	0.6098	0.4145	0.2771	0.3051	0.5073	0.8081	0.9543	0.9857	(89)

MIT 2	19.5020	19.7057	19.9063	20.0962	20.1742	20.1977	20.1991	20.2001	20.1918	20.0967	19.7893	19.4664 (90)
Living area fraction										fLA = Living area / (4) =		0.4776 (91)
MIT	19.8542	20.0604	20.2664	20.4654	20.5536	20.5792	20.5815	20.5819	20.5728	20.4628	20.1412	19.8159 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8542	20.0604	20.2664	20.4654	20.5536	20.5792	20.5815	20.5819	20.5728	20.4628	20.1412	19.8159 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9797	0.9530	0.9056	0.7953	0.6326	0.4422	0.3064	0.3356	0.5370	0.8218	0.9536	0.9839	(94)
Useful gains	355.0379	406.0557	419.4562	397.4160	325.0472	222.8388	148.8817	156.0891	240.2371	331.6106	346.6227	339.4454	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	595.4664	579.2385	524.9503	436.9701	333.9317	223.6949	148.9550	156.2168	242.9208	371.9946	493.6059	593.2182	(97)
Space heating kWh	178.8788	116.3789	78.4876	28.4790	6.6100	0.0000	0.0000	0.0000	0.0000	30.0457	105.8279	188.8069	(98a)
Space heating requirement - total per year (kWh/year)												733.5148	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	178.8788	116.3789	78.4876	28.4790	6.6100	0.0000	0.0000	0.0000	0.0000	30.0457	105.8279	188.8069	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												733.5148	
Space heating per m2											(98c) / (4) =	16.9169	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	351.6746	276.8502	283.9035	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9778	0.9919	0.9886	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	343.8528	274.5999	280.6537	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	560.0270	540.4413	517.6301	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	155.6454	197.7860	176.3104	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	38.9113	49.4465	44.0776	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												132.4355	(107)
Energy for space heating												16.9169	(99)
Energy for space cooling												3.0543	(108)
Total												19.9712	(109)
Fabric Energy Efficiency (DFEE)												20.0	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4004			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
E5 Ground floor (normal)	26.1200	0.1600	4.1792
P1 Party wall - Ground floor	6.7000	0.0800	0.5360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)													
	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							449.4572	(64a)
Heat gains from water heating, kWh/month													
	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains													
	281.3655	289.2254	276.9770	269.4043	256.2100	248.1415	239.2128	238.9354	245.8534	252.7493	266.7555	275.3306	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	6.5100	36.7938	0.6300	0.7000	0.7700	73.2028	(79)

Solar gains	73.2028	124.6915	170.6083	211.3920	236.7767	235.0644	226.6272	207.6891	184.7327	137.8107	87.6801	62.6464	(83)
Total gains	354.5683	413.9169	447.5854	480.7963	492.9866	483.2059	465.8400	446.6244	430.5862	390.5599	354.4356	337.9769	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area													
	0.9908	0.9798	0.9596	0.9038	0.7935	0.6103	0.4488	0.4863	0.7109	0.9190	0.9802	0.9926	(86)
MIT	19.7817	20.0017	20.2700	20.6035	20.8449	20.9678	20.9942	20.9915	20.9314	20.6244	20.1503	19.7471	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house													
	0.9880	0.9740	0.9475	0.8757	0.7378	0.5249	0.3488	0.3839	0.6289	0.8892	0.9733	0.9903	(89)
MIT 2	18.8774	19.0955	19.3580	19.6790	19.8861	19.9805	19.9932	19.9941	19.9567	19.7063	19.2527	18.8505	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.3093	19.5284	19.7936	20.1206	20.3441	20.4521	20.4713	20.4705	20.4222	20.1448	19.6814	19.2787	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3093	19.5284	19.7936	20.1206	20.3441	20.4521	20.4713	20.4705	20.4222	20.1448	19.6814	19.2787	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9857	0.9708	0.9451	0.8800	0.7588	0.5648	0.3967	0.4329	0.6657	0.8945	0.9708	0.9883	(94)
Useful gains	349.4873	401.8444	423.0009	423.0864	374.0578	272.9070	184.7876	193.3533	286.6316	349.3682	344.0748	334.0271	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	742.7912	722.0702	654.5199	545.8590	419.5666	281.0537	185.9245	195.1031	304.8796	463.2881	613.4759	738.7537	(97)
Space heating kWh													
	292.6181	215.1917	172.2502	88.3963	33.8586	0.0000	0.0000	0.0000	0.0000	84.7565	193.9688	301.1166	(98a)
Space heating requirement - total per year (kWh/year)												1382.1567	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	292.6181	215.1917	172.2502	88.3963	33.8586	0.0000	0.0000	0.0000	0.0000	84.7565	193.9688	301.1166	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1382.1567	
Space heating per m2											(98c) / (4) =	31.8763	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	451.4472	355.3946	364.2795	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8972	0.9471	0.9338	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	405.0267	336.6098	340.1704	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	538.0433	519.2260	498.1139	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	95.7719	135.8665	117.5099	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	23.9430	33.9666	29.3775	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												87.2871	(107)
Energy for space heating												31.8763	(99)
Energy for space cooling												2.0131	(108)
Total												33.8894	(109)
Fabric Energy Efficiency (TFEE)												33.9	(109)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.25	**TER**	16.29
Environmental	99 A	**% DER < TER**			92.33
CO_2 Emissions (t/year)	0.03	**DFEE**	19.97	**TFEE**	33.89
Compliance Check	See BREL	**% DFEE < TFEE**			41.07
% DPER < TPER	73.32	**DPER**	23.46	**TPER**	87.95

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		10371.4500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							239.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges					(36a) =		0.0000	

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	

Distribution loss (46)m = 0.15 x (45)m

23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
									Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)

12Total per year (kWh/year) 2188 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)

Water heating gains (Table 5)

130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)

Total internal gains

377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	6.5100	36.7938	0.6800	0.7000	0.7700	79.0126	(79)

Solar gains	79.0126	134.5876	184.1487	228.1691	255.5685	253.7203	244.6135	224.1724	199.3941	148.7480	94.6389	67.6183	(83)
Total gains	456.6035	519.3376	554.3102	585.7083	596.8351	583.8070	563.5301	544.2603	528.2181	487.9469	452.7963	438.4780	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106

alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874		
util living area	0.9526	0.9084	0.8398	0.7153	0.5591	0.3975	0.2835	0.3069	0.4722	0.7328	0.9050	0.9613	(86)
MIT	20.5331	20.6924	20.8335	20.9440	20.9887	20.9988	20.9999	20.9998	20.9967	20.9451	20.7413	20.4866	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house	0.9420	0.8907	0.8129	0.6776	0.5145	0.3494	0.2334	0.2550	0.4199	0.6889	0.8839	0.9524	(89)
MIT 2	19.7035	19.8929	20.0540	20.1707	20.2123	20.2201	20.2207	20.2207	20.2188	20.1742	19.9541	19.6471	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0997	20.2748	20.4263	20.5400	20.5831	20.5920	20.5929	20.5928	20.5903	20.5424	20.3301	20.0481	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0997	20.2748	20.4263	20.5400	20.5831	20.5920	20.5929	20.5928	20.5903	20.5424	20.3301	20.0481	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9402	0.8920	0.8204	0.6934	0.5354	0.3724	0.2573	0.2798	0.4448	0.7075	0.8871	0.9501	(94)
Useful gains	429.2788	463.2740	454.7311	406.1147	319.5415	217.3848	145.0194	152.2672	234.9404	345.2280	401.6656	416.6003	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	573.9246	558.4883	505.8728	422.8246	322.6792	217.6611	145.0406	152.3037	235.7612	361.1572	480.5824	575.6811	(97)
Space heating kWh	107.6165	63.9840	38.0495	12.0311	2.3344	0.0000	0.0000	0.0000	0.0000	11.8513	56.8201	118.3561	(98a)
Space heating requirement - total per year (kWh/year)												411.0430	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	107.6165	63.9840	38.0495	12.0311	2.3344	0.0000	0.0000	0.0000	0.0000	11.8513	56.8201	118.3561	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												411.0430	
Space heating per m2											(98c) / (4) =	9.4798	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	107.6165	63.9840	38.0495	12.0311	2.3344	0.0000	0.0000	0.0000	0.0000	11.8513	56.8201	118.3561	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	161.4248	95.9761	57.0742	18.0467	3.5016	0.0000	0.0000	0.0000	0.0000	17.7770	85.2301	177.5341	
Space heating requirement	161.4248	95.9761	57.0742	18.0467	3.5016	0.0000	0.0000	0.0000	0.0000	17.7770	85.2301	177.5341	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												616.5645	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												6.1656	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3082.4273	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1039.4781	0.1584	26.0451	(367)
Electrical energy for heat distribution (space & water)	6.1656	0.0000	5.5946	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			154.7831	(373)
Space and water heating			154.7831	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			54.2553	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.2500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1039.4781	1.5864	260.8247	(467)
Electrical energy for heat distribution (space & water)	6.1656	0.0000	59.6707	(472)
Overall CO2 factor for heat network			0.4235	(486)
Total CO2 associated with community systems			1650.8884	(473)
Space and water heating			1650.8884	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			1017.2936	(483)
Dwelling Primary energy Rate (DPER)			23.4600	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)

100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4004	(33)
Main dwelling						
Party Wall			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
E5 Ground floor (normal)	26.1200	0.1600	4.1792
P1 Party wall - Ground floor	6.7000	0.0800	0.5360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	6.5100	36.7938	0.6300	0.7000	0.7700	73.2028	(79)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	73.2028	124.6915	170.6083	211.3920	236.7767	235.0644	226.6272	207.6891	184.7327	137.8107	87.6801	62.6464	(83)
Total gains	442.4235	500.8532	532.3996	560.4931	569.6731	553.7131	534.1736	516.4068	502.1187	468.6393	437.3995	425.1358	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area	0.9774	0.9586	0.9266	0.8516	0.7232	0.5417	0.3933	0.4235	0.6312	0.8615	0.9560	0.9809	(86)
MIT	19.9898	20.1930	20.4338	20.7135	20.8985	20.9808	20.9968	20.9954	20.9593	20.7398	20.3322	19.9566	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house	0.9712	0.9477	0.9075	0.8153	0.6637	0.4623	0.3046	0.3329	0.5509	0.8201	0.9424	0.9755	(89)
MIT 2	18.8299	19.0835	19.3787	19.7116	19.9055	19.9843	19.9936	19.9948	19.9662	19.7498	19.2684	18.7954	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.3839	19.6134	19.8826	20.1901	20.3798	20.4603	20.4728	20.4727	20.4405	20.2226	19.7765	19.3500	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3839	19.6134	19.8826	20.1901	20.3798	20.4603	20.4728	20.4727	20.4405	20.2226	19.7765	19.3500	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9668	0.9432	0.9056	0.8233	0.6878	0.4997	0.3470	0.3762	0.5877	0.8307	0.9392	0.9714	(94)
Useful gains	427.7199	472.4186	482.1656	461.4724	391.8230	276.6658	185.3725	194.2781	295.1172	389.3110	410.8150	412.9816	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	746.4808	726.2679	658.9053	549.2439	421.3005	281.4463	185.9946	195.2116	305.7622	467.0652	618.1145	742.2485	(97)
Space heating kWh	237.1581	170.5867	131.4944	63.1954	21.9313	0.0000	0.0000	0.0000	0.0000	57.8491	149.2557	244.9746	(98a)
Space heating requirement - total per year (kWh/year)												1076.4453	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	237.1581	170.5867	131.4944	63.1954	21.9313	0.0000	0.0000	0.0000	0.0000	57.8491	149.2557	244.9746	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1076.4453	
Space heating per m2										(98c) / (4) =		24.8258	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	237.1581	170.5867	131.4944	63.1954	21.9313	0.0000	0.0000	0.0000	0.0000	57.8491	149.2557	244.9746	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	256.9427	184.8177	142.4641	68.4674	23.7608	0.0000	0.0000	0.0000	0.0000	62.6751	161.7071	265.4112	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.6367	84.1701	83.4515	82.2292	80.8461	79.8000	79.8000	79.8000	79.8000	82.0518	83.8478	84.7312	(217)
Fuel for water heating, kWh/month	216.7502	192.9517	207.4059	186.8110	185.3533	170.5061	169.2907	175.3325	176.4869	189.8679	195.7065	214.3809	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1166.2462 (211)
Space heating fuel - main system 2	0.0000 (213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2280.8436	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3292.1638	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1166.2462	0.2100	244.9117	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2280.8436	0.2100	478.9772	(264)
Space and water heating			723.8889	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			706.1863	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.2900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1166.2462	1.1300	1317.8582	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2280.8436	1.1300	2577.3533	(278)
Space and water heating			3895.2115	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3813.7091	(286)
Target Primary Energy Rate (TPER)			87.9500	(287)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.25	**TER**	16.29
Environmental	99 A	**% DER < TER**			92.33
CO_2 Emissions (t/year)	0.03	**DFEE**	19.97	**TFEE**	33.89
Compliance Check	See BREL	**% DFEE < TFEE**			41.07
% DPER < TPER	73.32	**DPER**	23.46	**TPER**	87.95

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
						(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000	/ (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			3.0000 (17)
Infiltration rate			0.1500 (18)
Number of sides sheltered			3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)]	=	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20)	=	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	6.5100	36.7938	0.6800	0.7000	0.7700	79.0126	(79)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	79.0126	134.5876	184.1487	228.1691	255.5685	253.7203	244.6135	224.1724	199.3941	148.7480	94.6389	67.6183	(83)
Total gains	497.7734	551.4570	589.3328	611.5393	617.9891	597.1731	576.9627	559.0966	545.4189	514.3393	483.8657	477.3354	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874

util living area													
	0.9322	0.8868	0.8099	0.6909	0.5410	0.3887	0.2770	0.2988	0.4577	0.7032	0.8804	0.9442	(86)
MIT	20.6121	20.7394	20.8656	20.9537	20.9905	20.9990	20.9999	20.9998	20.9972	20.9562	20.7854	20.5660	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.9184	0.8667	0.7812	0.6532	0.4976	0.3416	0.2279	0.2482	0.4068	0.6591	0.8562	0.9323	(89)
MIT 2	19.7979	19.9465	20.0880	20.1797	20.2137	20.2202	20.2207	20.2207	20.2191	20.1841	20.0032	19.7428	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.1868	20.3252	20.4594	20.5494	20.5847	20.5922	20.5929	20.5928	20.5908	20.5529	20.3768	20.1360	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1868	20.3252	20.4594	20.5494	20.5847	20.5922	20.5929	20.5928	20.5908	20.5529	20.3768	20.1360	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9177	0.8696	0.7903	0.6694	0.5180	0.3641	0.2514	0.2724	0.4310	0.6783	0.8614	0.9309	(94)
Useful gains	456.8291	479.5233	465.7557	409.3466	320.1199	217.4221	145.0225	152.2732	235.0885	348.8592	416.7803	444.3419	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	577.0875	560.3200	507.0759	423.1628	322.7383	217.6650	145.0410	152.3044	235.7765	361.5381	482.2790	578.8758	(97)
Space heating kWh													
	89.4722	54.2954	30.7422	9.9477	1.9481	0.0000	0.0000	0.0000	0.0000	9.4331	47.1591	100.0932	(98a)
Space heating requirement - total per year (kWh/year)												343.0911	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	89.4722	54.2954	30.7422	9.9477	1.9481	0.0000	0.0000	0.0000	0.0000	9.4331	47.1591	100.0932	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												343.0911	
Space heating per m2											(98c) / (4) =	7.9126	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	89.4722	54.2954	30.7422	9.9477	1.9481	0.0000	0.0000	0.0000	0.0000	9.4331	47.1591	100.0932	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	134.2083	81.4431	46.1133	14.9216	2.9221	0.0000	0.0000	0.0000	0.0000	14.1496	70.7386	150.1399	
Space heating requirement													
	134.2083	81.4431	46.1133	14.9216	2.9221	0.0000	0.0000	0.0000	0.0000	14.1496	70.7386	150.1399	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												514.6366	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												5.1464	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2980.4994	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	514.6366	4.4400	22.8499	(340a)
Space heating total			22.8499	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			186.1833	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7586 (357)
SAP value		87.7038
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1012.2973	0.1585	21.7494	(367)
Electrical energy for heat distribution (space & water)	5.1464	0.0000	5.4335	(372)
Overall CO2 factor for heat network			0.0396	(386)
Total CO2 associated with community systems			150.3263	(373)
Space and water heating			150.3263	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			49.7986	(383)
CO2 emissions per m2			1.1500	(384)
EI value			99.2448	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	43.3600 (1b)	x 2.4500 (2b)	= 106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 43.3600				(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)

Adj infilt rate

	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104 (22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 10371.4500 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

Thermal bridges (User defined value 0.030 * total exposed area) 2.2962 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)

Average = Sum(39)m / 12 = 36.3250

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Total per year (kWh/year) = Sum(64)m = 2187.6523 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)													

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	6.5100	42.9509	0.6800	0.7000	0.7700	92.2346	(79)

Solar gains	92.2346	139.6167	188.6581	237.9251	258.4168	276.0712	260.8108	242.3337	216.0832	162.8736	108.8094	79.4115	(83)
Total gains	510.9954	556.4860	593.8423	621.2953	620.8375	619.5239	593.1600	577.2579	562.1080	528.4649	498.0363	489.1286	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area													
	0.9195	0.8757	0.7878	0.6629	0.5110	0.3398	0.2388	0.2580	0.4254	0.6599	0.8560	0.9337	(86)
MIT	20.6576	20.7644	20.8893	20.9642	20.9935	20.9996	21.0000	20.9999	20.9982	20.9704	20.8258	20.6119	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.9036	0.8541	0.7570	0.6242	0.4671	0.2943	0.1911	0.2090	0.3756	0.6141	0.8284	0.9199	(89)
MIT 2	19.8519	19.9753	20.1135	20.1897	20.2161	20.2205	20.2207	20.2207	20.2197	20.1970	20.0480	19.7981	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.2367	20.3522	20.4841	20.5596	20.5874	20.5926	20.5929	20.5929	20.5916	20.5664	20.4195	20.1868	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2367	20.3522	20.4841	20.5596	20.5874	20.5926	20.5929	20.5929	20.5916	20.5664	20.4195	20.1868	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9039	0.8580	0.7677	0.6413	0.4879	0.3160	0.2139	0.2324	0.3994	0.6347	0.8358	0.9192	(94)
Useful gains	461.9102	477.4597	455.9167	398.4160	302.8951	195.7907	126.8738	134.1337	224.4829	335.4424	416.2830	449.6270	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	568.0030	550.4046	489.8083	409.0065	304.6713	195.8869	126.8800	134.1444	224.9089	343.8681	469.2998	569.8225	(97)
Space heating kWh													
	78.9330	49.0189	25.2154	7.6252	1.3215	0.0000	0.0000	0.0000	0.0000	6.2687	38.1721	89.4255	(98a)
Space heating requirement - total per year (kWh/year)												295.9802	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	78.9330	49.0189	25.2154	7.6252	1.3215	0.0000	0.0000	0.0000	0.0000	6.2687	38.1721	89.4255	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												295.9802	
Space heating per m2											(98c) / (4) =	6.8261	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	78.9330	49.0189	25.2154	7.6252	1.3215	0.0000	0.0000	0.0000	0.0000	6.2687	38.1721	89.4255	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	118.3995	73.5284	37.8231	11.4377	1.9822	0.0000	0.0000	0.0000	0.0000	9.4031	57.2581	134.1382	
Space heating requirement													
	118.3995	73.5284	37.8231	11.4377	1.9822	0.0000	0.0000	0.0000	0.0000	9.4031	57.2581	134.1382	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	443.9704	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	4.4397	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(330a)
Total electricity for the above, kWh/year	11.9235	(331)
Electricity for lighting (calculated in Appendix L)	130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2813.3071	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	443.9704	6.5500	29.0801	(340a)
Space heating total			29.0801	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			229.4811	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	993.4530	0.1589	18.8099	(367)
Electrical energy for heat distribution (space & water)	4.4397	0.0000	5.3232	(372)
Overall CO2 factor for heat network			0.0395	(386)
Total CO2 associated with community systems			147.2766	(373)
Space and water heating			147.2766	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			34.5167	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	993.4530	1.5881	188.0183	(467)
Electrical energy for heat distribution (space & water)	4.4397	0.0000	56.9404	(472)
Overall CO2 factor for heat network			0.4229	(486)
Total CO2 associated with community systems			1575.3518	(473)
Space and water heating			1575.3518	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			871.0268	(483)

SAP 10 EPC IMPROVEMENTS

Rev D - Northeast

Current energy efficiency rating:	B 88
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£41	£41	£0
Community scheme	£348	£348	£0
Space heating	£136	£136	£0
Water heating	£215	£215	£0
Lighting	£37	£37	£0
Generated (PV)	-£159	-£159	£0
Total cost of fuels	£230	£230	£0
Total cost of uses	£229	£229	£0
Delivered energy	65 kWh/m²	65 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.0 tonnes	0.0 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	20 kWh/m²	20 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)

Total net area of external elements Aum(A, m2)	76.5400				(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	16.5005			(33)
Main dwelling					
Party Wall	31.3600	0.0000	0.0000	70.0000	2195.2000 (32)
Party Ceiling 1	43.3600			30.0000	1300.8000 (32b)
Internal TF Wall	68.4500			9.0000	616.0500 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	6.5100	36.7938	0.6800	0.7000	0.7700	79.0126	(79)

Solar gains	79.0126	134.5876	184.1487	228.1691	255.5685	253.7203	244.6135	224.1724	199.3941	148.7480	94.6389	67.6183	(83)
Total gains	497.7734	551.4570	589.3328	611.5393	617.9891	597.1731	576.9627	559.0966	545.4189	514.3393	483.8657	477.3354	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area													
	0.9322	0.8868	0.8099	0.6909	0.5410	0.3887	0.2770	0.2988	0.4577	0.7032	0.8804	0.9442	(86)
MIT	20.6121	20.7394	20.8656	20.9537	20.9905	20.9990	20.9999	20.9998	20.9972	20.9562	20.7854	20.5660	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.9184	0.8667	0.7812	0.6532	0.4976	0.3416	0.2279	0.2482	0.4068	0.6591	0.8562	0.9323	(89)
MIT 2	19.7979	19.9465	20.0880	20.1797	20.2137	20.2202	20.2207	20.2207	20.2191	20.1841	20.0032	19.7428	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.1868	20.3252	20.4594	20.5494	20.5847	20.5922	20.5929	20.5928	20.5908	20.5529	20.3768	20.1360	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1868	20.3252	20.4594	20.5494	20.5847	20.5922	20.5929	20.5928	20.5908	20.5529	20.3768	20.1360	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9177	0.8696	0.7903	0.6694	0.5180	0.3641	0.2514	0.2724	0.4310	0.6783	0.8614	0.9309	(94)
Useful gains	456.8291	479.5233	465.7557	409.3466	320.1199	217.4221	145.0225	152.2732	235.0885	348.8592	416.7803	444.3419	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	577.0875	560.3200	507.0759	423.1628	322.7383	217.6650	145.0410	152.3044	235.7765	361.5381	482.2790	578.8758	(97)
Space heating kWh													
	89.4722	54.2954	30.7422	9.9477	1.9481	0.0000	0.0000	0.0000	0.0000	9.4331	47.1591	100.0932	(98a)
Space heating requirement - total per year (kWh/year)												343.0911	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	89.4722	54.2954	30.7422	9.9477	1.9481	0.0000	0.0000	0.0000	0.0000	9.4331	47.1591	100.0932	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												343.0911	
Space heating per m2											(98c) / (4) =	7.9126	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	89.4722	54.2954	30.7422	9.9477	1.9481	0.0000	0.0000	0.0000	0.0000	9.4331	47.1591	100.0932	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	134.2083	81.4431	46.1133	14.9216	2.9221	0.0000	0.0000	0.0000	0.0000	14.1496	70.7386	150.1399	
Space heating requirement													
	134.2083	81.4431	46.1133	14.9216	2.9221	0.0000	0.0000	0.0000	0.0000	14.1496	70.7386	150.1399	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												514.6366	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												5.1464	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)

Appendix Q - special features

Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2980.4994	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	514.6366	4.4400	22.8499	(340a)
Space heating total			22.8499	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			186.1833	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7586	(357)
SAP value		87.7038	
SAP rating (Section 12)		88	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1012.2973	0.1585	21.7494	(367)
Electrical energy for heat distribution (space & water)	5.1464	0.0000	5.4335	(372)
Overall CO2 factor for heat network			0.0396	(386)
Total CO2 associated with community systems			150.3263	(373)
Space and water heating			150.3263	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			49.7986	(383)
CO2 emissions per m2			1.1500	(384)
EI value			99.2448	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

Measured/design AP50 3.0000 (17)
Infiltration rate 0.1500 (18)
Number of sides sheltered 3 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.2962 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)

Average = Sum(39)m / 12 = 36.3250

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)											Total = Sum(45)m =	1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)

Water heating gains (Table 5)

	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)

Total internal gains

	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	6.5100	42.9509	0.6800	0.7000	0.7700	92.2346	(79)

Solar gains	92.2346	139.6167	188.6581	237.9251	258.4168	276.0712	260.8108	242.3337	216.0832	162.8736	108.8094	79.4115	(83)
Total gains	510.9954	556.4860	593.8423	621.2953	620.8375	619.5239	593.1600	577.2579	562.1080	528.4649	498.0363	489.1286	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area	0.9195	0.8757	0.7878	0.6629	0.5110	0.3398	0.2388	0.2580	0.4254	0.6599	0.8560	0.9337	(86)
MIT	20.6576	20.7644	20.8893	20.9642	20.9935	20.9996	21.0000	20.9999	20.9982	20.9704	20.8258	20.6119	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house	0.9036	0.8541	0.7570	0.6242	0.4671	0.2943	0.1911	0.2090	0.3756	0.6141	0.8284	0.9199	(89)
MIT 2	19.8519	19.9753	20.1135	20.1897	20.2161	20.2205	20.2207	20.2207	20.2197	20.1970	20.0480	19.7981	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.2367	20.3522	20.4841	20.5596	20.5874	20.5926	20.5929	20.5929	20.5916	20.5664	20.4195	20.1868	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2367	20.3522	20.4841	20.5596	20.5874	20.5926	20.5929	20.5929	20.5916	20.5664	20.4195	20.1868	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9039	0.8580	0.7677	0.6413	0.4879	0.3160	0.2139	0.2324	0.3994	0.6347	0.8358	0.9192	(94)
Useful gains	461.9102	477.4597	455.9167	398.4160	302.8951	195.7907	126.8738	134.1337	224.4829	335.4424	416.2830	449.6270	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	568.0030	550.4046	489.8083	409.0065	304.6713	195.8869	126.8800	134.1444	224.9089	343.8681	469.2998	569.8225	(97)
Space heating kWh	78.9330	49.0189	25.2154	7.6252	1.3215	0.0000	0.0000	0.0000	0.0000	6.2687	38.1721	89.4255	(98a)
Space heating requirement - total per year (kWh/year)												295.9802	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	78.9330	49.0189	25.2154	7.6252	1.3215	0.0000	0.0000	0.0000	0.0000	6.2687	38.1721	89.4255	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												295.9802	
Space heating per m2										(98c) / (4) =		6.8261	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement

	78.9330	49.0189	25.2154	7.6252	1.3215	0.0000	0.0000	0.0000	0.0000	6.2687	38.1721	89.4255	(98)

Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50

307a	118.3995	73.5284	37.8231	11.4377	1.9822	0.0000	0.0000	0.0000	0.0000	9.4031	57.2581	134.1382	

Space heating requirement

	118.3995	73.5284	37.8231	11.4377	1.9822	0.0000	0.0000	0.0000	0.0000	9.4031	57.2581	134.1382	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)

Space heating fuel for secondary/supplementary system

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement

	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50

310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	

Water heating fuel

	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)

Cooling System Energy Efficiency Ratio	0.0000	(314)

Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)

Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	443.9704	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	4.4397	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(330a)
Total electricity for the above, kWh/year	11.9235	(331)
Electricity for lighting (calculated in Appendix L)	130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2813.3071	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	443.9704	6.5500	29.0801	(340a)
Space heating total			29.0801	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			229.4811	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	993.4530	0.1589	18.8099	(367)
Electrical energy for heat distribution (space & water)	4.4397	0.0000	5.3232	(372)
Overall CO2 factor for heat network			0.0395	(386)
Total CO2 associated with community systems			147.2766	(373)
Space and water heating			147.2766	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			34.5167	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	993.4530	1.5881	188.0183	(467)
Electrical energy for heat distribution (space & water)	4.4397	0.0000	56.9404	(472)
Overall CO2 factor for heat network			0.4229	(486)
Total CO2 associated with community systems			1575.3518	(473)
Space and water heating			1575.3518	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			871.0268	(483)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.25	**TER**	16.29
Environmental	99 A	**% DER < TER**			92.33
CO_2 Emissions (t/year)	0.03	**DFEE**	19.97	**TFEE**	33.89
Compliance Check	See BREL	**% DFEE < TFEE**			41.07
% DPER < TPER	73.32	**DPER**	23.46	**TPER**	87.95

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	

Distribution loss (46)m = 0.15 x (45)m

23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
									Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)

12Total per year (kWh/year) 2188 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)

Water heating gains (Table 5)

130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)

Total internal gains

377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.5100	36.7938	0.6800	0.7000	0.7700	79.0126	(77)

Solar gains 79.0126	134.5876	184.1487	228.1691	255.5685	253.7203	244.6135	224.1724	199.3941	148.7480	94.6389	67.6183	(83)
Total gains 456.6035	519.3376	554.3102	585.7083	596.8351	583.8070	563.5301	544.2603	528.2181	487.9469	452.7963	438.4780	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106

alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874		
util living area	0.9526	0.9084	0.8398	0.7153	0.5591	0.3975	0.2835	0.3069	0.4722	0.7328	0.9050	0.9613	(86)
MIT	20.5331	20.6924	20.8335	20.9440	20.9887	20.9988	20.9999	20.9998	20.9967	20.9451	20.7413	20.4866	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house	0.9420	0.8907	0.8129	0.6776	0.5145	0.3494	0.2334	0.2550	0.4199	0.6889	0.8839	0.9524	(89)
MIT 2	19.7035	19.8929	20.0540	20.1707	20.2123	20.2201	20.2207	20.2207	20.2188	20.1742	19.9541	19.6471	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0997	20.2748	20.4263	20.5400	20.5831	20.5920	20.5929	20.5928	20.5903	20.5424	20.3301	20.0481	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0997	20.2748	20.4263	20.5400	20.5831	20.5920	20.5929	20.5928	20.5903	20.5424	20.3301	20.0481	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9402	0.8920	0.8204	0.6934	0.5354	0.3724	0.2573	0.2798	0.4448	0.7075	0.8871	0.9501	(94)
Useful gains	429.2788	463.2740	454.7311	406.1147	319.5415	217.3848	145.0194	152.2672	234.9404	345.2280	401.6656	416.6003	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	573.9246	558.4883	505.8728	422.8246	322.6792	217.6611	145.0406	152.3037	235.7612	361.1572	480.5824	575.6811	(97)
Space heating kWh	107.6165	63.9840	38.0495	12.0311	2.3344	0.0000	0.0000	0.0000	0.0000	11.8513	56.8201	118.3561	(98a)
Space heating requirement - total per year (kWh/year)												411.0430	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	107.6165	63.9840	38.0495	12.0311	2.3344	0.0000	0.0000	0.0000	0.0000	11.8513	56.8201	118.3561	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												411.0430	
Space heating per m2											(98c) / (4) =	9.4798	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	107.6165	63.9840	38.0495	12.0311	2.3344	0.0000	0.0000	0.0000	0.0000	11.8513	56.8201	118.3561	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	161.4248	95.9761	57.0742	18.0467	3.5016	0.0000	0.0000	0.0000	0.0000	17.7770	85.2301	177.5341	
Space heating requirement	161.4248	95.9761	57.0742	18.0467	3.5016	0.0000	0.0000	0.0000	0.0000	17.7770	85.2301	177.5341	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												616.5645	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												6.1656	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3082.4273	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1039.4781	0.1584	26.0451	(367)
Electrical energy for heat distribution (space & water)	6.1656	0.0000	5.5946	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			154.7831	(373)
Space and water heating			154.7831	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			54.2553	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.2500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1039.4781	1.5864	260.8247	(467)
Electrical energy for heat distribution (space & water)	6.1656	0.0000	59.6707	(472)
Overall CO2 factor for heat network			0.4235	(486)
Total CO2 associated with community systems			1650.8884	(473)
Space and water heating			1650.8884	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			1017.2936	(483)
Dwelling Primary energy Rate (DPER)			23.4600	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)

100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4004	(33)
Main dwelling						
Party Wall			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
E5 Ground floor (normal)	26.1200	0.1600	4.1792
P1 Party wall - Ground floor	6.7000	0.0800	0.5360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.5100	36.7938	0.6300	0.7000	0.7700	73.2028	(77)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	73.2028	124.6915	170.6083	211.3920	236.7767	235.0644	226.6272	207.6891	184.7327	137.8107	87.6801	62.6464	(83)
Total gains	442.4235	500.8532	532.3996	560.4931	569.6731	553.7131	534.1736	516.4068	502.1187	468.6393	437.3995	425.1358	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area	0.9774	0.9586	0.9266	0.8516	0.7232	0.5417	0.3933	0.4235	0.6312	0.8615	0.9560	0.9809	(86)
MIT	19.9898	20.1930	20.4338	20.7135	20.8985	20.9808	20.9968	20.9954	20.9593	20.7398	20.3322	19.9566	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house	0.9712	0.9477	0.9075	0.8153	0.6637	0.4623	0.3046	0.3329	0.5509	0.8201	0.9424	0.9755	(89)
MIT 2	18.8299	19.0835	19.3787	19.7116	19.9055	19.9843	19.9936	19.9948	19.9662	19.7498	19.2684	18.7954	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.3839	19.6134	19.8826	20.1901	20.3798	20.4603	20.4728	20.4727	20.4405	20.2226	19.7765	19.3500	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3839	19.6134	19.8826	20.1901	20.3798	20.4603	20.4728	20.4727	20.4405	20.2226	19.7765	19.3500	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9668	0.9432	0.9056	0.8233	0.6878	0.4997	0.3470	0.3762	0.5877	0.8307	0.9392	0.9714	(94)
Useful gains	427.7199	472.4186	482.1656	461.4724	391.8230	276.6658	185.3725	194.2781	295.1172	389.3110	410.8150	412.9816	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	746.4808	726.2679	658.9053	549.2439	421.3005	281.4463	185.9946	195.2116	305.7622	467.0652	618.1145	742.2485	(97)
Space heating kWh	237.1581	170.5867	131.4944	63.1954	21.9313	0.0000	0.0000	0.0000	0.0000	57.8491	149.2557	244.9746	(98a)
Space heating requirement - total per year (kWh/year)												1076.4453	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	237.1581	170.5867	131.4944	63.1954	21.9313	0.0000	0.0000	0.0000	0.0000	57.8491	149.2557	244.9746	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1076.4453	
Space heating per m2										(98c) / (4) =		24.8258	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	237.1581	170.5867	131.4944	63.1954	21.9313	0.0000	0.0000	0.0000	0.0000	57.8491	149.2557	244.9746	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	256.9427	184.8177	142.4641	68.4674	23.7608	0.0000	0.0000	0.0000	0.0000	62.6751	161.7071	265.4112	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.6367	84.1701	83.4515	82.2292	80.8461	79.8000	79.8000	79.8000	79.8000	82.0518	83.8478	84.7312	(217)
Fuel for water heating, kWh/month	216.7502	192.9517	207.4059	186.8110	185.3533	170.5061	169.2907	175.3325	176.4869	189.8679	195.7065	214.3809	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1166.2462	(211)
Space heating fuel - main system 2	0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2280.8436	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3292.1638	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1166.2462	0.2100	244.9117	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2280.8436	0.2100	478.9772	(264)
Space and water heating			723.8889	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			706.1863	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.2900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1166.2462	1.1300	1317.8582	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2280.8436	1.1300	2577.3533	(278)
Space and water heating			3895.2115	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3813.7091	(286)
Target Primary Energy Rate (TPER)			87.9500	(287)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.25	**TER**	16.29
Environmental	99 A	**% DER < TER**			92.33
CO_2 Emissions (t/year)	0.03	**DFEE**	19.97	**TFEE**	33.89
Compliance Check	See BREL	**% DFEE < TFEE**			41.07
% DPER < TPER	73.32	**DPER**	23.46	**TPER**	87.95

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area		Storey height		Volume	
Main dwelling		(m2)		(m)		(m3)	
Ground floor		43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2622	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)

Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	38.2833	38.2073	38.1327	37.7826	37.7171	37.4122	37.4122	37.3557	37.5296	37.7171	37.8496	37.9882	(39)
Average = Sum(39)m / 12 =												37.7823	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8829	0.8812	0.8794	0.8714	0.8699	0.8628	0.8628	0.8615	0.8655	0.8699	0.8729	0.8761	(40)
HLP (average)												0.8714	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =		663.9767	(64)
12Total per year (kWh/year)											664	(64)

Electric shower(s)

39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		449.4572	(64a)

Heat gains from water heating, kWh/month

27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.4004	291.4783	279.0119	271.5070	258.2448	250.2442	241.2477	240.9702	247.9561	254.7841	268.8582	277.3654	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.5100	36.7938	0.6800	0.7000	0.7700	79.0126	(77)

Solar gains	79.0126	134.5876	184.1487	228.1691	255.5685	253.7203	244.6135	224.1724	199.3941	148.7480	94.6389	67.6183	(83)
Total gains	362.4129	426.0660	463.1606	499.6762	513.8133	503.9646	485.8611	465.1426	447.3502	403.5322	363.4970	344.9837	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.2536	75.4034	75.5508	76.2509	76.3833	77.0059	77.0059	77.1223	76.7649	76.3833	76.1159	75.8383	
alpha	6.0169	6.0269	6.0367	6.0834	6.0922	6.1337	6.1337	6.1415	6.1177	6.0922	6.0744	6.0559	
util living area	0.9855	0.9636	0.9218	0.8179	0.6600	0.4725	0.3385	0.3689	0.5701	0.8465	0.9647	0.9888	(86)
MIT	20.2394	20.4484	20.6602	20.8691	20.9685	20.9964	20.9996	20.9994	20.9894	20.8631	20.5262	20.1981	(87)
Th 2	20.1820	20.1835	20.1850	20.1919	20.1932	20.1992	20.1992	20.2003	20.1969	20.1932	20.1906	20.1879	(88)
util rest of house	0.9816	0.9546	0.9037	0.7830	0.6098	0.4145	0.2771	0.3051	0.5073	0.8081	0.9543	0.9857	(89)

MIT 2	19.5020	19.7057	19.9063	20.0962	20.1742	20.1977	20.1991	20.2001	20.1918	20.0967	19.7893	19.4664 (90)
Living area fraction										fLA = Living area / (4) =		0.4776 (91)
MIT	19.8542	20.0604	20.2664	20.4654	20.5536	20.5792	20.5815	20.5819	20.5728	20.4628	20.1412	19.8159 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8542	20.0604	20.2664	20.4654	20.5536	20.5792	20.5815	20.5819	20.5728	20.4628	20.1412	19.8159 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9797	0.9530	0.9056	0.7953	0.6326	0.4422	0.3064	0.3356	0.5370	0.8218	0.9536	0.9839	(94)
Useful gains	355.0379	406.0557	419.4562	397.4160	325.0472	222.8388	148.8817	156.0891	240.2371	331.6106	346.6227	339.4454	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	595.4664	579.2385	524.9503	436.9701	333.9317	223.6949	148.9550	156.2168	242.9208	371.9946	493.6059	593.2182	(97)
Space heating kWh	178.8788	116.3789	78.4876	28.4790	6.6100	0.0000	0.0000	0.0000	0.0000	30.0457	105.8279	188.8069	(98a)
Space heating requirement - total per year (kWh/year)												733.5148	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	178.8788	116.3789	78.4876	28.4790	6.6100	0.0000	0.0000	0.0000	0.0000	30.0457	105.8279	188.8069	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												733.5148	
Space heating per m2											(98c) / (4) =	16.9169	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	351.6746	276.8502	283.9035	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9778	0.9919	0.9886	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	343.8528	274.5999	280.6537	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	560.0270	540.4413	517.6301	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	155.6454	197.7860	176.3104	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	38.9113	49.4465	44.0776	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												132.4355	(107)
Energy for space heating												16.9169	(99)
Energy for space cooling												3.0543	(108)
Total												19.9712	(109)
Fabric Energy Efficiency (DFEE)												20.0	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4004			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
E5 Ground floor (normal)	26.1200	0.1600	4.1792
P1 Party wall - Ground floor	6.7000	0.0800	0.5360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)													
	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							449.4572	(64a)
Heat gains from water heating, kWh/month													
	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains													
	281.3655	289.2254	276.9770	269.4043	256.2100	248.1415	239.2128	238.9354	245.8534	252.7493	266.7555	275.3306	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.5100	36.7938	0.6300	0.7000	0.7700	73.2028	(77)

Solar gains	73.2028	124.6915	170.6083	211.3920	236.7767	235.0644	226.6272	207.6891	184.7327	137.8107	87.6801	62.6464	(83)
Total gains	354.5683	413.9169	447.5854	480.7963	492.9866	483.2059	465.8400	446.6244	430.5862	390.5599	354.4356	337.9769	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area													
	0.9908	0.9798	0.9596	0.9038	0.7935	0.6103	0.4488	0.4863	0.7109	0.9190	0.9802	0.9926	(86)
MIT	19.7817	20.0017	20.2700	20.6035	20.8449	20.9678	20.9942	20.9915	20.9314	20.6244	20.1503	19.7471	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house													
	0.9880	0.9740	0.9475	0.8757	0.7378	0.5249	0.3488	0.3839	0.6289	0.8892	0.9733	0.9903	(89)
MIT 2	18.8774	19.0955	19.3580	19.6790	19.8861	19.9805	19.9932	19.9941	19.9567	19.7063	19.2527	18.8505	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.3093	19.5284	19.7936	20.1206	20.3441	20.4521	20.4713	20.4705	20.4222	20.1448	19.6814	19.2787	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3093	19.5284	19.7936	20.1206	20.3441	20.4521	20.4713	20.4705	20.4222	20.1448	19.6814	19.2787	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9857	0.9708	0.9451	0.8800	0.7588	0.5648	0.3967	0.4329	0.6657	0.8945	0.9708	0.9883	(94)
Useful gains	349.4873	401.8444	423.0009	423.0864	374.0578	272.9070	184.7876	193.3533	286.6316	349.3682	344.0748	334.0271	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	742.7912	722.0702	654.5199	545.8590	419.5666	281.0537	185.9245	195.1031	304.8796	463.2881	613.4759	738.7537	(97)
Space heating kWh													
	292.6181	215.1917	172.2502	88.3963	33.8586	0.0000	0.0000	0.0000	0.0000	84.7565	193.9688	301.1166	(98a)
Space heating requirement - total per year (kWh/year)												1382.1567	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	292.6181	215.1917	172.2502	88.3963	33.8586	0.0000	0.0000	0.0000	0.0000	84.7565	193.9688	301.1166	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1382.1567	
Space heating per m2											(98c) / (4) =	31.8763	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	451.4472	355.3946	364.2795	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8972	0.9471	0.9338	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	405.0267	336.6098	340.1704	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	538.0433	519.2260	498.1139	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	95.7719	135.8665	117.5099	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	23.9430	33.9666	29.3775	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												87.2871	(107)
Energy for space heating												31.8763	(99)
Energy for space cooling												2.0131	(108)
Total												33.8894	(109)
Fabric Energy Efficiency (TFEE)												33.9	(109)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.25	**TER**	16.29
Environmental	99 A	**% DER < TER**			92.33
CO_2 Emissions (t/year)	0.03	**DFEE**	19.97	**TFEE**	33.89
Compliance Check	See BREL	**% DFEE < TFEE**			41.07
% DPER < TPER	73.32	**DPER**	23.46	**TPER**	87.95

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	

Distribution loss (46)m = 0.15 x (45)m

23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss / Combi loss

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS / PV diverter / Solar input / FGHRS

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Total per year (kWh/year) = Sum(64)m = 2187.6523 (64)

12Total per year (kWh/year) 2188 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Pumps, fans

Losses e.g. evaporation (negative values) (Table 5)

-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)

Water heating gains (Table 5)

130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)

Total internal gains

377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.5100	36.7938	0.6800	0.7000	0.7700	79.0126	(77)

79.0126	134.5876	184.1487	228.1691	255.5685	253.7203	244.6135	224.1724	199.3941	148.7480	94.6389	67.6183	(83)
456.6035	519.3376	554.3102	585.7083	596.8351	583.8070	563.5301	544.2603	528.2181	487.9469	452.7963	438.4780	(84)

Solar gains / Total gains

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106

alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874		
util living area	0.9526	0.9084	0.8398	0.7153	0.5591	0.3975	0.2835	0.3069	0.4722	0.7328	0.9050	0.9613	(86)
MIT	20.5331	20.6924	20.8335	20.9440	20.9887	20.9988	20.9999	20.9998	20.9967	20.9451	20.7413	20.4866	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house	0.9420	0.8907	0.8129	0.6776	0.5145	0.3494	0.2334	0.2550	0.4199	0.6889	0.8839	0.9524	(89)
MIT 2	19.7035	19.8929	20.0540	20.1707	20.2123	20.2201	20.2207	20.2207	20.2188	20.1742	19.9541	19.6471	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0997	20.2748	20.4263	20.5400	20.5831	20.5920	20.5929	20.5928	20.5903	20.5424	20.3301	20.0481	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0997	20.2748	20.4263	20.5400	20.5831	20.5920	20.5929	20.5928	20.5903	20.5424	20.3301	20.0481	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9402	0.8920	0.8204	0.6934	0.5354	0.3724	0.2573	0.2798	0.4448	0.7075	0.8871	0.9501	(94)
Useful gains	429.2788	463.2740	454.7311	406.1147	319.5415	217.3848	145.0194	152.2672	234.9404	345.2280	401.6656	416.6003	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	573.9246	558.4883	505.8728	422.8246	322.6792	217.6611	145.0406	152.3037	235.7612	361.1572	480.5824	575.6811	(97)
Space heating kWh	107.6165	63.9840	38.0495	12.0311	2.3344	0.0000	0.0000	0.0000	0.0000	11.8513	56.8201	118.3561	(98a)
Space heating requirement - total per year (kWh/year)												411.0430	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	107.6165	63.9840	38.0495	12.0311	2.3344	0.0000	0.0000	0.0000	0.0000	11.8513	56.8201	118.3561	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												411.0430	
Space heating per m2											(98c) / (4) =	9.4798	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	107.6165	63.9840	38.0495	12.0311	2.3344	0.0000	0.0000	0.0000	0.0000	11.8513	56.8201	118.3561	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	161.4248	95.9761	57.0742	18.0467	3.5016	0.0000	0.0000	0.0000	0.0000	17.7770	85.2301	177.5341	
Space heating requirement	161.4248	95.9761	57.0742	18.0467	3.5016	0.0000	0.0000	0.0000	0.0000	17.7770	85.2301	177.5341	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												616.5645	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												6.1656	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3082.4273	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1039.4781	0.1584	26.0451	(367)
Electrical energy for heat distribution (space & water)	6.1656	0.0000	5.5946	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			154.7831	(373)
Space and water heating			154.7831	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			54.2553	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.2500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1039.4781	1.5864	260.8247	(467)
Electrical energy for heat distribution (space & water)	6.1656	0.0000	59.6707	(472)
Overall CO2 factor for heat network			0.4235	(486)
Total CO2 associated with community systems			1650.8884	(473)
Space and water heating			1650.8884	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			1017.2936	(483)
Dwelling Primary energy Rate (DPER)			23.4600	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)

100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4004	(33)
Main dwelling						
Party Wall			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
E5 Ground floor (normal)	26.1200	0.1600	4.1792
P1 Party wall - Ground floor	6.7000	0.0800	0.5360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.5100	36.7938	0.6300	0.7000	0.7700	73.2028	(77)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	73.2028	124.6915	170.6083	211.3920	236.7767	235.0644	226.6272	207.6891	184.7327	137.8107	87.6801	62.6464	(83)
Total gains	442.4235	500.8532	532.3996	560.4931	569.6731	553.7131	534.1736	516.4068	502.1187	468.6393	437.3995	425.1358	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area	0.9774	0.9586	0.9266	0.8516	0.7232	0.5417	0.3933	0.4235	0.6312	0.8615	0.9560	0.9809	(86)
MIT	19.9898	20.1930	20.4338	20.7135	20.8985	20.9808	20.9968	20.9954	20.9593	20.7398	20.3322	19.9566	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house	0.9712	0.9477	0.9075	0.8153	0.6637	0.4623	0.3046	0.3329	0.5509	0.8201	0.9424	0.9755	(89)
MIT 2	18.8299	19.0835	19.3787	19.7116	19.9055	19.9843	19.9936	19.9948	19.9662	19.7498	19.2684	18.7954	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.3839	19.6134	19.8826	20.1901	20.3798	20.4603	20.4728	20.4727	20.4405	20.2226	19.7765	19.3500	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3839	19.6134	19.8826	20.1901	20.3798	20.4603	20.4728	20.4727	20.4405	20.2226	19.7765	19.3500	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9668	0.9432	0.9056	0.8233	0.6878	0.4997	0.3470	0.3762	0.5877	0.8307	0.9392	0.9714	(94)
Useful gains	427.7199	472.4186	482.1656	461.4724	391.8230	276.6658	185.3725	194.2781	295.1172	389.3110	410.8150	412.9816	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	746.4808	726.2679	658.9053	549.2439	421.3005	281.4463	185.9946	195.2116	305.7622	467.0652	618.1145	742.2485	(97)
Space heating kWh	237.1581	170.5867	131.4944	63.1954	21.9313	0.0000	0.0000	0.0000	0.0000	57.8491	149.2557	244.9746	(98a)
Space heating requirement - total per year (kWh/year)												1076.4453	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	237.1581	170.5867	131.4944	63.1954	21.9313	0.0000	0.0000	0.0000	0.0000	57.8491	149.2557	244.9746	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1076.4453	
Space heating per m2										(98c) / (4) =		24.8258	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	237.1581	170.5867	131.4944	63.1954	21.9313	0.0000	0.0000	0.0000	0.0000	57.8491	149.2557	244.9746	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	256.9427	184.8177	142.4641	68.4674	23.7608	0.0000	0.0000	0.0000	0.0000	62.6751	161.7071	265.4112	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.6367	84.1701	83.4515	82.2292	80.8461	79.8000	79.8000	79.8000	79.8000	82.0518	83.8478	84.7312	(217)
Fuel for water heating, kWh/month	216.7502	192.9517	207.4059	186.8110	185.3533	170.5061	169.2907	175.3325	176.4869	189.8679	195.7065	214.3809	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1166.2462	(211)
Space heating fuel - main system 2	0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2280.8436	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3292.1638	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1166.2462	0.2100	244.9117	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2280.8436	0.2100	478.9772	(264)
Space and water heating			723.8889	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			706.1863	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.2900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1166.2462	1.1300	1317.8582	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2280.8436	1.1300	2577.3533	(278)
Space and water heating			3895.2115	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3813.7091	(286)
Target Primary Energy Rate (TPER)			87.9500	(287)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.25	**TER**	16.29
Environmental	99 A	**% DER < TER**			92.33
CO_2 Emissions (t/year)	0.03	**DFEE**	19.97	**TFEE**	33.89
Compliance Check	See BREL	**% DFEE < TFEE**			41.07
% DPER < TPER	73.32	**DPER**	23.46	**TPER**	87.95

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
						(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			10371.4500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							239.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.5100	36.7938	0.6800	0.7000	0.7700	79.0126	(77)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	79.0126	134.5876	184.1487	228.1691	255.5685	253.7203	244.6135	224.1724	199.3941	148.7480	94.6389	67.6183	(83)
Total gains	497.7734	551.4570	589.3328	611.5393	617.9891	597.1731	576.9627	559.0966	545.4189	514.3393	483.8657	477.3354	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874

util living area													
	0.9322	0.8868	0.8099	0.6909	0.5410	0.3887	0.2770	0.2988	0.4577	0.7032	0.8804	0.9442	(86)
MIT	20.6121	20.7394	20.8656	20.9537	20.9905	20.9990	20.9999	20.9998	20.9972	20.9562	20.7854	20.5660	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.9184	0.8667	0.7812	0.6532	0.4976	0.3416	0.2279	0.2482	0.4068	0.6591	0.8562	0.9323	(89)
MIT 2	19.7979	19.9465	20.0880	20.1797	20.2137	20.2202	20.2207	20.2207	20.2191	20.1841	20.0032	19.7428	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.1868	20.3252	20.4594	20.5494	20.5847	20.5922	20.5929	20.5928	20.5908	20.5529	20.3768	20.1360	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1868	20.3252	20.4594	20.5494	20.5847	20.5922	20.5929	20.5928	20.5908	20.5529	20.3768	20.1360	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9177	0.8696	0.7903	0.6694	0.5180	0.3641	0.2514	0.2724	0.4310	0.6783	0.8614	0.9309	(94)
Useful gains	456.8291	479.5233	465.7557	409.3466	320.1199	217.4221	145.0225	152.2732	235.0885	348.8592	416.7803	444.3419	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	577.0875	560.3200	507.0759	423.1628	322.7383	217.6650	145.0410	152.3044	235.7765	361.5381	482.2790	578.8758	(97)
Space heating kWh													
	89.4722	54.2954	30.7422	9.9477	1.9481	0.0000	0.0000	0.0000	0.0000	9.4331	47.1591	100.0932	(98a)
Space heating requirement - total per year (kWh/year)												343.0911	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	89.4722	54.2954	30.7422	9.9477	1.9481	0.0000	0.0000	0.0000	0.0000	9.4331	47.1591	100.0932	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												343.0911	
Space heating per m2											(98c) / (4) =	7.9126	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	89.4722	54.2954	30.7422	9.9477	1.9481	0.0000	0.0000	0.0000	0.0000	9.4331	47.1591	100.0932	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	134.2083	81.4431	46.1133	14.9216	2.9221	0.0000	0.0000	0.0000	0.0000	14.1496	70.7386	150.1399	
Space heating requirement													
	134.2083	81.4431	46.1133	14.9216	2.9221	0.0000	0.0000	0.0000	0.0000	14.1496	70.7386	150.1399	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												514.6366	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												5.1464	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2980.4994	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	514.6366	4.4400	22.8499	(340a)
Space heating total			22.8499	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			186.1833	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7586 (357)
SAP value		87.7038
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1012.2973	0.1585	21.7494	(367)
Electrical energy for heat distribution (space & water)	5.1464	0.0000	5.4335	(372)
Overall CO2 factor for heat network			0.0396	(386)
Total CO2 associated with community systems			150.3263	(373)
Space and water heating			150.3263	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			49.7986	(383)
CO2 emissions per m2			1.1500	(384)
EI value			99.2448	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	43.3600 (1b)	x 2.4500 (2b)	= 106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 43.3600				(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)

Adj infilt rate

	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104 (22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 10371.4500 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

Thermal bridges (User defined value 0.030 * total exposed area) 2.2962 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)

Average = Sum(39)m / 12 = 36.3250

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Total per year (kWh/year) = Sum(64)m = 2187.6523 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.5100	42.9509	0.6800	0.7000	0.7700	92.2346	(77)

Solar gains	92.2346	139.6167	188.6581	237.9251	258.4168	276.0712	260.8108	242.3337	216.0832	162.8736	108.8094	79.4115	(83)
Total gains	510.9954	556.4860	593.8423	621.2953	620.8375	619.5239	593.1600	577.2579	562.1080	528.4649	498.0363	489.1286	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area													
	0.9195	0.8757	0.7878	0.6629	0.5110	0.3398	0.2388	0.2580	0.4254	0.6599	0.8560	0.9337	(86)
MIT	20.6576	20.7644	20.8893	20.9642	20.9935	20.9996	21.0000	20.9999	20.9982	20.9704	20.8258	20.6119	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.9036	0.8541	0.7570	0.6242	0.4671	0.2943	0.1911	0.2090	0.3756	0.6141	0.8284	0.9199	(89)
MIT 2	19.8519	19.9753	20.1135	20.1897	20.2161	20.2205	20.2207	20.2207	20.2197	20.1970	20.0480	19.7981	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.2367	20.3522	20.4841	20.5596	20.5874	20.5926	20.5929	20.5929	20.5916	20.5664	20.4195	20.1868	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2367	20.3522	20.4841	20.5596	20.5874	20.5926	20.5929	20.5929	20.5916	20.5664	20.4195	20.1868	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9039	0.8580	0.7677	0.6413	0.4879	0.3160	0.2139	0.2324	0.3994	0.6347	0.8358	0.9192	(94)
Useful gains	461.9102	477.4597	455.9167	398.4160	302.8951	195.7907	126.8738	134.1337	224.4829	335.4424	416.2830	449.6270	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	568.0030	550.4046	489.8083	409.0065	304.6713	195.8869	126.8800	134.1444	224.9089	343.8681	469.2998	569.8225	(97)
Space heating kWh													
	78.9330	49.0189	25.2154	7.6252	1.3215	0.0000	0.0000	0.0000	0.0000	6.2687	38.1721	89.4255	(98a)
Space heating requirement - total per year (kWh/year)												295.9802	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	78.9330	49.0189	25.2154	7.6252	1.3215	0.0000	0.0000	0.0000	0.0000	6.2687	38.1721	89.4255	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												295.9802	
Space heating per m2											(98c) / (4) =	6.8261	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	78.9330	49.0189	25.2154	7.6252	1.3215	0.0000	0.0000	0.0000	0.0000	6.2687	38.1721	89.4255	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	118.3995	73.5284	37.8231	11.4377	1.9822	0.0000	0.0000	0.0000	0.0000	9.4031	57.2581	134.1382	
Space heating requirement													
	118.3995	73.5284	37.8231	11.4377	1.9822	0.0000	0.0000	0.0000	0.0000	9.4031	57.2581	134.1382	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	443.9704	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	4.4397	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(330a)
Total electricity for the above, kWh/year	11.9235	(331)
Electricity for lighting (calculated in Appendix L)	130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2813.3071	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	443.9704	6.5500	29.0801	(340a)
Space heating total			29.0801	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			229.4811	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	993.4530	0.1589	18.8099	(367)
Electrical energy for heat distribution (space & water)	4.4397	0.0000	5.3232	(372)
Overall CO2 factor for heat network			0.0395	(386)
Total CO2 associated with community systems			147.2766	(373)
Space and water heating			147.2766	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			34.5167	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	993.4530	1.5881	188.0183	(467)
Electrical energy for heat distribution (space & water)	4.4397	0.0000	56.9404	(472)
Overall CO2 factor for heat network			0.4229	(486)
Total CO2 associated with community systems			1575.3518	(473)
Space and water heating			1575.3518	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			871.0268	(483)

SAP 10 EPC IMPROVEMENTS

Rev D - Northwest

Current energy efficiency rating:	B 88
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£41	£41	£0
Community scheme	£348	£348	£0
Space heating	£136	£136	£0
Water heating	£215	£215	£0
Lighting	£37	£37	£0
Generated (PV)	-£159	-£159	£0
Total cost of fuels	£230	£230	£0
Total cost of uses	£229	£229	£0
Delivered energy	65 kWh/m²	65 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.0 tonnes	0.0 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	20 kWh/m²	20 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)

Total net area of external elements Aum(A, m2)	76.5400				(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	16.5005			(33)
Main dwelling					
Party Wall	31.3600	0.0000	0.0000	70.0000	2195.2000 (32)
Party Ceiling 1	43.3600			30.0000	1300.8000 (32b)
Internal TF Wall	68.4500			9.0000	616.0500 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.5100	36.7938	0.6800	0.7000	0.7700	79.0126	(77)

Solar gains	79.0126	134.5876	184.1487	228.1691	255.5685	253.7203	244.6135	224.1724	199.3941	148.7480	94.6389	67.6183	(83)
Total gains	497.7734	551.4570	589.3328	611.5393	617.9891	597.1731	576.9627	559.0966	545.4189	514.3393	483.8657	477.3354	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area													
	0.9322	0.8868	0.8099	0.6909	0.5410	0.3887	0.2770	0.2988	0.4577	0.7032	0.8804	0.9442	(86)
MIT	20.6121	20.7394	20.8656	20.9537	20.9905	20.9990	20.9999	20.9998	20.9972	20.9562	20.7854	20.5660	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.9184	0.8667	0.7812	0.6532	0.4976	0.3416	0.2279	0.2482	0.4068	0.6591	0.8562	0.9323	(89)
MIT 2	19.7979	19.9465	20.0880	20.1797	20.2137	20.2202	20.2207	20.2207	20.2191	20.1841	20.0032	19.7428	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.1868	20.3252	20.4594	20.5494	20.5847	20.5922	20.5929	20.5928	20.5908	20.5529	20.3768	20.1360	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1868	20.3252	20.4594	20.5494	20.5847	20.5922	20.5929	20.5928	20.5908	20.5529	20.3768	20.1360	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9177	0.8696	0.7903	0.6694	0.5180	0.3641	0.2514	0.2724	0.4310	0.6783	0.8614	0.9309	(94)
Useful gains	456.8291	479.5233	465.7557	409.3466	320.1199	217.4221	145.0225	152.2732	235.0885	348.8592	416.7803	444.3419	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	577.0875	560.3200	507.0759	423.1628	322.7383	217.6650	145.0410	152.3044	235.7765	361.5381	482.2790	578.8758	(97)
Space heating kWh													
	89.4722	54.2954	30.7422	9.9477	1.9481	0.0000	0.0000	0.0000	0.0000	9.4331	47.1591	100.0932	(98a)
Space heating requirement - total per year (kWh/year)												343.0911	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	89.4722	54.2954	30.7422	9.9477	1.9481	0.0000	0.0000	0.0000	0.0000	9.4331	47.1591	100.0932	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												343.0911	
Space heating per m2											(98c) / (4) =	7.9126	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	89.4722	54.2954	30.7422	9.9477	1.9481	0.0000	0.0000	0.0000	0.0000	9.4331	47.1591	100.0932	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	134.2083	81.4431	46.1133	14.9216	2.9221	0.0000	0.0000	0.0000	0.0000	14.1496	70.7386	150.1399	
Space heating requirement													
	134.2083	81.4431	46.1133	14.9216	2.9221	0.0000	0.0000	0.0000	0.0000	14.1496	70.7386	150.1399	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												514.6366	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												5.1464	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)

Appendix Q - special features

Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2980.4994	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	514.6366	4.4400	22.8499	(340a)
Space heating total			22.8499	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			186.1833	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7586	(357)
SAP value		87.7038	
SAP rating (Section 12)		88	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1012.2973	0.1585	21.7494	(367)
Electrical energy for heat distribution (space & water)	5.1464	0.0000	5.4335	(372)
Overall CO2 factor for heat network			0.0396	(386)
Total CO2 associated with community systems			150.3263	(373)
Space and water heating			150.3263	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			49.7986	(383)
CO2 emissions per m2			1.1500	(384)
EI value			99.2448	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

Measured/design AP50 3.0000 (17)
Infiltration rate 0.1500 (18)
Number of sides sheltered 3 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.2962 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)
Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
									Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.5100	42.9509	0.6800	0.7000	0.7700	92.2346	(77)

Solar gains	92.2346	139.6167	188.6581	237.9251	258.4168	276.0712	260.8108	242.3337	216.0832	162.8736	108.8094	79.4115	(83)
Total gains	510.9954	556.4860	593.8423	621.2953	620.8375	619.5239	593.1600	577.2579	562.1080	528.4649	498.0363	489.1286	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area													
	0.9195	0.8757	0.7878	0.6629	0.5110	0.3398	0.2388	0.2580	0.4254	0.6599	0.8560	0.9337	(86)
MIT	20.6576	20.7644	20.8893	20.9642	20.9935	20.9996	21.0000	20.9999	20.9982	20.9704	20.8258	20.6119	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.9036	0.8541	0.7570	0.6242	0.4671	0.2943	0.1911	0.2090	0.3756	0.6141	0.8284	0.9199	(89)
MIT 2	19.8519	19.9753	20.1135	20.1897	20.2161	20.2205	20.2207	20.2207	20.2197	20.1970	20.0480	19.7981	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.2367	20.3522	20.4841	20.5596	20.5874	20.5926	20.5929	20.5929	20.5916	20.5664	20.4195	20.1868	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2367	20.3522	20.4841	20.5596	20.5874	20.5926	20.5929	20.5929	20.5916	20.5664	20.4195	20.1868	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9039	0.8580	0.7677	0.6413	0.4879	0.3160	0.2139	0.2324	0.3994	0.6347	0.8358	0.9192	(94)
Useful gains	461.9102	477.4597	455.9167	398.4160	302.8951	195.7907	126.8738	134.1337	224.4829	335.4424	416.2830	449.6270	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	568.0030	550.4046	489.8083	409.0065	304.6713	195.8869	126.8800	134.1444	224.9089	343.8681	469.2998	569.8225	(97)
Space heating kWh													
	78.9330	49.0189	25.2154	7.6252	1.3215	0.0000	0.0000	0.0000	0.0000	6.2687	38.1721	89.4255	(98a)
Space heating requirement - total per year (kWh/year)												295.9802	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	78.9330	49.0189	25.2154	7.6252	1.3215	0.0000	0.0000	0.0000	0.0000	6.2687	38.1721	89.4255	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												295.9802	
Space heating per m2										(98c) / (4) =		6.8261	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement													
	78.9330	49.0189	25.2154	7.6252	1.3215	0.0000	0.0000	0.0000	0.0000	6.2687	38.1721	89.4255	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	118.3995	73.5284	37.8231	11.4377	1.9822	0.0000	0.0000	0.0000	0.0000	9.4031	57.2581	134.1382	
Space heating requirement													
	118.3995	73.5284	37.8231	11.4377	1.9822	0.0000	0.0000	0.0000	0.0000	9.4031	57.2581	134.1382	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)

Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	443.9704	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	4.4397	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(330a)
Total electricity for the above, kWh/year	11.9235	(331)
Electricity for lighting (calculated in Appendix L)	130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2813.3071	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	443.9704	6.5500	29.0801	(340a)
Space heating total			29.0801	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			229.4811	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	993.4530	0.1589	18.8099	(367)
Electrical energy for heat distribution (space & water)	4.4397	0.0000	5.3232	(372)
Overall CO2 factor for heat network			0.0395	(386)
Total CO2 associated with community systems			147.2766	(373)
Space and water heating			147.2766	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			34.5167	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	993.4530	1.5881	188.0183	(467)
Electrical energy for heat distribution (space & water)	4.4397	0.0000	56.9404	(472)
Overall CO2 factor for heat network			0.4229	(486)
Total CO2 associated with community systems			1575.3518	(473)
Space and water heating			1575.3518	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			871.0268	(483)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.52	**TER**	17.53
Environmental	99 A	**% DER < TER**			91.33
CO_2 Emissions (t/year)	0.04	**DFEE**	24.98	**TFEE**	39.86
Compliance Check	See BREL	**% DFEE < TFEE**			37.33
% DPER < TPER	72.33	**DPER**	26.19	**TPER**	94.65

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 10371.4500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	239.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	2.2962	(36)
Point Thermal bridges	(36a) = 0.0000	

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	

Distribution loss (46)m = 0.15 x (45)m

23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
									Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)

12Total per year (kWh/year) 2188 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)

Water heating gains (Table 5)

130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)

Total internal gains

377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.5100	10.6334	0.6800	0.7000	0.7700	22.8346	(74)

Solar gains	22.8346	43.6381	74.1517	119.1067	160.4476	171.7639	160.3635	127.2280	89.1544	51.9454	28.1694	19.0360	(83)
Total gains	400.4255	428.3880	444.3132	476.6458	501.7142	501.8506	479.2802	447.3160	417.9784	391.1442	386.3268	389.8957	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106

alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874		
util living area	0.9738	0.9579	0.9245	0.8254	0.6540	0.4613	0.3333	0.3731	0.5898	0.8473	0.9491	0.9775	(86)
MIT	20.4106	20.5254	20.6846	20.8747	20.9736	20.9973	20.9997	20.9994	20.9888	20.8739	20.6240	20.3768	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house	0.9673	0.9478	0.9071	0.7917	0.6052	0.4060	0.2744	0.3101	0.5272	0.8097	0.9354	0.9719	(89)
MIT 2	19.5541	19.6955	19.8878	20.1026	20.2003	20.2193	20.2206	20.2205	20.2138	20.1064	19.8186	19.5122	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.9632	20.0919	20.2684	20.4713	20.5696	20.5909	20.5927	20.5925	20.5840	20.4730	20.2033	19.9252	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9632	20.0919	20.2684	20.4713	20.5696	20.5909	20.5927	20.5925	20.5840	20.4730	20.2033	19.9252	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9647	0.9459	0.9082	0.8031	0.6274	0.4323	0.3025	0.3402	0.5567	0.8227	0.9351	0.9693	(94)
Useful gains	386.3049	405.2292	403.5366	382.7841	314.7755	216.9723	144.9813	152.1793	232.6949	321.7777	361.2551	377.9407	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	568.9651	551.8450	500.1363	420.3290	322.1886	217.6183	145.0364	152.2941	235.5294	358.6374	475.9766	571.2160	(97)
Space heating kWh	135.8992	98.5258	71.8701	27.0323	5.5153	0.0000	0.0000	0.0000	0.0000	27.4236	82.5995	143.7969	(98a)
Space heating requirement - total per year (kWh/year)												592.6627	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	135.8992	98.5258	71.8701	27.0323	5.5153	0.0000	0.0000	0.0000	0.0000	27.4236	82.5995	143.7969	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												592.6627	
Space heating per m2											(98c) / (4) =	13.6684	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	135.8992	98.5258	71.8701	27.0323	5.5153	0.0000	0.0000	0.0000	0.0000	27.4236	82.5995	143.7969	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	203.8488	147.7887	107.8052	40.5485	8.2730	0.0000	0.0000	0.0000	0.0000	41.1354	123.8992	215.6953	
Space heating requirement													
	203.8488	147.7887	107.8052	40.5485	8.2730	0.0000	0.0000	0.0000	0.0000	41.1354	123.8992	215.6953	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												888.9941	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												8.8899	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3354.8569	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1112.1260	0.1572	37.2586	(367)
Electrical energy for heat distribution (space & water)	8.8899	0.0000	6.0151	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			166.4171	(373)
Space and water heating			166.4171	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			65.8893	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.5200	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1112.1260	1.5818	375.0002	(467)
Electrical energy for heat distribution (space & water)	8.8899	0.0000	63.9522	(472)
Overall CO2 factor for heat network			0.4243	(486)
Total CO2 associated with community systems			1769.3455	(473)
Space and water heating			1769.3455	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			1135.7506	(483)
Dwelling Primary energy Rate (DPER)			26.1900	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)

100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4004	(33)
Main dwelling						
Party Wall			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
E5 Ground floor (normal)	26.1200	0.1600	4.1792
P1 Party wall - Ground floor	6.7000	0.0800	0.5360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.5100	10.6334	0.6300	0.7000	0.7700	21.1556	(74)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	21.1556	40.4294	68.6994	110.3488	148.6500	159.1342	148.5721	117.8730	82.5989	48.1259	26.0981	17.6363	(83)
Total gains	390.3763	416.5911	430.4906	459.4499	481.5464	477.7828	456.1185	426.5907	399.9848	378.9545	375.8175	380.1258	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area	0.9863	0.9793	0.9650	0.9165	0.8041	0.6161	0.4579	0.5075	0.7482	0.9265	0.9750	0.9878	(86)
MIT	19.8682	20.0079	20.2338	20.5688	20.8348	20.9664	20.9937	20.9897	20.9137	20.6043	20.1992	19.8500	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house	0.9823	0.9733	0.9542	0.8909	0.7495	0.5303	0.3561	0.4015	0.6673	0.8986	0.9666	0.9843	(89)
MIT 2	18.6779	18.8557	19.1403	19.5542	19.8488	19.9757	19.9926	19.9927	19.9341	19.6051	19.1069	18.6616	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.2464	19.4060	19.6626	20.0388	20.3197	20.4489	20.4707	20.4689	20.4019	20.0824	19.6286	19.2292	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2464	19.4060	19.6626	20.0388	20.3197	20.4489	20.4707	20.4689	20.4019	20.0824	19.6286	19.2292	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9786	0.9692	0.9503	0.8925	0.7688	0.5702	0.4048	0.4522	0.7022	0.9017	0.9630	0.9809	(94)
Useful gains	382.0369	403.7423	409.1120	410.0458	370.1961	272.4163	184.6523	192.9075	280.8811	341.7121	361.9149	372.8732	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	739.6762	716.0316	648.0698	541.8803	418.3850	280.9017	185.8974	195.0296	303.9017	460.2560	610.9027	736.3292	(97)
Space heating kWh	266.0836	209.8584	177.7846	94.9208	35.8525	0.0000	0.0000	0.0000	0.0000	88.1966	179.2713	270.4112	(98a)
Space heating requirement - total per year (kWh/year)												1322.3791	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	266.0836	209.8584	177.7846	94.9208	35.8525	0.0000	0.0000	0.0000	0.0000	88.1966	179.2713	270.4112	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1322.3791	
Space heating per m2										(98c) / (4) =		30.4977	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	266.0836	209.8584	177.7846	94.9208	35.8525	0.0000	0.0000	0.0000	0.0000	88.1966	179.2713	270.4112	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	288.2813	227.3655	192.6160	102.8395	38.8435	0.0000	0.0000	0.0000	0.0000	95.5543	194.2267	292.9699	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.8928	84.6357	84.1200	83.0133	81.3926	79.8000	79.8000	79.8000	79.8000	82.8348	84.2586	84.9502	(217)
Fuel for water heating, kWh/month	216.0963	191.8904	205.7578	185.0465	184.1087	170.5061	169.2907	175.3325	176.4869	188.0732	194.7524	213.8282	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1432.6968	(211)
Space heating fuel - main system 2	0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2271.1698	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3548.9405	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1432.6968	0.2100	300.8663	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2271.1698	0.2100	476.9457	(264)
Space and water heating			777.8120	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			760.1094	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			17.5300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1432.6968	1.1300	1618.9473	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2271.1698	1.1300	2566.4218	(278)
Space and water heating			4185.3692	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			4103.8667	(286)
Target Primary Energy Rate (TPER)			94.6500	(287)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.52	**TER**	17.53
Environmental	99 A	**% DER < TER**			91.33
CO_2 Emissions (t/year)	0.04	**DFEE**	24.98	**TFEE**	39.86
Compliance Check	See BREL	**% DFEE < TFEE**			37.33
% DPER < TPER	72.33	**DPER**	26.19	**TPER**	94.65

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2622	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	38.2833	38.2073	38.1327	37.7826	37.7171	37.4122	37.4122	37.3557	37.5296	37.7171	37.8496	37.9882	(39)
Average = Sum(39)m / 12 =												37.7823	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8829	0.8812	0.8794	0.8714	0.8699	0.8628	0.8628	0.8615	0.8655	0.8699	0.8729	0.8761	(40)
HLP (average)												0.8714	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		449.4572	(64a)
Heat gains from water heating, kWh/month	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.4004	291.4783	279.0119	271.5070	258.2448	250.2442	241.2477	240.9702	247.9561	254.7841	268.8582	277.3654	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.5100	10.6334	0.6800	0.7000	0.7700	22.8346	(74)

Solar gains	22.8346	43.6381	74.1517	119.1067	160.4476	171.7639	160.3635	127.2280	89.1544	51.9454	28.1694	19.0360	(83)
Total gains	306.2350	335.1164	353.1636	390.6137	418.6924	422.0081	401.6112	368.1982	337.1105	306.7295	297.0275	296.4015	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.2536	75.4034	75.5508	76.2509	76.3833	77.0059	77.0059	77.1223	76.7649	76.3833	76.1159	75.8383	
alpha	6.0169	6.0269	6.0367	6.0834	6.0922	6.1337	6.1337	6.1415	6.1177	6.0922	6.0744	6.0559	
util living area	0.9937	0.9881	0.9748	0.9168	0.7731	0.5597	0.4089	0.4644	0.7263	0.9410	0.9862	0.9948	(86)
MIT	20.0970	20.2342	20.4372	20.7324	20.9268	20.9912	20.9989	20.9977	20.9618	20.7199	20.3702	20.0733	(87)
Th 2	20.1820	20.1835	20.1850	20.1919	20.1932	20.1992	20.1992	20.2003	20.1969	20.1932	20.1906	20.1879	(88)
util rest of house	0.9919	0.9847	0.9673	0.8938	0.7237	0.4930	0.3350	0.3849	0.6570	0.9194	0.9816	0.9933	(89)

MIT 2	19.3619	19.4988	19.6989	19.9825	20.1464	20.1953	20.1989	20.1996	20.1771	19.9774	19.6399	19.3432	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.7130	19.8500	20.0515	20.3406	20.5192	20.5754	20.5810	20.5808	20.5519	20.3321	19.9887	19.6919	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7130	19.8500	20.0515	20.3406	20.5192	20.5754	20.5810	20.5808	20.5519	20.3321	19.9887	19.6919	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9906	0.9830	0.9658	0.8984	0.7445	0.5246	0.3703	0.4229	0.6887	0.9236	0.9802	0.9921	(94)
Useful gains	303.3594	329.4140	341.1015	350.9316	311.7123	221.3968	148.7245	155.7125	232.1828	283.2855	291.1469	294.0721	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	590.0611	571.2001	516.7553	432.2575	332.6333	223.5540	148.9382	156.1774	242.1369	367.0655	487.8331	588.5098	(97)
Space heating kWh	213.3060	162.4802	130.6865	58.5546	15.5652	0.0000	0.0000	0.0000	0.0000	62.3323	141.6140	219.0616	(98a)
Space heating requirement - total per year (kWh/year)												1003.6005	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	213.3060	162.4802	130.6865	58.5546	15.5652	0.0000	0.0000	0.0000	0.0000	62.3323	141.6140	219.0616	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1003.6005	
Space heating per m2											(98c) / (4) =	23.1458	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	351.6746	276.8502	283.9035	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9488	0.9780	0.9631	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	333.6631	270.7643	273.4244	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	464.2337	441.9674	404.3185	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	94.0108	127.3751	97.3852	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	23.5027	31.8438	24.3463	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												79.6928	(107)
Energy for space heating												23.1458	(99)
Energy for space cooling												1.8379	(108)
Total												24.9837	(109)
Fabric Energy Efficiency (DFEE)												25.0	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4004			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
E5 Ground floor (normal)	26.1200	0.1600	4.1792
P1 Party wall - Ground floor	6.7000	0.0800	0.5360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)													
	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							449.4572	(64a)
Heat gains from water heating, kWh/month													
	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains													
	281.3655	289.2254	276.9770	269.4043	256.2100	248.1415	239.2128	238.9354	245.8534	252.7493	266.7555	275.3306	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.5100	10.6334	0.6300	0.7000	0.7700	21.1556	(74)

Solar gains	21.1556	40.4294	68.6994	110.3488	148.6500	159.1342	148.5721	117.8730	82.5989	48.1259	26.0981	17.6363	(83)
Total gains	302.5211	329.6548	345.6764	379.7531	404.8599	407.2757	387.7849	356.8084	328.4523	300.8752	292.8536	292.9669	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area													
	0.9953	0.9920	0.9850	0.9562	0.8740	0.6991	0.5327	0.5955	0.8382	0.9674	0.9909	0.9960	(86)
MIT	19.6530	19.8002	20.0415	20.4197	20.7488	20.9416	20.9877	20.9793	20.8519	20.4498	20.0031	19.6349	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house													
	0.9938	0.9895	0.9799	0.9404	0.8293	0.6103	0.4172	0.4765	0.7672	0.9525	0.9875	0.9947	(89)
MIT 2	18.7501	18.8982	19.1389	19.5145	19.8141	19.9675	19.9914	19.9903	19.9082	19.5501	19.1092	18.7392	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.1814	19.3290	19.5700	19.9468	20.2605	20.4327	20.4673	20.4627	20.3590	19.9798	19.5362	19.1670	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1814	19.3290	19.5700	19.9468	20.2605	20.4327	20.4673	20.4627	20.3590	19.9798	19.5362	19.1670	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9923	0.9875	0.9774	0.9397	0.8427	0.6508	0.4726	0.5335	0.7958	0.9524	0.9856	0.9934	(94)
Useful gains	300.1909	325.5197	337.8666	356.8653	341.1947	265.0632	183.2608	190.3511	261.3799	286.5685	288.6388	291.0316	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	736.4581	712.2306	643.5130	537.4069	415.5127	280.1240	185.7313	194.7308	301.8283	455.2778	606.3959	733.2816	(97)
Space heating kWh													
	324.5828	259.8697	227.4009	129.9899	55.2926	0.0000	0.0000	0.0000	0.0000	125.5198	228.7851	329.0340	(98a)
Space heating requirement - total per year (kWh/year)												1680.4749	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	324.5828	259.8697	227.4009	129.9899	55.2926	0.0000	0.0000	0.0000	0.0000	125.5198	228.7851	329.0340	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1680.4749	
Space heating per m2											(98c) / (4) =	38.7563	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	451.4472	355.3946	364.2795	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8313	0.9003	0.8636	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	375.2929	319.9790	314.5963	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	449.2937	427.9928	393.1341	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	53.2805	80.3623	58.4321	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	13.3201	20.0906	14.6080	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												48.0187	(107)
Energy for space heating												38.7563	(99)
Energy for space cooling												1.1074	(108)
Total												39.8638	(109)
Fabric Energy Efficiency (TFEE)												39.9	(109)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.52	**TER**	17.53
Environmental	99 A	**% DER < TER**			91.33
CO_2 Emissions (t/year)	0.04	**DFEE**	24.98	**TFEE**	39.86
Compliance Check	See BREL	**% DFEE < TFEE**			37.33
% DPER < TPER	72.33	**DPER**	26.19	**TPER**	94.65

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 10371.4500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	239.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	2.2962	(36)
Point Thermal bridges	(36a) = 0.0000	

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	

Distribution loss (46)m = 0.15 x (45)m

23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
									Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)

12Total per year (kWh/year) 2188 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)

Water heating gains (Table 5)

130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)

Total internal gains

377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.5100	10.6334	0.6800	0.7000	0.7700	22.8346	(74)

Solar gains	22.8346	43.6381	74.1517	119.1067	160.4476	171.7639	160.3635	127.2280	89.1544	51.9454	28.1694	19.0360	(83)
Total gains	400.4255	428.3880	444.3132	476.6458	501.7142	501.8506	479.2802	447.3160	417.9784	391.1442	386.3268	389.8957	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106

alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874		
util living area	0.9738	0.9579	0.9245	0.8254	0.6540	0.4613	0.3333	0.3731	0.5898	0.8473	0.9491	0.9775	(86)
MIT	20.4106	20.5254	20.6846	20.8747	20.9736	20.9973	20.9997	20.9994	20.9888	20.8739	20.6240	20.3768	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house	0.9673	0.9478	0.9071	0.7917	0.6052	0.4060	0.2744	0.3101	0.5272	0.8097	0.9354	0.9719	(89)
MIT 2	19.5541	19.6955	19.8878	20.1026	20.2003	20.2193	20.2206	20.2205	20.2138	20.1064	19.8186	19.5122	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.9632	20.0919	20.2684	20.4713	20.5696	20.5909	20.5927	20.5925	20.5840	20.4730	20.2033	19.9252	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9632	20.0919	20.2684	20.4713	20.5696	20.5909	20.5927	20.5925	20.5840	20.4730	20.2033	19.9252	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9647	0.9459	0.9082	0.8031	0.6274	0.4323	0.3025	0.3402	0.5567	0.8227	0.9351	0.9693	(94)
Useful gains	386.3049	405.2292	403.5366	382.7841	314.7755	216.9723	144.9813	152.1793	232.6949	321.7777	361.2551	377.9407	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	568.9651	551.8450	500.1363	420.3290	322.1886	217.6183	145.0364	152.2941	235.5294	358.6374	475.9766	571.2160	(97)
Space heating kWh	135.8992	98.5258	71.8701	27.0323	5.5153	0.0000	0.0000	0.0000	0.0000	27.4236	82.5995	143.7969	(98a)
Space heating requirement - total per year (kWh/year)												592.6627	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	135.8992	98.5258	71.8701	27.0323	5.5153	0.0000	0.0000	0.0000	0.0000	27.4236	82.5995	143.7969	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												592.6627	
Space heating per m2											(98c) / (4) =	13.6684	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	135.8992	98.5258	71.8701	27.0323	5.5153	0.0000	0.0000	0.0000	0.0000	27.4236	82.5995	143.7969	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	203.8488	147.7887	107.8052	40.5485	8.2730	0.0000	0.0000	0.0000	0.0000	41.1354	123.8992	215.6953	
Space heating requirement													
	203.8488	147.7887	107.8052	40.5485	8.2730	0.0000	0.0000	0.0000	0.0000	41.1354	123.8992	215.6953	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												888.9941	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												8.8899	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3354.8569	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1112.1260	0.1572	37.2586	(367)
Electrical energy for heat distribution (space & water)	8.8899	0.0000	6.0151	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			166.4171	(373)
Space and water heating			166.4171	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			65.8893	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.5200	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1112.1260	1.5818	375.0002	(467)
Electrical energy for heat distribution (space & water)	8.8899	0.0000	63.9522	(472)
Overall CO2 factor for heat network			0.4243	(486)
Total CO2 associated with community systems			1769.3455	(473)
Space and water heating			1769.3455	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			1135.7506	(483)
Dwelling Primary energy Rate (DPER)			26.1900	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)

100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4004	(33)
Main dwelling						
Party Wall			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
E5 Ground floor (normal)	26.1200	0.1600	4.1792
P1 Party wall - Ground floor	6.7000	0.0800	0.5360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.5100	10.6334	0.6300	0.7000	0.7700	21.1556	(74)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	21.1556	40.4294	68.6994	110.3488	148.6500	159.1342	148.5721	117.8730	82.5989	48.1259	26.0981	17.6363	(83)
Total gains	390.3763	416.5911	430.4906	459.4499	481.5464	477.7828	456.1185	426.5907	399.9848	378.9545	375.8175	380.1258	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area	0.9863	0.9793	0.9650	0.9165	0.8041	0.6161	0.4579	0.5075	0.7482	0.9265	0.9750	0.9878	(86)
MIT	19.8682	20.0079	20.2338	20.5688	20.8348	20.9664	20.9937	20.9897	20.9137	20.6043	20.1992	19.8500	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house	0.9823	0.9733	0.9542	0.8909	0.7495	0.5303	0.3561	0.4015	0.6673	0.8986	0.9666	0.9843	(89)
MIT 2	18.6779	18.8557	19.1403	19.5542	19.8488	19.9757	19.9926	19.9927	19.9341	19.6051	19.1069	18.6616	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.2464	19.4060	19.6626	20.0388	20.3197	20.4489	20.4707	20.4689	20.4019	20.0824	19.6286	19.2292	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2464	19.4060	19.6626	20.0388	20.3197	20.4489	20.4707	20.4689	20.4019	20.0824	19.6286	19.2292	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9786	0.9692	0.9503	0.8925	0.7688	0.5702	0.4048	0.4522	0.7022	0.9017	0.9630	0.9809	(94)
Useful gains	382.0369	403.7423	409.1120	410.0458	370.1961	272.4163	184.6523	192.9075	280.8811	341.7121	361.9149	372.8732	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	739.6762	716.0316	648.0698	541.8803	418.3850	280.9017	185.8974	195.0296	303.9017	460.2560	610.9027	736.3292	(97)
Space heating kWh	266.0836	209.8584	177.7846	94.9208	35.8525	0.0000	0.0000	0.0000	0.0000	88.1966	179.2713	270.4112	(98a)
Space heating requirement - total per year (kWh/year)												1322.3791	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	266.0836	209.8584	177.7846	94.9208	35.8525	0.0000	0.0000	0.0000	0.0000	88.1966	179.2713	270.4112	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1322.3791	
Space heating per m2										(98c) / (4) =		30.4977	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	266.0836	209.8584	177.7846	94.9208	35.8525	0.0000	0.0000	0.0000	0.0000	88.1966	179.2713	270.4112	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	288.2813	227.3655	192.6160	102.8395	38.8435	0.0000	0.0000	0.0000	0.0000	95.5543	194.2267	292.9699	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.8928	84.6357	84.1200	83.0133	81.3926	79.8000	79.8000	79.8000	79.8000	82.8348	84.2586	84.9502	(217)
Fuel for water heating, kWh/month	216.0963	191.8904	205.7578	185.0465	184.1087	170.5061	169.2907	175.3325	176.4869	188.0732	194.7524	213.8282	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1432.6968	(211)
Space heating fuel - main system 2	0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2271.1698	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3548.9405	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1432.6968	0.2100	300.8663	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2271.1698	0.2100	476.9457	(264)
Space and water heating			777.8120	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			760.1094	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			17.5300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1432.6968	1.1300	1618.9473	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2271.1698	1.1300	2566.4218	(278)
Space and water heating			4185.3692	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			4103.8667	(286)
Target Primary Energy Rate (TPER)			94.6500	(287)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.52	**TER**	17.53
Environmental	99 A	**% DER < TER**			91.33
CO_2 Emissions (t/year)	0.04	**DFEE**	24.98	**TFEE**	39.86
Compliance Check	See BREL	**% DFEE < TFEE**			37.33
% DPER < TPER	72.33	**DPER**	26.19	**TPER**	94.65

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	

Distribution loss (46)m = 0.15 x (45)m

23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
									Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.5100	10.6334	0.6800	0.7000	0.7700	22.8346	(74)

Solar gains	22.8346	43.6381	74.1517	119.1067	160.4476	171.7639	160.3635	127.2280	89.1544	51.9454	28.1694	19.0360	(83)
Total gains	441.5954	460.5074	479.3358	502.4769	522.8682	515.2166	492.7128	462.1522	435.1792	417.5366	417.3962	428.7531	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874

util living area													
	0.9590	0.9426	0.8999	0.7989	0.6308	0.4496	0.3242	0.3612	0.5682	0.8161	0.9302	0.9650	(86)
MIT	20.5019	20.5900	20.7406	20.8964	20.9782	20.9977	20.9998	20.9995	20.9908	20.8993	20.6827	20.4655	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.9496	0.9299	0.8790	0.7635	0.5828	0.3956	0.2669	0.3002	0.5072	0.7756	0.9129	0.9568	(89)
MIT 2	19.6658	19.7730	19.9518	20.1245	20.2041	20.2195	20.2206	20.2206	20.2151	20.1313	19.8872	19.6214	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0651	20.1632	20.3286	20.4931	20.5738	20.5911	20.5928	20.5926	20.5856	20.4981	20.2672	20.0246	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0651	20.1632	20.3286	20.4931	20.5738	20.5911	20.5928	20.5926	20.5856	20.4981	20.2672	20.0246	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9474	0.9289	0.8821	0.7764	0.6048	0.4213	0.2943	0.3293	0.5361	0.7907	0.9141	0.9544	(94)
Useful gains	418.3821	427.7553	422.8355	390.0987	316.2567	217.0700	144.9905	152.2015	233.2837	330.1607	381.5302	409.1992	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	572.6689	554.4364	502.3225	421.1208	322.3416	217.6284	145.0374	152.2965	235.5903	359.5492	478.2975	574.8268	(97)
Space heating kWh													
	114.7894	85.1297	59.1383	22.3360	4.5272	0.0000	0.0000	0.0000	0.0000	21.8650	69.6724	123.2269	(98a)
Space heating requirement - total per year (kWh/year)												500.6849	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	114.7894	85.1297	59.1383	22.3360	4.5272	0.0000	0.0000	0.0000	0.0000	21.8650	69.6724	123.2269	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												500.6849	
Space heating per m2											(98c) / (4) =	11.5472	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	114.7894	85.1297	59.1383	22.3360	4.5272	0.0000	0.0000	0.0000	0.0000	21.8650	69.6724	123.2269	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	172.1841	127.6945	88.7074	33.5040	6.7907	0.0000	0.0000	0.0000	0.0000	32.7975	104.5087	184.8404	
Space heating requirement													
	172.1841	127.6945	88.7074	33.5040	6.7907	0.0000	0.0000	0.0000	0.0000	32.7975	104.5087	184.8404	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												751.0273	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												7.5103	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3216.8901	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	751.0273	4.4400	33.3456	(340a)
Space heating total			33.3456	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			196.6790	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8013	(357)
SAP value		87.0106	
SAP rating (Section 12)		87	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1075.3349	0.1573	31.5006	(367)
Electrical energy for heat distribution (space & water)	7.5103	0.0000	5.7991	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			160.4431	(373)
Space and water heating			160.4431	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			59.9153	(383)
CO2 emissions per m2			1.3800	(384)
EI value			99.0914	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	43.3600 (1b)	x 2.4500 (2b)	= 106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)

Adj infilt rate

	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104 (22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 10371.4500 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

Thermal bridges (User defined value 0.030 * total exposed area) 2.2962 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)

Average = Sum(39)m / 12 = 36.3250

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Total per year (kWh/year) = Sum(64)m = 2187.6523 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)													

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.5100	12.7500	0.6800	0.7000	0.7700	27.3798	(74)

Solar gains	27.3798	46.9693	79.5710	129.9934	168.5258	193.2019	177.1418	143.5631	101.3139	59.2783	33.3677	22.8947	(83)
Total gains	446.1406	463.8387	484.7551	513.3636	530.9465	536.6546	509.4910	478.4873	447.3387	424.8696	422.5946	432.6117	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area													
	0.9536	0.9362	0.8826	0.7697	0.5919	0.3919	0.2780	0.3111	0.5310	0.7816	0.9180	0.9605	(86)
MIT	20.5368	20.6201	20.7804	20.9188	20.9854	20.9990	20.9999	20.9998	20.9939	20.9251	20.7214	20.5000	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.9430	0.9222	0.8587	0.7318	0.5430	0.3396	0.2225	0.2521	0.4704	0.7368	0.8981	0.9512	(89)
MIT 2	19.7087	19.8093	19.9974	20.1473	20.2101	20.2203	20.2207	20.2207	20.2172	20.1570	19.9327	19.6639	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.1042	20.1965	20.3714	20.5158	20.5804	20.5922	20.5929	20.5928	20.5882	20.5239	20.3094	20.0633	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1042	20.1965	20.3714	20.5158	20.5804	20.5922	20.5929	20.5928	20.5882	20.5239	20.3094	20.0633	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9412	0.9217	0.8636	0.7466	0.5658	0.3646	0.2490	0.2803	0.4992	0.7549	0.9006	0.9491	(94)
Useful gains	419.9089	427.5163	418.6489	383.2788	300.4156	195.6521	126.8635	134.1091	223.2993	320.7549	380.5983	410.5950	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	563.1907	544.7494	485.7166	407.4143	304.4172	195.8723	126.8788	134.1416	224.7865	342.3231	465.3015	565.3352	(97)
Space heating kWh													
	106.6017	78.7807	49.8984	17.3775	2.9772	0.0000	0.0000	0.0000	0.0000	16.0468	60.9863	115.1267	(98a)
Space heating requirement - total per year (kWh/year)												447.7953	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	106.6017	78.7807	49.8984	17.3775	2.9772	0.0000	0.0000	0.0000	0.0000	16.0468	60.9863	115.1267	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												447.7953	
Space heating per m2											(98c) / (4) =	10.3274	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	106.6017	78.7807	49.8984	17.3775	2.9772	0.0000	0.0000	0.0000	0.0000	16.0468	60.9863	115.1267	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	159.9025	118.1710	74.8476	26.0663	4.4658	0.0000	0.0000	0.0000	0.0000	24.0702	91.4795	172.6901	
Space heating requirement													
	159.9025	118.1710	74.8476	26.0663	4.4658	0.0000	0.0000	0.0000	0.0000	24.0702	91.4795	172.6901	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year												
Space heating fuel - community heating											671.6929	(307)
Space heating fuel - secondary											0.0000	(309)
Water heating fuel - community heating											3281.4784	(310)
Efficiency of water heater											0.0000	(311)
Electricity used for heat distribution											6.7169	(313)
Space cooling fuel											0.0000	(321)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)												
mechanical ventilation fans (SFP = 0.0920)											11.9235	(330a)
Total electricity for the above, kWh/year											11.9235	(331)
Electricity for lighting (calculated in Appendix L)											130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											-1054.7470	(333)
Wind generation											0.0000	(334)
Hydro-electric generation (Appendix N)											0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)											0.0000	(335)
Appendix Q - special features												
Energy saved or generated											-0.0000	(336)
Energy used											0.0000	(337)
Total delivered energy for all uses											3041.0296	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	671.6929	6.5500	43.9959	(340a)
Space heating total			43.9959	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			244.3970	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1054.1790	0.1578	28.2601	(367)
Electrical energy for heat distribution (space & water)	6.7169	0.0000	5.6776	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			157.0812	(373)
Space and water heating			157.0812	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			44.3213	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1054.1790	1.5841	283.7373	(467)
Electrical energy for heat distribution (space & water)	6.7169	0.0000	60.5299	(472)
Overall CO2 factor for heat network			0.4236	(486)
Total CO2 associated with community systems			1674.6602	(473)
Space and water heating			1674.6602	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			970.3352	(483)

SAP 10 EPC IMPROVEMENTS

Rev D - South

Current energy efficiency rating:	B 87
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: B 87
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£41	£41	£0
Community scheme	£363	£363	£0
Space heating	£151	£151	£0
Water heating	£215	£215	£0
Lighting	£37	£37	£0
Generated (PV)	-£159	-£159	£0
Total cost of fuels	£245	£245	£0
Total cost of uses	£244	£244	£0
Delivered energy	70 kWh/m²	70 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.0 tonnes	0.0 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	22 kWh/m²	22 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)

Total net area of external elements Aum(A, m2)												76.5400	(31)
Fabric heat loss, W/K = Sum (A x U)												(26)...(30) + (32) = 16.5005	(33)
Main dwelling													
Party Wall												31.3600 0.0000 0.0000 70.0000 2195.2000	(32)
Party Ceiling 1												43.3600 30.0000 1300.8000	(32b)
Internal TF Wall												68.4500 9.0000 616.0500	(32c)
Heat capacity Cm = Sum(A x k)												(28)...(30) + (32) + (32a)...(32e) = 10371.4500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)													2.2962 (36)
Point Thermal bridges												(36a) =	0.0000
Total fabric heat loss												(33) + (36) + (36a) =	18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.5100	10.6334	0.6800	0.7000	0.7700	22.8346	(74)

Solar gains	22.8346	43.6381	74.1517	119.1067	160.4476	171.7639	160.3635	127.2280	89.1544	51.9454	28.1694	19.0360	(83)
Total gains	441.5954	460.5074	479.3358	502.4769	522.8682	515.2166	492.7128	462.1522	435.1792	417.5366	417.3962	428.7531	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area													
	0.9590	0.9426	0.8999	0.7989	0.6308	0.4496	0.3242	0.3612	0.5682	0.8161	0.9302	0.9650	(86)
MIT	20.5019	20.5900	20.7406	20.8964	20.9782	20.9977	20.9998	20.9995	20.9908	20.8993	20.6827	20.4655	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.9496	0.9299	0.8790	0.7635	0.5828	0.3956	0.2669	0.3002	0.5072	0.7756	0.9129	0.9568	(89)
MIT 2	19.6658	19.7730	19.9518	20.1245	20.2041	20.2195	20.2206	20.2206	20.2151	20.1313	19.8872	19.6214	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0651	20.1632	20.3286	20.4931	20.5738	20.5911	20.5928	20.5926	20.5856	20.4981	20.2672	20.0246	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0651	20.1632	20.3286	20.4931	20.5738	20.5911	20.5928	20.5926	20.5856	20.4981	20.2672	20.0246	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9474	0.9289	0.8821	0.7764	0.6048	0.4213	0.2943	0.3293	0.5361	0.7907	0.9141	0.9544	(94)
Useful gains	418.3821	427.7553	422.8355	390.0987	316.2567	217.0700	144.9905	152.2015	233.2837	330.1607	381.5302	409.1992	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	572.6689	554.4364	502.3225	421.1208	322.3416	217.6284	145.0374	152.2965	235.5903	359.5492	478.2975	574.8268	(97)
Space heating kWh													
	114.7894	85.1297	59.1383	22.3360	4.5272	0.0000	0.0000	0.0000	0.0000	21.8650	69.6724	123.2269	(98a)
Space heating requirement - total per year (kWh/year)												500.6849	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	114.7894	85.1297	59.1383	22.3360	4.5272	0.0000	0.0000	0.0000	0.0000	21.8650	69.6724	123.2269	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												500.6849	
Space heating per m2											(98c) / (4) =	11.5472	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	114.7894	85.1297	59.1383	22.3360	4.5272	0.0000	0.0000	0.0000	0.0000	21.8650	69.6724	123.2269	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	172.1841	127.6945	88.7074	33.5040	6.7907	0.0000	0.0000	0.0000	0.0000	32.7975	104.5087	184.8404	
Space heating requirement													
	172.1841	127.6945	88.7074	33.5040	6.7907	0.0000	0.0000	0.0000	0.0000	32.7975	104.5087	184.8404	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												751.0273	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												7.5103	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)

Appendix Q - special features

Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3216.8901	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	751.0273	4.4400	33.3456	(340a)
Space heating total			33.3456	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			196.6790	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8013	(357)
SAP value		87.0106	
SAP rating (Section 12)		87	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1075.3349	0.1573	31.5006	(367)
Electrical energy for heat distribution (space & water)	7.5103	0.0000	5.7991	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			160.4431	(373)
Space and water heating			160.4431	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			59.9153	(383)
CO2 emissions per m2			1.3800	(384)
EI value			99.0914	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

Measured/design AP50 3.0000 (17)
Infiltration rate 0.1500 (18)
Number of sides sheltered 3 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.2962 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)
Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
									Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)

Water heating gains (Table 5)

	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)

Total internal gains

	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.5100	12.7500	0.6800	0.7000	0.7700	27.3798	(74)

Solar gains	27.3798	46.9693	79.5710	129.9934	168.5258	193.2019	177.1418	143.5631	101.3139	59.2783	33.3677	22.8947	(83)
Total gains	446.1406	463.8387	484.7551	513.3636	530.9465	536.6546	509.4910	478.4873	447.3387	424.8696	422.5946	432.6117	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area	0.9536	0.9362	0.8826	0.7697	0.5919	0.3919	0.2780	0.3111	0.5310	0.7816	0.9180	0.9605	(86)
MIT	20.5368	20.6201	20.7804	20.9188	20.9854	20.9990	20.9999	20.9998	20.9939	20.9251	20.7214	20.5000	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house	0.9430	0.9222	0.8587	0.7318	0.5430	0.3396	0.2225	0.2521	0.4704	0.7368	0.8981	0.9512	(89)
MIT 2	19.7087	19.8093	19.9974	20.1473	20.2101	20.2203	20.2207	20.2207	20.2172	20.1570	19.9327	19.6639	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.1042	20.1965	20.3714	20.5158	20.5804	20.5922	20.5929	20.5928	20.5882	20.5239	20.3094	20.0633	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1042	20.1965	20.3714	20.5158	20.5804	20.5922	20.5929	20.5928	20.5882	20.5239	20.3094	20.0633	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9412	0.9217	0.8636	0.7466	0.5658	0.3646	0.2490	0.2803	0.4992	0.7549	0.9006	0.9491	(94)
Useful gains	419.9089	427.5163	418.6489	383.2788	300.4156	195.6521	126.8635	134.1091	223.2993	320.7549	380.5983	410.5950	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	563.1907	544.7494	485.7166	407.4143	304.4172	195.8723	126.8788	134.1416	224.7865	342.3231	465.3015	565.3352	(97)
Space heating kWh	106.6017	78.7807	49.8984	17.3775	2.9772	0.0000	0.0000	0.0000	0.0000	16.0468	60.9863	115.1267	(98a)
Space heating requirement - total per year (kWh/year)												447.7953	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	106.6017	78.7807	49.8984	17.3775	2.9772	0.0000	0.0000	0.0000	0.0000	16.0468	60.9863	115.1267	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												447.7953	
Space heating per m2										(98c) / (4) =		10.3274	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement

	106.6017	78.7807	49.8984	17.3775	2.9772	0.0000	0.0000	0.0000	0.0000	16.0468	60.9863	115.1267	(98)

Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50

307a	159.9025	118.1710	74.8476	26.0663	4.4658	0.0000	0.0000	0.0000	0.0000	24.0702	91.4795	172.6901	

Space heating requirement

	159.9025	118.1710	74.8476	26.0663	4.4658	0.0000	0.0000	0.0000	0.0000	24.0702	91.4795	172.6901	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)

Space heating fuel for secondary/supplementary system

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement

	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50

310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	

Water heating fuel

	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)

Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	671.6929	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	6.7169	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(330a)
Total electricity for the above, kWh/year	11.9235	(331)
Electricity for lighting (calculated in Appendix L)	130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3041.0296	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	671.6929	6.5500	43.9959	(340a)
Space heating total			43.9959	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			244.3970	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1054.1790	0.1578	28.2601	(367)
Electrical energy for heat distribution (space & water)	6.7169	0.0000	5.6776	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			157.0812	(373)
Space and water heating			157.0812	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			44.3213	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1054.1790	1.5841	283.7373	(467)
Electrical energy for heat distribution (space & water)	6.7169	0.0000	60.5299	(472)
Overall CO2 factor for heat network			0.4236	(486)
Total CO2 associated with community systems			1674.6602	(473)
Space and water heating			1674.6602	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			970.3352	(483)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.49	**TER**	17.38
Environmental	99 A	**% DER < TER**			91.43
CO_2 Emissions (t/year)	0.04	**DFEE**	24.73	**TFEE**	39.32
Compliance Check	See BREL	**% DFEE < TFEE**			37.10
% DPER < TPER	72.38	**DPER**	25.92	**TPER**	93.85

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
12Total per year (kWh/year)												2188	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	6.5100	11.2829	0.6800	0.7000	0.7700	24.2294	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	24.2294	49.3197	88.8585	145.9312	196.1601	209.1274	195.6344	155.9620	108.2755	60.2726	30.4869	19.7870	(83)
Total gains	401.8204	434.0697	459.0200	503.4703	537.4268	539.2142	514.5511	476.0500	437.0995	399.4715	388.6443	390.6467	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106

alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874		
util living area	0.9733	0.9554	0.9145	0.7979	0.6155	0.4299	0.3105	0.3507	0.5659	0.8376	0.9478	0.9773	(86)
MIT	20.4138	20.5372	20.7091	20.8971	20.9809	20.9982	20.9998	20.9996	20.9910	20.8825	20.6286	20.3786	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house	0.9667	0.9449	0.8956	0.7624	0.5682	0.3781	0.2556	0.2915	0.5051	0.7990	0.9339	0.9716	(89)
MIT 2	19.5581	19.7098	19.9160	20.1252	20.2062	20.2197	20.2207	20.2206	20.2153	20.1150	19.8240	19.5144	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.9668	20.1050	20.2948	20.4939	20.5762	20.5915	20.5928	20.5927	20.5858	20.4816	20.2083	19.9271	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9668	20.1050	20.2948	20.4939	20.5762	20.5915	20.5928	20.5927	20.5858	20.4816	20.2083	19.9271	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9642	0.9431	0.8976	0.7753	0.5900	0.4028	0.2818	0.3198	0.5338	0.8126	0.9336	0.9691	(94)
Useful gains	387.4412	409.3701	411.9996	390.3540	317.1070	217.2099	145.0024	152.2183	233.3415	324.6164	362.8505	378.5689	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	569.0964	552.3221	501.0978	421.1483	322.4292	217.6430	145.0387	152.2984	235.5962	358.9474	476.1597	571.2886	(97)
Space heating kWh	135.1514	96.0638	66.2890	22.1719	3.9598	0.0000	0.0000	0.0000	0.0000	25.5423	81.5827	143.3835	(98a)
Space heating requirement - total per year (kWh/year)												574.1443	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	135.1514	96.0638	66.2890	22.1719	3.9598	0.0000	0.0000	0.0000	0.0000	25.5423	81.5827	143.3835	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												574.1443	
Space heating per m2											(98c) / (4) =	13.2413	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	135.1514	96.0638	66.2890	22.1719	3.9598	0.0000	0.0000	0.0000	0.0000	25.5423	81.5827	143.3835	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	202.7271	144.0956	99.4336	33.2579	5.9396	0.0000	0.0000	0.0000	0.0000	38.3134	122.3740	215.0752	
Space heating requirement	202.7271	144.0956	99.4336	33.2579	5.9396	0.0000	0.0000	0.0000	0.0000	38.3134	122.3740	215.0752	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												861.2165	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												8.6122	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3327.0793	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1104.7186	0.1575	36.1598	(367)
Electrical energy for heat distribution (space & water)	8.6122	0.0000	5.9739	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			165.2771	(373)
Space and water heating			165.2771	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			64.7494	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.4900	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1104.7186	1.5829	363.5212	(467)
Electrical energy for heat distribution (space & water)	8.6122	0.0000	63.5218	(472)
Overall CO2 factor for heat network			0.4242	(486)
Total CO2 associated with community systems			1757.4360	(473)
Space and water heating			1757.4360	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			1123.8412	(483)
Dwelling Primary energy Rate (DPER)			25.9200	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)

100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4004	(33)
Main dwelling						
Party Wall			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
E5 Ground floor (normal)	26.1200	0.1600	4.1792
P1 Party wall - Ground floor	6.7000	0.0800	0.5360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	6.5100	11.2829	0.6300	0.7000	0.7700	22.4479	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	22.4479	45.6933	82.3248	135.2009	181.7366	193.7504	181.2495	144.4942	100.3140	55.8408	28.2452	18.3321	(83)
Total gains	391.6686	421.8550	444.1160	484.3020	514.6330	512.3991	488.7959	453.2120	417.7000	386.6694	377.9646	380.8215	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area	0.9861	0.9783	0.9607	0.9017	0.7733	0.5803	0.4286	0.4796	0.7264	0.9215	0.9745	0.9878	(86)
MIT	19.8713	20.0200	20.2627	20.6090	20.8624	20.9741	20.9953	20.9920	20.9244	20.6178	20.2041	19.8516	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house	0.9820	0.9720	0.9489	0.8732	0.7161	0.4972	0.3326	0.3785	0.6447	0.8924	0.9659	0.9842	(89)
MIT 2	18.6817	18.8708	19.1753	19.5990	19.8739	19.9804	19.9931	19.9936	19.9420	19.6200	19.1128	18.6638	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.2499	19.4197	19.6947	20.0814	20.3461	20.4550	20.4718	20.4704	20.4112	20.0966	19.6340	19.2311	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2499	19.4197	19.6947	20.0814	20.3461	20.4550	20.4718	20.4704	20.4112	20.0966	19.6340	19.2311	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9784	0.9678	0.9451	0.8763	0.7376	0.5361	0.3785	0.4269	0.6806	0.8961	0.9623	0.9808	(94)
Useful gains	383.2007	408.2658	419.7486	424.3806	379.6107	274.6986	185.0263	193.4593	284.2746	346.4819	363.7086	373.5064	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	739.8492	716.7049	649.6517	543.9533	419.6649	281.1946	185.9478	195.1027	304.3496	460.9464	611.1672	736.4224	(97)
Space heating kWh	265.3464	207.2710	171.0479	86.0923	29.8003	0.0000	0.0000	0.0000	0.0000	85.1616	178.1702	270.0095	(98a)
Space heating requirement - total per year (kWh/year)												1292.8994	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	265.3464	207.2710	171.0479	86.0923	29.8003	0.0000	0.0000	0.0000	0.0000	85.1616	178.1702	270.0095	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1292.8994	
Space heating per m2											(98c) / (4) =	29.8178	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	265.3464	207.2710	171.0479	86.0923	29.8003	0.0000	0.0000	0.0000	0.0000	85.1616	178.1702	270.0095	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	287.4826	224.5623	185.3174	93.2745	32.2864	0.0000	0.0000	0.0000	0.0000	92.2661	193.0338	292.5347	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.8867	84.6079	84.0333	82.8146	81.1645	79.8000	79.8000	79.8000	79.8000	82.7648	84.2447	84.9469	(217)
Fuel for water heating, kWh/month	216.1119	191.9534	205.9701	185.4906	184.6260	170.5061	169.2907	175.3325	176.4869	188.2323	194.7845	213.8364	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1400.7577	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2272.6216	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3518.4533	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1400.7577	0.2100	294.1591	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2272.6216	0.2100	477.2505	(264)
Space and water heating			771.4097	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			753.7071	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			17.3800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1400.7577	1.1300	1582.8562	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2272.6216	1.1300	2568.0624	(278)
Space and water heating			4150.9186	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			4069.4162	(286)
Target Primary Energy Rate (TPER)			93.8500	(287)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.49	**TER**	17.38
Environmental	99 A	**% DER < TER**			91.43
CO_2 Emissions (t/year)	0.04	**DFEE**	24.73	**TFEE**	39.32
Compliance Check	See BREL	**% DFEE < TFEE**			37.10
% DPER < TPER	72.38	**DPER**	25.92	**TPER**	93.85

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2622	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	38.2833	38.2073	38.1327	37.7826	37.7171	37.4122	37.4122	37.3557	37.5296	37.7171	37.8496	37.9882	(39)
Average = Sum(39)m / 12 =												37.7823	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8829	0.8812	0.8794	0.8714	0.8699	0.8628	0.8628	0.8615	0.8655	0.8699	0.8729	0.8761	(40)
HLP (average)												0.8714	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
							Total per year (kWh/year) = Sum(64)m =				663.9767	(64)
12Total per year (kWh/year)											664	(64)

Electric shower(s)

39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
				Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							449.4572	(64a)

Heat gains from water heating, kWh/month

27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.4004	291.4783	279.0119	271.5070	258.2448	250.2442	241.2477	240.9702	247.9561	254.7841	268.8582	277.3654	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	6.5100	11.2829	0.6800	0.7000	0.7700	24.2294	(81)

Solar gains	24.2294	49.3197	88.8585	145.9312	196.1601	209.1274	195.6344	155.9620	108.2755	60.2726	30.4869	19.7870	(83)
Total gains	307.6298	340.7981	367.8704	417.4382	454.4050	459.3717	436.8821	396.9323	356.2316	315.0568	299.3451	297.1524	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.2536	75.4034	75.5508	76.2509	76.3833	77.0059	77.0059	77.1223	76.7649	76.3833	76.1159	75.8383	
alpha	6.0169	6.0269	6.0367	6.0834	6.0922	6.1337	6.1337	6.1415	6.1177	6.0922	6.0744	6.0559	
util living area	0.9936	0.9871	0.9697	0.8947	0.7287	0.5166	0.3762	0.4315	0.6955	0.9343	0.9857	0.9948	(86)
MIT	20.1006	20.2484	20.4708	20.7739	20.9469	20.9942	20.9993	20.9985	20.9697	20.7355	20.3760	20.0753	(87)
Th 2	20.1820	20.1835	20.1850	20.1919	20.1932	20.1992	20.1992	20.2003	20.1969	20.1932	20.1906	20.1879	(88)
util rest of house	0.9917	0.9834	0.9609	0.8680	0.6780	0.4540	0.3081	0.3572	0.6263	0.9110	0.9809	0.9932	(89)

MIT 2	19.3655	19.5127	19.7309	20.0182	20.1601	20.1967	20.1990	20.1999	20.1815	19.9911	19.6454	19.3452	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.7166	19.8641	20.0843	20.3792	20.5359	20.5776	20.5813	20.5813	20.5579	20.3466	19.9944	19.6939	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7166	19.8641	20.0843	20.3792	20.5359	20.5776	20.5813	20.5813	20.5579	20.3466	19.9944	19.6939	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9904	0.9816	0.9597	0.8747	0.7001	0.4838	0.3406	0.3927	0.6583	0.9160	0.9795	0.9920	(94)
Useful gains	304.6782	334.5440	353.0285	365.1350	318.1505	222.2405	148.8142	155.8869	234.5153	288.6032	293.2095	294.7884	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	590.1987	571.7367	518.0055	433.7126	333.2632	223.6364	148.9477	156.1956	242.3645	367.6140	488.0473	588.5839	(97)
Space heating kWh	212.4272	159.3935	122.7429	49.3759	11.2439	0.0000	0.0000	0.0000	0.0000	58.7841	140.2832	218.5839	(98a)
Space heating requirement - total per year (kWh/year)												972.8344	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	212.4272	159.3935	122.7429	49.3759	11.2439	0.0000	0.0000	0.0000	0.0000	58.7841	140.2832	218.5839	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												972.8344	
Space heating per m2											(98c) / (4) =	22.4362	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	351.6746	276.8502	283.9035	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9652	0.9857	0.9743	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	339.4376	272.8933	276.5995	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	507.9054	483.1931	437.9038	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	121.2968	156.4631	120.0104	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	30.3242	39.1158	30.0026	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												99.4426	(107)
Energy for space heating												22.4362	(99)
Energy for space cooling												2.2934	(108)
Total												24.7296	(109)
Fabric Energy Efficiency (DFEE)												24.7	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4004			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
E5 Ground floor (normal)	26.1200	0.1600	4.1792
P1 Party wall - Ground floor	6.7000	0.0800	0.5360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)													
	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							449.4572	(64a)
Heat gains from water heating, kWh/month													
	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains													
	281.3655	289.2254	276.9770	269.4043	256.2100	248.1415	239.2128	238.9354	245.8534	252.7493	266.7555	275.3306	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	6.5100	11.2829	0.6300	0.7000	0.7700	22.4479	(81)

Solar gains	22.4479	45.6933	82.3248	135.2009	181.7366	193.7504	181.2495	144.4942	100.3140	55.8408	28.2452	18.3321	(83)
Total gains	303.8134	334.9187	359.3018	404.6052	437.9465	441.8920	420.4623	383.4296	346.1675	308.5901	295.0007	293.6626	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area													
	0.9952	0.9915	0.9825	0.9452	0.8445	0.6567	0.4944	0.5592	0.8160	0.9642	0.9907	0.9960	(86)
MIT	19.6562	19.8132	20.0737	20.4693	20.7900	20.9557	20.9912	20.9843	20.8704	20.4664	20.0084	19.6366	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house													
	0.9937	0.9888	0.9767	0.9264	0.7948	0.5688	0.3857	0.4450	0.7414	0.9481	0.9872	0.9947	(89)
MIT 2	18.7533	18.9109	19.1701	19.5600	19.8458	19.9746	19.9924	19.9919	19.9202	19.5655	19.1144	18.7410	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.1846	19.3419	19.6017	19.9943	20.2968	20.4432	20.4694	20.4659	20.3740	19.9958	19.5414	19.1688	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1846	19.3419	19.6017	19.9943	20.2968	20.4432	20.4694	20.4659	20.3740	19.9958	19.5414	19.1688	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9922	0.9867	0.9740	0.9266	0.8114	0.6094	0.4378	0.4997	0.7723	0.9483	0.9852	0.9933	(94)
Useful gains	301.4330	330.4531	349.9633	374.9115	355.3441	269.3013	184.0701	191.5925	267.3303	292.6392	290.6341	291.7039	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	736.6173	712.8642	645.0723	539.7186	417.2709	280.6271	185.8334	194.8841	302.5546	456.0539	606.6499	733.3670	(97)
Space heating kWh													
	323.7771	256.9802	219.5611	118.6611	46.0736	0.0000	0.0000	0.0000	0.0000	121.5806	227.5314	328.5973	(98a)
Space heating requirement - total per year (kWh/year)												1642.7624	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	323.7771	256.9802	219.5611	118.6611	46.0736	0.0000	0.0000	0.0000	0.0000	121.5806	227.5314	328.5973	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1642.7624	
Space heating per m2											(98c) / (4) =	37.8866	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	451.4472	355.3946	364.2795	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8653	0.9238	0.8901	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	390.6458	328.3275	324.2452	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	489.7542	466.1872	424.2498	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	71.3581	102.5676	74.4034	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	17.8395	25.6419	18.6008	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												62.0823	(107)
Energy for space heating												37.8866	(99)
Energy for space cooling												1.4318	(108)
Total												39.3184	(109)
Fabric Energy Efficiency (TFEE)												39.3	(109)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.49	**TER**	17.38
Environmental	99 A	**% DER < TER**			91.43
CO_2 Emissions (t/year)	0.04	**DFEE**	24.73	**TFEE**	39.32
Compliance Check	See BREL	**% DFEE < TFEE**			37.10
% DPER < TPER	72.38	**DPER**	25.92	**TPER**	93.85

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
12Total per year (kWh/year)												2188	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	6.5100	11.2829	0.6800	0.7000	0.7700	24.2294	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	24.2294	49.3197	88.8585	145.9312	196.1601	209.1274	195.6344	155.9620	108.2755	60.2726	30.4869	19.7870	(83)
Total gains	401.8204	434.0697	459.0200	503.4703	537.4268	539.2142	514.5511	476.0500	437.0995	399.4715	388.6443	390.6467	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106

alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874		
util living area	0.9733	0.9554	0.9145	0.7979	0.6155	0.4299	0.3105	0.3507	0.5659	0.8376	0.9478	0.9773	(86)
MIT	20.4138	20.5372	20.7091	20.8971	20.9809	20.9982	20.9998	20.9996	20.9910	20.8825	20.6286	20.3786	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house	0.9667	0.9449	0.8956	0.7624	0.5682	0.3781	0.2556	0.2915	0.5051	0.7990	0.9339	0.9716	(89)
MIT 2	19.5581	19.7098	19.9160	20.1252	20.2062	20.2197	20.2207	20.2206	20.2153	20.1150	19.8240	19.5144	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.9668	20.1050	20.2948	20.4939	20.5762	20.5915	20.5928	20.5927	20.5858	20.4816	20.2083	19.9271	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9668	20.1050	20.2948	20.4939	20.5762	20.5915	20.5928	20.5927	20.5858	20.4816	20.2083	19.9271	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9642	0.9431	0.8976	0.7753	0.5900	0.4028	0.2818	0.3198	0.5338	0.8126	0.9336	0.9691	(94)
Useful gains	387.4412	409.3701	411.9996	390.3540	317.1070	217.2099	145.0024	152.2183	233.3415	324.6164	362.8505	378.5689	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	569.0964	552.3221	501.0978	421.1483	322.4292	217.6430	145.0387	152.2984	235.5962	358.9474	476.1597	571.2886	(97)
Space heating kWh	135.1514	96.0638	66.2890	22.1719	3.9598	0.0000	0.0000	0.0000	0.0000	25.5423	81.5827	143.3835	(98a)
Space heating requirement - total per year (kWh/year)												574.1443	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	135.1514	96.0638	66.2890	22.1719	3.9598	0.0000	0.0000	0.0000	0.0000	25.5423	81.5827	143.3835	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												574.1443	
Space heating per m2											(98c) / (4) =	13.2413	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	135.1514	96.0638	66.2890	22.1719	3.9598	0.0000	0.0000	0.0000	0.0000	25.5423	81.5827	143.3835	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	202.7271	144.0956	99.4336	33.2579	5.9396	0.0000	0.0000	0.0000	0.0000	38.3134	122.3740	215.0752	
Space heating requirement	202.7271	144.0956	99.4336	33.2579	5.9396	0.0000	0.0000	0.0000	0.0000	38.3134	122.3740	215.0752	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												861.2165	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												8.6122	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3327.0793	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1104.7186	0.1575	36.1598	(367)
Electrical energy for heat distribution (space & water)	8.6122	0.0000	5.9739	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			165.2771	(373)
Space and water heating			165.2771	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			64.7494	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.4900	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1104.7186	1.5829	363.5212	(467)
Electrical energy for heat distribution (space & water)	8.6122	0.0000	63.5218	(472)
Overall CO2 factor for heat network			0.4242	(486)
Total CO2 associated with community systems			1757.4360	(473)
Space and water heating			1757.4360	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			1123.8412	(483)
Dwelling Primary energy Rate (DPER)			25.9200	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)

100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4004	(33)
Main dwelling						
Party Wall			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
E5 Ground floor (normal)	26.1200	0.1600	4.1792
P1 Party wall - Ground floor	6.7000	0.0800	0.5360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	6.5100	11.2829	0.6300	0.7000	0.7700	22.4479	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	22.4479	45.6933	82.3248	135.2009	181.7366	193.7504	181.2495	144.4942	100.3140	55.8408	28.2452	18.3321	(83)
Total gains	391.6686	421.8550	444.1160	484.3020	514.6330	512.3991	488.7959	453.2120	417.7000	386.6694	377.9646	380.8215	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area	0.9861	0.9783	0.9607	0.9017	0.7733	0.5803	0.4286	0.4796	0.7264	0.9215	0.9745	0.9878	(86)
MIT	19.8713	20.0200	20.2627	20.6090	20.8624	20.9741	20.9953	20.9920	20.9244	20.6178	20.2041	19.8516	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house	0.9820	0.9720	0.9489	0.8732	0.7161	0.4972	0.3326	0.3785	0.6447	0.8924	0.9659	0.9842	(89)
MIT 2	18.6817	18.8708	19.1753	19.5990	19.8739	19.9804	19.9931	19.9936	19.9420	19.6200	19.1128	18.6638	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.2499	19.4197	19.6947	20.0814	20.3461	20.4550	20.4718	20.4704	20.4112	20.0966	19.6340	19.2311	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2499	19.4197	19.6947	20.0814	20.3461	20.4550	20.4718	20.4704	20.4112	20.0966	19.6340	19.2311	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9784	0.9678	0.9451	0.8763	0.7376	0.5361	0.3785	0.4269	0.6806	0.8961	0.9623	0.9808	(94)
Useful gains	383.2007	408.2658	419.7486	424.3806	379.6107	274.6986	185.0263	193.4593	284.2746	346.4819	363.7086	373.5064	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	739.8492	716.7049	649.6517	543.9533	419.6649	281.1946	185.9478	195.1027	304.3496	460.9464	611.1672	736.4224	(97)
Space heating kWh	265.3464	207.2710	171.0479	86.0923	29.8003	0.0000	0.0000	0.0000	0.0000	85.1616	178.1702	270.0095	(98a)
Space heating requirement - total per year (kWh/year)												1292.8994	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	265.3464	207.2710	171.0479	86.0923	29.8003	0.0000	0.0000	0.0000	0.0000	85.1616	178.1702	270.0095	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1292.8994	
Space heating per m2											(98c) / (4) =	29.8178	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	265.3464	207.2710	171.0479	86.0923	29.8003	0.0000	0.0000	0.0000	0.0000	85.1616	178.1702	270.0095	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	287.4826	224.5623	185.3174	93.2745	32.2864	0.0000	0.0000	0.0000	0.0000	92.2661	193.0338	292.5347	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.8867	84.6079	84.0333	82.8146	81.1645	79.8000	79.8000	79.8000	79.8000	82.7648	84.2447	84.9469	(217)
Fuel for water heating, kWh/month	216.1119	191.9534	205.9701	185.4906	184.6260	170.5061	169.2907	175.3325	176.4869	188.2323	194.7845	213.8364	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1400.7577	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2272.6216	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3518.4533	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1400.7577	0.2100	294.1591	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2272.6216	0.2100	477.2505	(264)
Space and water heating			771.4097	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			753.7071	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			17.3800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1400.7577	1.1300	1582.8562	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2272.6216	1.1300	2568.0624	(278)
Space and water heating			4150.9186	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			4069.4162	(286)
Target Primary Energy Rate (TPER)			93.8500	(287)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.49	**TER**	17.38
Environmental	99 A	**% DER < TER**			91.43
CO_2 Emissions (t/year)	0.04	**DFEE**	24.73	**TFEE**	39.32
Compliance Check	See BREL	**% DFEE < TFEE**			37.10
% DPER < TPER	72.38	**DPER**	25.92	**TPER**	93.85

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
						(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 10371.4500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	239.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	2.2962	(36)
Point Thermal bridges	(36a) = 0.0000	

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	

Distribution loss (46)m = 0.15 x (45)m

23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
									Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)	
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)													
-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)	
Water heating gains (Table 5)													
130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)	
Total internal gains													
418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)	

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	6.5100	11.2829	0.6800	0.7000	0.7700	24.2294	(81)

Solar gains 24.2294	49.3197	88.8585	145.9312	196.1601	209.1274	195.6344	155.9620	108.2755	60.2726	30.4869	19.7870	(83)
Total gains 442.9902	466.1891	494.0426	529.3014	558.5808	552.5802	527.9837	490.8862	454.3003	425.8639	419.7138	429.5041	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874

util living area													
	0.9584	0.9397	0.8888	0.7714	0.5944	0.4197	0.3026	0.3401	0.5458	0.8061	0.9287	0.9647	(86)
MIT	20.5048	20.6008	20.7617	20.9151	20.9842	20.9984	20.9998	20.9997	20.9926	20.9062	20.6868	20.4672	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.9489	0.9265	0.8665	0.7348	0.5480	0.3690	0.2491	0.2827	0.4866	0.7650	0.9111	0.9564	(89)
MIT 2	19.6694	19.7858	19.9754	20.1429	20.2088	20.2199	20.2207	20.2206	20.2163	20.1380	19.8920	19.6234	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0684	20.1751	20.3510	20.5117	20.5792	20.5917	20.5928	20.5927	20.5871	20.5049	20.2716	20.0264	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0684	20.1751	20.3510	20.5117	20.5792	20.5917	20.5928	20.5927	20.5871	20.5049	20.2716	20.0264	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9468	0.9256	0.8705	0.7489	0.5696	0.3932	0.2746	0.3101	0.5146	0.7807	0.9124	0.9541	(94)
Useful gains	419.4135	431.5128	430.0722	396.3827	318.1411	217.2721	145.0082	152.2330	233.7990	332.4524	382.9452	409.7770	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	572.7878	554.8674	503.1358	421.7945	322.5356	217.6494	145.0394	152.3000	235.6435	359.7964	478.4588	574.8936	(97)
Space heating kWh													
	114.1105	82.8943	54.3593	18.2965	3.2695	0.0000	0.0000	0.0000	0.0000	20.3440	68.7698	122.8467	(98a)
Space heating requirement - total per year (kWh/year)												484.8905	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	114.1105	82.8943	54.3593	18.2965	3.2695	0.0000	0.0000	0.0000	0.0000	20.3440	68.7698	122.8467	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												484.8905	
Space heating per m2											(98c) / (4) =	11.1829	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	114.1105	82.8943	54.3593	18.2965	3.2695	0.0000	0.0000	0.0000	0.0000	20.3440	68.7698	122.8467	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	171.1658	124.3414	81.5390	27.4447	4.9042	0.0000	0.0000	0.0000	0.0000	30.5159	103.1547	184.2700	
Space heating requirement													
	171.1658	124.3414	81.5390	27.4447	4.9042	0.0000	0.0000	0.0000	0.0000	30.5159	103.1547	184.2700	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												727.3358	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												7.2734	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3193.1986	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	727.3358	4.4400	32.2937	(340a)
Space heating total			32.2937	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			195.6271	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7970 (357)
SAP value		87.0801
SAP rating (Section 12)		87 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1069.0171	0.1576	30.5612	(367)
Electrical energy for heat distribution (space & water)	7.2734	0.0000	5.7639	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			159.4685	(373)
Space and water heating			159.4685	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			58.9408	(383)
CO2 emissions per m2			1.3600	(384)
EI value			99.1061	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	43.3600 (1b)	x 2.4500 (2b)	= 106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)

Adj infilt rate

	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104 (22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 10371.4500 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

Thermal bridges (User defined value 0.030 * total exposed area) 2.2962 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)

Average = Sum(39)m / 12 = 36.3250

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Total per year (kWh/year) = Sum(64)m = 2187.6523 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)													

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)												
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874 (72)
Total internal gains												
	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	6.5100	13.7758	0.6800	0.7000	0.7700	29.5826	(81)

Solar gains	29.5826	53.8385	96.0030	159.3666	205.6523	234.6690	215.6278	175.8602	123.5269	69.5726	36.7370	24.2504 (83)
Total gains	448.3434	470.7078	501.1871	542.7367	568.0729	578.1218	547.9771	510.7844	469.5517	435.1638	425.9639	433.9675 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area													
	0.9526	0.9323	0.8690	0.7392	0.5560	0.3640	0.2585	0.2915	0.5069	0.7688	0.9155	0.9600	(86)
MIT	20.5413	20.6326	20.8014	20.9352	20.9896	20.9994	20.9999	20.9999	20.9953	20.9318	20.7269	20.5029	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.9418	0.9177	0.8437	0.7004	0.5091	0.3153	0.2069	0.2361	0.4487	0.7234	0.8953	0.9506	(89)
MIT 2	19.7141	19.8240	20.0204	20.1629	20.2132	20.2204	20.2207	20.2207	20.2180	20.1631	19.9390	19.6674	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.1092	20.2102	20.3934	20.5318	20.5841	20.5925	20.5929	20.5929	20.5893	20.5303	20.3153	20.0665	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1092	20.2102	20.3934	20.5318	20.5841	20.5925	20.5929	20.5929	20.5893	20.5303	20.3153	20.0665	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9401	0.9175	0.8496	0.7163	0.5311	0.3386	0.2315	0.2626	0.4764	0.7421	0.8980	0.9485	(94)
Useful gains	421.4798	431.8659	425.8239	388.7493	301.7164	195.7377	126.8696	134.1208	223.6776	322.9303	382.4963	411.6069	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	563.3716	545.2470	486.5160	407.9947	304.5507	195.8813	126.8795	134.1429	224.8256	342.5548	465.5167	565.4519	(97)
Space heating kWh													
	105.5675	76.1921	45.1549	13.8567	2.1087	0.0000	0.0000	0.0000	0.0000	14.6006	59.7747	114.4607	(98a)
Space heating requirement - total per year (kWh/year)												431.7159	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	105.5675	76.1921	45.1549	13.8567	2.1087	0.0000	0.0000	0.0000	0.0000	14.6006	59.7747	114.4607	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												431.7159	
Space heating per m2											(98c) / (4) =	9.9565	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	105.5675	76.1921	45.1549	13.8567	2.1087	0.0000	0.0000	0.0000	0.0000	14.6006	59.7747	114.4607	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	158.3513	114.2882	67.7323	20.7850	3.1631	0.0000	0.0000	0.0000	0.0000	21.9009	89.6620	171.6910	
Space heating requirement													
	158.3513	114.2882	67.7323	20.7850	3.1631	0.0000	0.0000	0.0000	0.0000	21.9009	89.6620	171.6910	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	647.5738	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	6.4757	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(330a)
Total electricity for the above, kWh/year	11.9235	(331)
Electricity for lighting (calculated in Appendix L)	130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3016.9105	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	647.5738	6.5500	42.4161	(340a)
Space heating total			42.4161	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			242.8172	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1047.7473	0.1581	27.2942	(367)
Electrical energy for heat distribution (space & water)	6.4757	0.0000	5.6414	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			156.0790	(373)
Space and water heating			156.0790	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			43.3191	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1047.7473	1.5851	273.7263	(467)
Electrical energy for heat distribution (space & water)	6.4757	0.0000	60.1545	(472)
Overall CO2 factor for heat network			0.4236	(486)
Total CO2 associated with community systems			1664.2738	(473)
Space and water heating			1664.2738	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			959.9488	(483)

SAP 10 EPC IMPROVEMENTS

Rev D - Southeast

Current energy efficiency rating:	B 87
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: B 87
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£41	£41	£0
Community scheme	£361	£361	£0
Space heating	£150	£150	£0
Water heating	£215	£215	£0
Lighting	£37	£37	£0
Generated (PV)	-£159	-£159	£0
Total cost of fuels	£243	£243	£0
Total cost of uses	£243	£243	£0
Delivered energy	70 kWh/m²	70 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.0 tonnes	0.0 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	22 kWh/m²	22 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)

Total net area of external elements Aum(A, m2)	76.5400				(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	16.5005			(33)
Main dwelling					
Party Wall	31.3600	0.0000	0.0000	70.0000	2195.2000 (32)
Party Ceiling 1	43.3600			30.0000	1300.8000 (32b)
Internal TF Wall	68.4500			9.0000	616.0500 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	6.5100	11.2829	0.6800	0.7000	0.7700	24.2294	(81)

Solar gains	24.2294	49.3197	88.8585	145.9312	196.1601	209.1274	195.6344	155.9620	108.2755	60.2726	30.4869	19.7870	(83)
Total gains	442.9902	466.1891	494.0426	529.3014	558.5808	552.5802	527.9837	490.8862	454.3003	425.8639	419.7138	429.5041	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area	0.9584	0.9397	0.8888	0.7714	0.5944	0.4197	0.3026	0.3401	0.5458	0.8061	0.9287	0.9647	(86)
MIT	20.5048	20.6008	20.7617	20.9151	20.9842	20.9984	20.9998	20.9997	20.9926	20.9062	20.6868	20.4672	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house	0.9489	0.9265	0.8665	0.7348	0.5480	0.3690	0.2491	0.2827	0.4866	0.7650	0.9111	0.9564	(89)
MIT 2	19.6694	19.7858	19.9754	20.1429	20.2088	20.2199	20.2207	20.2206	20.2163	20.1380	19.8920	19.6234	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0684	20.1751	20.3510	20.5117	20.5792	20.5917	20.5928	20.5927	20.5871	20.5049	20.2716	20.0264	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0684	20.1751	20.3510	20.5117	20.5792	20.5917	20.5928	20.5927	20.5871	20.5049	20.2716	20.0264	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9468	0.9256	0.8705	0.7489	0.5696	0.3932	0.2746	0.3101	0.5146	0.7807	0.9124	0.9541	(94)
Useful gains	419.4135	431.5128	430.0722	396.3827	318.1411	217.2721	145.0082	152.2330	233.7990	332.4524	382.9452	409.7770	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	572.7878	554.8674	503.1358	421.7945	322.5356	217.6494	145.0394	152.3000	235.6435	359.7964	478.4588	574.8936	(97)
Space heating kWh	114.1105	82.8943	54.3593	18.2965	3.2695	0.0000	0.0000	0.0000	0.0000	20.3440	68.7698	122.8467	(98a)
Space heating requirement - total per year (kWh/year)												484.8905	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	114.1105	82.8943	54.3593	18.2965	3.2695	0.0000	0.0000	0.0000	0.0000	20.3440	68.7698	122.8467	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												484.8905	
Space heating per m2										(98c) / (4) =		11.1829	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

Space heating:

Space heating requirement												
114.1105	82.8943	54.3593	18.2965	3.2695	0.0000	0.0000	0.0000	0.0000	20.3440	68.7698	122.8467	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a 171.1658	124.3414	81.5390	27.4447	4.9042	0.0000	0.0000	0.0000	0.0000	30.5159	103.1547	184.2700	
Space heating requirement												
171.1658	124.3414	81.5390	27.4447	4.9042	0.0000	0.0000	0.0000	0.0000	30.5159	103.1547	184.2700	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)											0.0000	(308)
Space heating fuel for secondary/supplementary system												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating												
Annual water heating requirement												
214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a 322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel												
322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio											0.0000	(314)
Space coolin 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa 1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting 16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m -13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m -5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year
Space heating fuel - community heating 727.3358 (307)
Space heating fuel - secondary 0.0000 (309)
Water heating fuel - community heating 3281.4784 (310)
Efficiency of water heater 0.0000 (311)
Electricity used for heat distribution 7.2734 (313)
Space cooling fuel 0.0000 (321)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)
mechanical ventilation fans (SFP = 0.0920) 11.9235 (330a)
Total electricity for the above, kWh/year 11.9235 (331)
Electricity for lighting (calculated in Appendix L) 130.6818 (332)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation -958.2209 (333)
Wind generation 0.0000 (334)
Hydro-electric generation (Appendix N) 0.0000 (335a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (335)

Appendix Q - special features

Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3193.1986	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	727.3358	4.4400	32.2937	(340a)
Space heating total			32.2937	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			195.6271	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7970	(357)
SAP value		87.0801	
SAP rating (Section 12)		87	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1069.0171	0.1576	30.5612	(367)
Electrical energy for heat distribution (space & water)	7.2734	0.0000	5.7639	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			159.4685	(373)
Space and water heating			159.4685	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			58.9408	(383)
CO2 emissions per m2			1.3600	(384)
EI value			99.1061	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

Measured/design AP50 3.0000 (17)
Infiltration rate 0.1500 (18)
Number of sides sheltered 3 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.2962 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)

Average = Sum(39)m / 12 = 36.3250

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)											Total = Sum(45)m =	1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	6.5100	13.7758	0.6800	0.7000	0.7700	29.5826	(81)

Solar gains	29.5826	53.8385	96.0030	159.3666	205.6523	234.6690	215.6278	175.8602	123.5269	69.5726	36.7370	24.2504	(83)
Total gains	448.3434	470.7078	501.1871	542.7367	568.0729	578.1218	547.9771	510.7844	469.5517	435.1638	425.9639	433.9675	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area													
	0.9526	0.9323	0.8690	0.7392	0.5560	0.3640	0.2585	0.2915	0.5069	0.7688	0.9155	0.9600	(86)
MIT	20.5413	20.6326	20.8014	20.9352	20.9896	20.9994	20.9999	20.9999	20.9953	20.9318	20.7269	20.5029	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.9418	0.9177	0.8437	0.7004	0.5091	0.3153	0.2069	0.2361	0.4487	0.7234	0.8953	0.9506	(89)
MIT 2	19.7141	19.8240	20.0204	20.1629	20.2132	20.2204	20.2207	20.2207	20.2180	20.1631	19.9390	19.6674	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.1092	20.2102	20.3934	20.5318	20.5841	20.5925	20.5929	20.5929	20.5893	20.5303	20.3153	20.0665	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1092	20.2102	20.3934	20.5318	20.5841	20.5925	20.5929	20.5929	20.5893	20.5303	20.3153	20.0665	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9401	0.9175	0.8496	0.7163	0.5311	0.3386	0.2315	0.2626	0.4764	0.7421	0.8980	0.9485	(94)
Useful gains	421.4798	431.8659	425.8239	388.7493	301.7164	195.7377	126.8696	134.1208	223.6776	322.9303	382.4963	411.6069	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	563.3716	545.2470	486.5160	407.9947	304.5507	195.8813	126.8795	134.1429	224.8256	342.5548	465.5167	565.4519	(97)
Space heating kWh													
	105.5675	76.1921	45.1549	13.8567	2.1087	0.0000	0.0000	0.0000	0.0000	14.6006	59.7747	114.4607	(98a)
Space heating requirement - total per year (kWh/year)												431.7159	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	105.5675	76.1921	45.1549	13.8567	2.1087	0.0000	0.0000	0.0000	0.0000	14.6006	59.7747	114.4607	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												431.7159	
Space heating per m2										(98c) / (4) =		9.9565	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement													
	105.5675	76.1921	45.1549	13.8567	2.1087	0.0000	0.0000	0.0000	0.0000	14.6006	59.7747	114.4607	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	158.3513	114.2882	67.7323	20.7850	3.1631	0.0000	0.0000	0.0000	0.0000	21.9009	89.6620	171.6910	
Space heating requirement													
	158.3513	114.2882	67.7323	20.7850	3.1631	0.0000	0.0000	0.0000	0.0000	21.9009	89.6620	171.6910	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)

Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year	
Space heating fuel - community heating	647.5738 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	3281.4784 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	6.4757 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)	
mechanical ventilation fans (SFP = 0.0920)	11.9235 (330a)
Total electricity for the above, kWh/year	11.9235 (331)
Electricity for lighting (calculated in Appendix L)	130.6818 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	3016.9105 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	647.5738	6.5500	42.4161	(340a)
Space heating total			42.4161	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			242.8172	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1047.7473	0.1581	27.2942	(367)
Electrical energy for heat distribution (space & water)	6.4757	0.0000	5.6414	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			156.0790	(373)
Space and water heating			156.0790	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			43.3191	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1047.7473	1.5851	273.7263	(467)
Electrical energy for heat distribution (space & water)	6.4757	0.0000	60.1545	(472)
Overall CO2 factor for heat network			0.4236	(486)
Total CO2 associated with community systems			1664.2738	(473)
Space and water heating			1664.2738	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			959.9488	(483)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.49	**TER**	17.38
Environmental	99 A	**% DER < TER**			91.43
CO_2 Emissions (t/year)	0.04	**DFEE**	24.73	**TFEE**	39.32
Compliance Check	See BREL	**% DFEE < TFEE**			37.10
% DPER < TPER	72.38	**DPER**	25.92	**TPER**	93.85

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			10371.4500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							239.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523 (64)
12Total per year (kWh/year)												2188 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.5100	11.2829	0.6800	0.7000	0.7700	24.2294	(75)

Solar gains	24.2294	49.3197	88.8585	145.9312	196.1601	209.1274	195.6344	155.9620	108.2755	60.2726	30.4869	19.7870 (83)
Total gains	401.8204	434.0697	459.0200	503.4703	537.4268	539.2142	514.5511	476.0500	437.0995	399.4715	388.6443	390.6467 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106

alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874		
util living area	0.9733	0.9554	0.9145	0.7979	0.6155	0.4299	0.3105	0.3507	0.5659	0.8376	0.9478	0.9773	(86)
MIT	20.4138	20.5372	20.7091	20.8971	20.9809	20.9982	20.9998	20.9996	20.9910	20.8825	20.6286	20.3786	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house	0.9667	0.9449	0.8956	0.7624	0.5682	0.3781	0.2556	0.2915	0.5051	0.7990	0.9339	0.9716	(89)
MIT 2	19.5581	19.7098	19.9160	20.1252	20.2062	20.2197	20.2207	20.2206	20.2153	20.1150	19.8240	19.5144	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.9668	20.1050	20.2948	20.4939	20.5762	20.5915	20.5928	20.5927	20.5858	20.4816	20.2083	19.9271	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9668	20.1050	20.2948	20.4939	20.5762	20.5915	20.5928	20.5927	20.5858	20.4816	20.2083	19.9271	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9642	0.9431	0.8976	0.7753	0.5900	0.4028	0.2818	0.3198	0.5338	0.8126	0.9336	0.9691	(94)
Useful gains	387.4412	409.3701	411.9996	390.3540	317.1070	217.2099	145.0024	152.2183	233.3415	324.6164	362.8505	378.5689	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	569.0964	552.3221	501.0978	421.1483	322.4292	217.6430	145.0387	152.2984	235.5962	358.9474	476.1597	571.2886	(97)
Space heating kWh	135.1514	96.0638	66.2890	22.1719	3.9598	0.0000	0.0000	0.0000	0.0000	25.5423	81.5827	143.3835	(98a)
Space heating requirement - total per year (kWh/year)												574.1443	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	135.1514	96.0638	66.2890	22.1719	3.9598	0.0000	0.0000	0.0000	0.0000	25.5423	81.5827	143.3835	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												574.1443	
Space heating per m2											(98c) / (4) =	13.2413	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	135.1514	96.0638	66.2890	22.1719	3.9598	0.0000	0.0000	0.0000	0.0000	25.5423	81.5827	143.3835	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	202.7271	144.0956	99.4336	33.2579	5.9396	0.0000	0.0000	0.0000	0.0000	38.3134	122.3740	215.0752	
Space heating requirement	202.7271	144.0956	99.4336	33.2579	5.9396	0.0000	0.0000	0.0000	0.0000	38.3134	122.3740	215.0752	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												861.2165	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												8.6122	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3327.0793	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1104.7186	0.1575	36.1598	(367)
Electrical energy for heat distribution (space & water)	8.6122	0.0000	5.9739	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			165.2771	(373)
Space and water heating			165.2771	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			64.7494	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.4900	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1104.7186	1.5829	363.5212	(467)
Electrical energy for heat distribution (space & water)	8.6122	0.0000	63.5218	(472)
Overall CO2 factor for heat network			0.4242	(486)
Total CO2 associated with community systems			1757.4360	(473)
Space and water heating			1757.4360	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			1123.8412	(483)
Dwelling Primary energy Rate (DPER)			25.9200	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)

100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4004	(33)
Main dwelling						
Party Wall			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
E5 Ground floor (normal)	26.1200	0.1600	4.1792
P1 Party wall - Ground floor	6.7000	0.0800	0.5360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.5100	11.2829	0.6300	0.7000	0.7700	22.4479	(75)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	22.4479	45.6933	82.3248	135.2009	181.7366	193.7504	181.2495	144.4942	100.3140	55.8408	28.2452	18.3321	(83)
Total gains	391.6686	421.8550	444.1160	484.3020	514.6330	512.3991	488.7959	453.2120	417.7000	386.6694	377.9646	380.8215	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area	0.9861	0.9783	0.9607	0.9017	0.7733	0.5803	0.4286	0.4796	0.7264	0.9215	0.9745	0.9878	(86)
MIT	19.8713	20.0200	20.2627	20.6090	20.8624	20.9741	20.9953	20.9920	20.9244	20.6178	20.2041	19.8516	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house	0.9820	0.9720	0.9489	0.8732	0.7161	0.4972	0.3326	0.3785	0.6447	0.8924	0.9659	0.9842	(89)
MIT 2	18.6817	18.8708	19.1753	19.5990	19.8739	19.9804	19.9931	19.9936	19.9420	19.6200	19.1128	18.6638	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.2499	19.4197	19.6947	20.0814	20.3461	20.4550	20.4718	20.4704	20.4112	20.0966	19.6340	19.2311	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2499	19.4197	19.6947	20.0814	20.3461	20.4550	20.4718	20.4704	20.4112	20.0966	19.6340	19.2311	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9784	0.9678	0.9451	0.8763	0.7376	0.5361	0.3785	0.4269	0.6806	0.8961	0.9623	0.9808	(94)
Useful gains	383.2007	408.2658	419.7486	424.3806	379.6107	274.6986	185.0263	193.4593	284.2746	346.4819	363.7086	373.5064	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	739.8492	716.7049	649.6517	543.9533	419.6649	281.1946	185.9478	195.1027	304.3496	460.9464	611.1672	736.4224	(97)
Space heating kWh	265.3464	207.2710	171.0479	86.0923	29.8003	0.0000	0.0000	0.0000	0.0000	85.1616	178.1702	270.0095	(98a)
Space heating requirement - total per year (kWh/year)												1292.8994	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	265.3464	207.2710	171.0479	86.0923	29.8003	0.0000	0.0000	0.0000	0.0000	85.1616	178.1702	270.0095	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1292.8994	
Space heating per m2											(98c) / (4) =	29.8178	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	265.3464	207.2710	171.0479	86.0923	29.8003	0.0000	0.0000	0.0000	0.0000	85.1616	178.1702	270.0095	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	287.4826	224.5623	185.3174	93.2745	32.2864	0.0000	0.0000	0.0000	0.0000	92.2661	193.0338	292.5347	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.8867	84.6079	84.0333	82.8146	81.1645	79.8000	79.8000	79.8000	79.8000	82.7648	84.2447	84.9469	(217)
Fuel for water heating, kWh/month	216.1119	191.9534	205.9701	185.4906	184.6260	170.5061	169.2907	175.3325	176.4869	188.2323	194.7845	213.8364	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1400.7577	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2272.6216	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3518.4533	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1400.7577	0.2100	294.1591	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2272.6216	0.2100	477.2505	(264)
Space and water heating			771.4097	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			753.7071	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			17.3800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1400.7577	1.1300	1582.8562	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2272.6216	1.1300	2568.0624	(278)
Space and water heating			4150.9186	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			4069.4162	(286)
Target Primary Energy Rate (TPER)			93.8500	(287)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.49	**TER**	17.38
Environmental	99 A	**% DER < TER**			91.43
CO_2 Emissions (t/year)	0.04	**DFEE**	24.73	**TFEE**	39.32
Compliance Check	See BREL	**% DFEE < TFEE**			37.10
% DPER < TPER	72.38	**DPER**	25.92	**TPER**	93.85

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		2 * 10 =	20.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		20.0000 / (5) =	0.1883	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.3383	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2622	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		10371.4500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							239.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges					(36a) =		0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		18.7967	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	38.2833	38.2073	38.1327	37.7826	37.7171	37.4122	37.4122	37.3557	37.5296	37.7171	37.8496	37.9882	(39)
Average = Sum(39)m / 12 =												37.7823	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8829	0.8812	0.8794	0.8714	0.8699	0.8628	0.8628	0.8615	0.8655	0.8699	0.8729	0.8761	(40)
HLP (average)												0.8714	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												449.4572	(64a)
Heat gains from water heating, kWh/month	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.4004	291.4783	279.0119	271.5070	258.2448	250.2442	241.2477	240.9702	247.9561	254.7841	268.8582	277.3654	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.5100	11.2829	0.6800	0.7000	0.7700	24.2294	(75)

Solar gains	24.2294	49.3197	88.8585	145.9312	196.1601	209.1274	195.6344	155.9620	108.2755	60.2726	30.4869	19.7870	(83)
Total gains	307.6298	340.7981	367.8704	417.4382	454.4050	459.3717	436.8821	396.9323	356.2316	315.0568	299.3451	297.1524	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.2536	75.4034	75.5508	76.2509	76.3833	77.0059	77.0059	77.1223	76.7649	76.3833	76.1159	75.8383	
alpha	6.0169	6.0269	6.0367	6.0834	6.0922	6.1337	6.1337	6.1415	6.1177	6.0922	6.0744	6.0559	
util living area	0.9936	0.9871	0.9697	0.8947	0.7287	0.5166	0.3762	0.4315	0.6955	0.9343	0.9857	0.9948	(86)
MIT	20.1006	20.2484	20.4708	20.7739	20.9469	20.9942	20.9993	20.9985	20.9697	20.7355	20.3760	20.0753	(87)
Th 2	20.1820	20.1835	20.1850	20.1919	20.1932	20.1992	20.1992	20.2003	20.1969	20.1932	20.1906	20.1879	(88)
util rest of house	0.9917	0.9834	0.9609	0.8680	0.6780	0.4540	0.3081	0.3572	0.6263	0.9110	0.9809	0.9932	(89)

MIT 2	19.3655	19.5127	19.7309	20.0182	20.1601	20.1967	20.1990	20.1999	20.1815	19.9911	19.6454	19.3452	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.7166	19.8641	20.0843	20.3792	20.5359	20.5776	20.5813	20.5813	20.5579	20.3466	19.9944	19.6939	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7166	19.8641	20.0843	20.3792	20.5359	20.5776	20.5813	20.5813	20.5579	20.3466	19.9944	19.6939	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9904	0.9816	0.9597	0.8747	0.7001	0.4838	0.3406	0.3927	0.6583	0.9160	0.9795	0.9920	(94)
Useful gains	304.6782	334.5440	353.0285	365.1350	318.1505	222.2405	148.8142	155.8869	234.5153	288.6032	293.2095	294.7884	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	590.1987	571.7367	518.0055	433.7126	333.2632	223.6364	148.9477	156.1956	242.3645	367.6140	488.0473	588.5839	(97)
Space heating kWh	212.4272	159.3935	122.7429	49.3759	11.2439	0.0000	0.0000	0.0000	0.0000	58.7841	140.2832	218.5839	(98a)
Space heating requirement - total per year (kWh/year)												972.8344	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	212.4272	159.3935	122.7429	49.3759	11.2439	0.0000	0.0000	0.0000	0.0000	58.7841	140.2832	218.5839	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												972.8344	
Space heating per m2											(98c) / (4) =	22.4362	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	351.6746	276.8502	283.9035	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9652	0.9857	0.9743	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	339.4376	272.8933	276.5995	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	507.9054	483.1931	437.9038	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	121.2968	156.4631	120.0104	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	30.3242	39.1158	30.0026	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												99.4426	(107)
Energy for space heating												22.4362	(99)
Energy for space cooling												2.2934	(108)
Total												24.7296	(109)
Fabric Energy Efficiency (DFEE)												24.7	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4004			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
E5 Ground floor (normal)	26.1200	0.1600	4.1792
P1 Party wall - Ground floor	6.7000	0.0800	0.5360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)													
	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							449.4572	(64a)
Heat gains from water heating, kWh/month													
	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains													
	281.3655	289.2254	276.9770	269.4043	256.2100	248.1415	239.2128	238.9354	245.8534	252.7493	266.7555	275.3306	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.5100	11.2829	0.6300	0.7000	0.7700	22.4479	(75)

Solar gains	22.4479	45.6933	82.3248	135.2009	181.7366	193.7504	181.2495	144.4942	100.3140	55.8408	28.2452	18.3321	(83)
Total gains	303.8134	334.9187	359.3018	404.6052	437.9465	441.8920	420.4623	383.4296	346.1675	308.5901	295.0007	293.6626	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area													
	0.9952	0.9915	0.9825	0.9452	0.8445	0.6567	0.4944	0.5592	0.8160	0.9642	0.9907	0.9960	(86)
MIT	19.6562	19.8132	20.0737	20.4693	20.7900	20.9557	20.9912	20.9843	20.8704	20.4664	20.0084	19.6366	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house													
	0.9937	0.9888	0.9767	0.9264	0.7948	0.5688	0.3857	0.4450	0.7414	0.9481	0.9872	0.9947	(89)
MIT 2	18.7533	18.9109	19.1701	19.5600	19.8458	19.9746	19.9924	19.9919	19.9202	19.5655	19.1144	18.7410	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.1846	19.3419	19.6017	19.9943	20.2968	20.4432	20.4694	20.4659	20.3740	19.9958	19.5414	19.1688	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1846	19.3419	19.6017	19.9943	20.2968	20.4432	20.4694	20.4659	20.3740	19.9958	19.5414	19.1688	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9922	0.9867	0.9740	0.9266	0.8114	0.6094	0.4378	0.4997	0.7723	0.9483	0.9852	0.9933	(94)
Useful gains	301.4330	330.4531	349.9633	374.9115	355.3441	269.3013	184.0701	191.5925	267.3303	292.6392	290.6341	291.7039	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	736.6173	712.8642	645.0723	539.7186	417.2709	280.6271	185.8334	194.8841	302.5546	456.0539	606.6499	733.3670	(97)
Space heating kWh													
	323.7771	256.9802	219.5611	118.6611	46.0736	0.0000	0.0000	0.0000	0.0000	121.5806	227.5314	328.5973	(98a)
Space heating requirement - total per year (kWh/year)												1642.7624	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	323.7771	256.9802	219.5611	118.6611	46.0736	0.0000	0.0000	0.0000	0.0000	121.5806	227.5314	328.5973	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1642.7624	
Space heating per m2											(98c) / (4) =	37.8866	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	451.4472	355.3946	364.2795	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8653	0.9238	0.8901	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	390.6458	328.3275	324.2452	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	489.7542	466.1872	424.2498	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	71.3581	102.5676	74.4034	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	17.8395	25.6419	18.6008	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												62.0823	(107)
Energy for space heating												37.8866	(99)
Energy for space cooling												1.4318	(108)
Total												39.3184	(109)
Fabric Energy Efficiency (TFEE)												39.3	(109)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.49	**TER**	17.38
Environmental	99 A	**% DER < TER**			91.43
CO_2 Emissions (t/year)	0.04	**DFEE**	24.73	**TFEE**	39.32
Compliance Check	See BREL	**% DFEE < TFEE**			37.10
% DPER < TPER	72.38	**DPER**	25.92	**TPER**	93.85

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			10371.4500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							239.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523 (64)
12Total per year (kWh/year)												2188 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.5100	11.2829	0.6800	0.7000	0.7700	24.2294	(75)

Solar gains	24.2294	49.3197	88.8585	145.9312	196.1601	209.1274	195.6344	155.9620	108.2755	60.2726	30.4869	19.7870 (83)
Total gains	401.8204	434.0697	459.0200	503.4703	537.4268	539.2142	514.5511	476.0500	437.0995	399.4715	388.6443	390.6467 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106

alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874		
util living area	0.9733	0.9554	0.9145	0.7979	0.6155	0.4299	0.3105	0.3507	0.5659	0.8376	0.9478	0.9773	(86)
MIT	20.4138	20.5372	20.7091	20.8971	20.9809	20.9982	20.9998	20.9996	20.9910	20.8825	20.6286	20.3786	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house	0.9667	0.9449	0.8956	0.7624	0.5682	0.3781	0.2556	0.2915	0.5051	0.7990	0.9339	0.9716	(89)
MIT 2	19.5581	19.7098	19.9160	20.1252	20.2062	20.2197	20.2207	20.2206	20.2153	20.1150	19.8240	19.5144	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.9668	20.1050	20.2948	20.4939	20.5762	20.5915	20.5928	20.5927	20.5858	20.4816	20.2083	19.9271	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9668	20.1050	20.2948	20.4939	20.5762	20.5915	20.5928	20.5927	20.5858	20.4816	20.2083	19.9271	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9642	0.9431	0.8976	0.7753	0.5900	0.4028	0.2818	0.3198	0.5338	0.8126	0.9336	0.9691	(94)
Useful gains	387.4412	409.3701	411.9996	390.3540	317.1070	217.2099	145.0024	152.2183	233.3415	324.6164	362.8505	378.5689	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	569.0964	552.3221	501.0978	421.1483	322.4292	217.6430	145.0387	152.2984	235.5962	358.9474	476.1597	571.2886	(97)
Space heating kWh	135.1514	96.0638	66.2890	22.1719	3.9598	0.0000	0.0000	0.0000	0.0000	25.5423	81.5827	143.3835	(98a)
Space heating requirement - total per year (kWh/year)												574.1443	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	135.1514	96.0638	66.2890	22.1719	3.9598	0.0000	0.0000	0.0000	0.0000	25.5423	81.5827	143.3835	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												574.1443	
Space heating per m2											(98c) / (4) =	13.2413	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	135.1514	96.0638	66.2890	22.1719	3.9598	0.0000	0.0000	0.0000	0.0000	25.5423	81.5827	143.3835	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	202.7271	144.0956	99.4336	33.2579	5.9396	0.0000	0.0000	0.0000	0.0000	38.3134	122.3740	215.0752	
Space heating requirement	202.7271	144.0956	99.4336	33.2579	5.9396	0.0000	0.0000	0.0000	0.0000	38.3134	122.3740	215.0752	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												861.2165	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												8.6122	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3327.0793	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1104.7186	0.1575	36.1598	(367)
Electrical energy for heat distribution (space & water)	8.6122	0.0000	5.9739	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			165.2771	(373)
Space and water heating			165.2771	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			64.7494	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.4900	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1104.7186	1.5829	363.5212	(467)
Electrical energy for heat distribution (space & water)	8.6122	0.0000	63.5218	(472)
Overall CO2 factor for heat network			0.4242	(486)
Total CO2 associated with community systems			1757.4360	(473)
Space and water heating			1757.4360	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			1123.8412	(483)
Dwelling Primary energy Rate (DPER)			25.9200	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)

100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4004	(33)
Main dwelling						
Party Wall			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
E5 Ground floor (normal)	26.1200	0.1600	4.1792
P1 Party wall - Ground floor	6.7000	0.0800	0.5360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.5100	11.2829	0.6300	0.7000	0.7700	22.4479	(75)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	22.4479	45.6933	82.3248	135.2009	181.7366	193.7504	181.2495	144.4942	100.3140	55.8408	28.2452	18.3321	(83)
Total gains	391.6686	421.8550	444.1160	484.3020	514.6330	512.3991	488.7959	453.2120	417.7000	386.6694	377.9646	380.8215	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area	0.9861	0.9783	0.9607	0.9017	0.7733	0.5803	0.4286	0.4796	0.7264	0.9215	0.9745	0.9878	(86)
MIT	19.8713	20.0200	20.2627	20.6090	20.8624	20.9741	20.9953	20.9920	20.9244	20.6178	20.2041	19.8516	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house	0.9820	0.9720	0.9489	0.8732	0.7161	0.4972	0.3326	0.3785	0.6447	0.8924	0.9659	0.9842	(89)
MIT 2	18.6817	18.8708	19.1753	19.5990	19.8739	19.9804	19.9931	19.9936	19.9420	19.6200	19.1128	18.6638	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.2499	19.4197	19.6947	20.0814	20.3461	20.4550	20.4718	20.4704	20.4112	20.0966	19.6340	19.2311	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2499	19.4197	19.6947	20.0814	20.3461	20.4550	20.4718	20.4704	20.4112	20.0966	19.6340	19.2311	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9784	0.9678	0.9451	0.8763	0.7376	0.5361	0.3785	0.4269	0.6806	0.8961	0.9623	0.9808	(94)
Useful gains	383.2007	408.2658	419.7486	424.3806	379.6107	274.6986	185.0263	193.4593	284.2746	346.4819	363.7086	373.5064	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	739.8492	716.7049	649.6517	543.9533	419.6649	281.1946	185.9478	195.1027	304.3496	460.9464	611.1672	736.4224	(97)
Space heating kWh	265.3464	207.2710	171.0479	86.0923	29.8003	0.0000	0.0000	0.0000	0.0000	85.1616	178.1702	270.0095	(98a)
Space heating requirement - total per year (kWh/year)												1292.8994	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	265.3464	207.2710	171.0479	86.0923	29.8003	0.0000	0.0000	0.0000	0.0000	85.1616	178.1702	270.0095	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1292.8994	
Space heating per m2											(98c) / (4) =	29.8178	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	265.3464	207.2710	171.0479	86.0923	29.8003	0.0000	0.0000	0.0000	0.0000	85.1616	178.1702	270.0095	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	287.4826	224.5623	185.3174	93.2745	32.2864	0.0000	0.0000	0.0000	0.0000	92.2661	193.0338	292.5347	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.8867	84.6079	84.0333	82.8146	81.1645	79.8000	79.8000	79.8000	79.8000	82.7648	84.2447	84.9469	(217)
Fuel for water heating, kWh/month	216.1119	191.9534	205.9701	185.4906	184.6260	170.5061	169.2907	175.3325	176.4869	188.2323	194.7845	213.8364	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1400.7577	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2272.6216	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3518.4533	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1400.7577	0.2100	294.1591	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2272.6216	0.2100	477.2505	(264)
Space and water heating			771.4097	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			753.7071	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			17.3800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1400.7577	1.1300	1582.8562	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2272.6216	1.1300	2568.0624	(278)
Space and water heating			4150.9186	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			4069.4162	(286)
Target Primary Energy Rate (TPER)			93.8500	(287)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.49	**TER**	17.38
Environmental	99 A	**% DER < TER**			91.43
CO_2 Emissions (t/year)	0.04	**DFEE**	24.73	**TFEE**	39.32
Compliance Check	See BREL	**% DFEE < TFEE**			37.10
% DPER < TPER	72.38	**DPER**	25.92	**TPER**	93.85

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =	10371.4500			(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							239.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges					(36a) =		0.0000	

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.5100	11.2829	0.6800	0.7000	0.7700	24.2294	(75)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	24.2294	49.3197	88.8585	145.9312	196.1601	209.1274	195.6344	155.9620	108.2755	60.2726	30.4869	19.7870	(83)
Total gains	442.9902	466.1891	494.0426	529.3014	558.5808	552.5802	527.9837	490.8862	454.3003	425.8639	419.7138	429.5041	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874

util living area													
	0.9584	0.9397	0.8888	0.7714	0.5944	0.4197	0.3026	0.3401	0.5458	0.8061	0.9287	0.9647	(86)
MIT	20.5048	20.6008	20.7617	20.9151	20.9842	20.9984	20.9998	20.9997	20.9926	20.9062	20.6868	20.4672	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.9489	0.9265	0.8665	0.7348	0.5480	0.3690	0.2491	0.2827	0.4866	0.7650	0.9111	0.9564	(89)
MIT 2	19.6694	19.7858	19.9754	20.1429	20.2088	20.2199	20.2207	20.2206	20.2163	20.1380	19.8920	19.6234	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0684	20.1751	20.3510	20.5117	20.5792	20.5917	20.5928	20.5927	20.5871	20.5049	20.2716	20.0264	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0684	20.1751	20.3510	20.5117	20.5792	20.5917	20.5928	20.5927	20.5871	20.5049	20.2716	20.0264	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9468	0.9256	0.8705	0.7489	0.5696	0.3932	0.2746	0.3101	0.5146	0.7807	0.9124	0.9541	(94)
Useful gains	419.4135	431.5128	430.0722	396.3827	318.1411	217.2721	145.0082	152.2330	233.7990	332.4524	382.9452	409.7770	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	572.7878	554.8674	503.1358	421.7945	322.5356	217.6494	145.0394	152.3000	235.6435	359.7964	478.4588	574.8936	(97)
Space heating kWh													
	114.1105	82.8943	54.3593	18.2965	3.2695	0.0000	0.0000	0.0000	0.0000	20.3440	68.7698	122.8467	(98a)
Space heating requirement - total per year (kWh/year)												484.8905	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	114.1105	82.8943	54.3593	18.2965	3.2695	0.0000	0.0000	0.0000	0.0000	20.3440	68.7698	122.8467	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												484.8905	
Space heating per m2											(98c) / (4) =	11.1829	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	114.1105	82.8943	54.3593	18.2965	3.2695	0.0000	0.0000	0.0000	0.0000	20.3440	68.7698	122.8467	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	171.1658	124.3414	81.5390	27.4447	4.9042	0.0000	0.0000	0.0000	0.0000	30.5159	103.1547	184.2700	
Space heating requirement													
	171.1658	124.3414	81.5390	27.4447	4.9042	0.0000	0.0000	0.0000	0.0000	30.5159	103.1547	184.2700	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												727.3358	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												7.2734	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3193.1986	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	727.3358	4.4400	32.2937	(340a)
Space heating total			32.2937	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			195.6271	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7970 (357)
SAP value		87.0801
SAP rating (Section 12)		87 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1069.0171	0.1576	30.5612	(367)
Electrical energy for heat distribution (space & water)	7.2734	0.0000	5.7639	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			159.4685	(373)
Space and water heating			159.4685	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			58.9408	(383)
CO2 emissions per m2			1.3600	(384)
EI value			99.1061	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	43.3600 (1b)	x 2.4500 (2b)	= 106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)

Adj infilt rate

	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104 (22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 10371.4500 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

Thermal bridges (User defined value 0.030 * total exposed area) 2.2962 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)

Average = Sum(39)m / 12 = 36.3250

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Total per year (kWh/year) = Sum(64)m = 2187.6523 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)													

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.5100	13.7758	0.6800	0.7000	0.7700	29.5826	(75)

Solar gains	29.5826	53.8385	96.0030	159.3666	205.6523	234.6690	215.6278	175.8602	123.5269	69.5726	36.7370	24.2504	(83)
Total gains	448.3434	470.7078	501.1871	542.7367	568.0729	578.1218	547.9771	510.7844	469.5517	435.1638	425.9639	433.9675	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area													
	0.9526	0.9323	0.8690	0.7392	0.5560	0.3640	0.2585	0.2915	0.5069	0.7688	0.9155	0.9600	(86)
MIT	20.5413	20.6326	20.8014	20.9352	20.9896	20.9994	20.9999	20.9999	20.9953	20.9318	20.7269	20.5029	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.9418	0.9177	0.8437	0.7004	0.5091	0.3153	0.2069	0.2361	0.4487	0.7234	0.8953	0.9506	(89)
MIT 2	19.7141	19.8240	20.0204	20.1629	20.2132	20.2204	20.2207	20.2207	20.2180	20.1631	19.9390	19.6674	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.1092	20.2102	20.3934	20.5318	20.5841	20.5925	20.5929	20.5929	20.5893	20.5303	20.3153	20.0665	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1092	20.2102	20.3934	20.5318	20.5841	20.5925	20.5929	20.5929	20.5893	20.5303	20.3153	20.0665	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9401	0.9175	0.8496	0.7163	0.5311	0.3386	0.2315	0.2626	0.4764	0.7421	0.8980	0.9485	(94)
Useful gains	421.4798	431.8659	425.8239	388.7493	301.7164	195.7377	126.8696	134.1208	223.6776	322.9303	382.4963	411.6069	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	563.3716	545.2470	486.5160	407.9947	304.5507	195.8813	126.8795	134.1429	224.8256	342.5548	465.5167	565.4519	(97)
Space heating kWh													
	105.5675	76.1921	45.1549	13.8567	2.1087	0.0000	0.0000	0.0000	0.0000	14.6006	59.7747	114.4607	(98a)
Space heating requirement - total per year (kWh/year)												431.7159	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	105.5675	76.1921	45.1549	13.8567	2.1087	0.0000	0.0000	0.0000	0.0000	14.6006	59.7747	114.4607	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												431.7159	
Space heating per m2											(98c) / (4) =	9.9565	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	105.5675	76.1921	45.1549	13.8567	2.1087	0.0000	0.0000	0.0000	0.0000	14.6006	59.7747	114.4607	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	158.3513	114.2882	67.7323	20.7850	3.1631	0.0000	0.0000	0.0000	0.0000	21.9009	89.6620	171.6910	
Space heating requirement													
	158.3513	114.2882	67.7323	20.7850	3.1631	0.0000	0.0000	0.0000	0.0000	21.9009	89.6620	171.6910	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year												
Space heating fuel - community heating											647.5738	(307)
Space heating fuel - secondary											0.0000	(309)
Water heating fuel - community heating											3281.4784	(310)
Efficiency of water heater											0.0000	(311)
Electricity used for heat distribution											6.4757	(313)
Space cooling fuel											0.0000	(321)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)												
mechanical ventilation fans (SFP = 0.0920)											11.9235	(330a)
Total electricity for the above, kWh/year											11.9235	(331)
Electricity for lighting (calculated in Appendix L)											130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											-1054.7470	(333)
Wind generation											0.0000	(334)
Hydro-electric generation (Appendix N)											0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)											0.0000	(335)
Appendix Q - special features												
Energy saved or generated											-0.0000	(336)
Energy used											0.0000	(337)
Total delivered energy for all uses											3016.9105	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	647.5738	6.5500	42.4161	(340a)
Space heating total			42.4161	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			242.8172	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1047.7473	0.1581	27.2942	(367)
Electrical energy for heat distribution (space & water)	6.4757	0.0000	5.6414	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			156.0790	(373)
Space and water heating			156.0790	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			43.3191	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1047.7473	1.5851	273.7263	(467)
Electrical energy for heat distribution (space & water)	6.4757	0.0000	60.1545	(472)
Overall CO2 factor for heat network			0.4236	(486)
Total CO2 associated with community systems			1664.2738	(473)
Space and water heating			1664.2738	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			959.9488	(483)

SAP 10 EPC IMPROVEMENTS

Rev D - Southwest

Current energy efficiency rating:	B 87
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: B 87
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£41	£41	£0
Community scheme	£361	£361	£0
Space heating	£150	£150	£0
Water heating	£215	£215	£0
Lighting	£37	£37	£0
Generated (PV)	-£159	-£159	£0
Total cost of fuels	£243	£243	£0
Total cost of uses	£243	£243	£0
Delivered energy	70 kWh/m²	70 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.0 tonnes	0.0 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	22 kWh/m²	22 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)

Total net area of external elements Aum(A, m2)												76.5400	(31)
Fabric heat loss, W/K = Sum (A x U)												(26)...(30) + (32) = 16.5005	(33)
Main dwelling													
Party Wall												31.3600 0.0000 0.0000 70.0000 2195.2000	(32)
Party Ceiling 1												43.3600 30.0000 1300.8000	(32b)
Internal TF Wall												68.4500 9.0000 616.0500	(32c)
Heat capacity Cm = Sum(A x k)												(28)...(30) + (32) + (32a)...(32e) = 10371.4500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)													2.2962 (36)
Point Thermal bridges												(36a) =	0.0000
Total fabric heat loss												(33) + (36) + (36a) =	18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.5100	11.2829	0.6800	0.7000	0.7700	24.2294	(75)

Solar gains	24.2294	49.3197	88.8585	145.9312	196.1601	209.1274	195.6344	155.9620	108.2755	60.2726	30.4869	19.7870	(83)
Total gains	442.9902	466.1891	494.0426	529.3014	558.5808	552.5802	527.9837	490.8862	454.3003	425.8639	419.7138	429.5041	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area	0.9584	0.9397	0.8888	0.7714	0.5944	0.4197	0.3026	0.3401	0.5458	0.8061	0.9287	0.9647	(86)
MIT	20.5048	20.6008	20.7617	20.9151	20.9842	20.9984	20.9998	20.9997	20.9926	20.9062	20.6868	20.4672	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house	0.9489	0.9265	0.8665	0.7348	0.5480	0.3690	0.2491	0.2827	0.4866	0.7650	0.9111	0.9564	(89)
MIT 2	19.6694	19.7858	19.9754	20.1429	20.2088	20.2199	20.2207	20.2206	20.2163	20.1380	19.8920	19.6234	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0684	20.1751	20.3510	20.5117	20.5792	20.5917	20.5928	20.5927	20.5871	20.5049	20.2716	20.0264	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0684	20.1751	20.3510	20.5117	20.5792	20.5917	20.5928	20.5927	20.5871	20.5049	20.2716	20.0264	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9468	0.9256	0.8705	0.7489	0.5696	0.3932	0.2746	0.3101	0.5146	0.7807	0.9124	0.9541	(94)
Useful gains	419.4135	431.5128	430.0722	396.3827	318.1411	217.2721	145.0082	152.2330	233.7990	332.4524	382.9452	409.7770	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	572.7878	554.8674	503.1358	421.7945	322.5356	217.6494	145.0394	152.3000	235.6435	359.7964	478.4588	574.8936	(97)
Space heating kWh	114.1105	82.8943	54.3593	18.2965	3.2695	0.0000	0.0000	0.0000	0.0000	20.3440	68.7698	122.8467	(98a)
Space heating requirement - total per year (kWh/year)												484.8905	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	114.1105	82.8943	54.3593	18.2965	3.2695	0.0000	0.0000	0.0000	0.0000	20.3440	68.7698	122.8467	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												484.8905	
Space heating per m2										(98c) / (4) =		11.1829	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

Space heating:

Space heating requirement												
114.1105	82.8943	54.3593	18.2965	3.2695	0.0000	0.0000	0.0000	0.0000	20.3440	68.7698	122.8467	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a 171.1658	124.3414	81.5390	27.4447	4.9042	0.0000	0.0000	0.0000	0.0000	30.5159	103.1547	184.2700	
Space heating requirement												
171.1658	124.3414	81.5390	27.4447	4.9042	0.0000	0.0000	0.0000	0.0000	30.5159	103.1547	184.2700	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)											0.0000	(308)
Space heating fuel for secondary/supplementary system												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating												
Annual water heating requirement												
214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a 322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel												
322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio											0.0000	(314)
Space coolin 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa 1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting 16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m -13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m -5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year
Space heating fuel - community heating 727.3358 (307)
Space heating fuel - secondary 0.0000 (309)
Water heating fuel - community heating 3281.4784 (310)
Efficiency of water heater 0.0000 (311)
Electricity used for heat distribution 7.2734 (313)
Space cooling fuel 0.0000 (321)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)
mechanical ventilation fans (SFP = 0.0920) 11.9235 (330a)
Total electricity for the above, kWh/year 11.9235 (331)
Electricity for lighting (calculated in Appendix L) 130.6818 (332)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation -958.2209 (333)
Wind generation 0.0000 (334)
Hydro-electric generation (Appendix N) 0.0000 (335a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (335)

Appendix Q - special features

Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3193.1986	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	727.3358	4.4400	32.2937	(340a)
Space heating total			32.2937	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			195.6271	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7970	(357)
SAP value		87.0801	
SAP rating (Section 12)		87	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1069.0171	0.1576	30.5612	(367)
Electrical energy for heat distribution (space & water)	7.2734	0.0000	5.7639	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			159.4685	(373)
Space and water heating			159.4685	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			58.9408	(383)
CO2 emissions per m2			1.3600	(384)
EI value			99.1061	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

Measured/design AP50 3.0000 (17)
Infiltration rate 0.1500 (18)
Number of sides sheltered 3 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.2962 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)

Average = Sum(39)m / 12 = 36.3250

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)											Total = Sum(45)m =	1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.5100	13.7758	0.6800	0.7000	0.7700	29.5826	(75)

Solar gains	29.5826	53.8385	96.0030	159.3666	205.6523	234.6690	215.6278	175.8602	123.5269	69.5726	36.7370	24.2504	(83)
Total gains	448.3434	470.7078	501.1871	542.7367	568.0729	578.1218	547.9771	510.7844	469.5517	435.1638	425.9639	433.9675	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area													
	0.9526	0.9323	0.8690	0.7392	0.5560	0.3640	0.2585	0.2915	0.5069	0.7688	0.9155	0.9600	(86)
MIT	20.5413	20.6326	20.8014	20.9352	20.9896	20.9994	20.9999	20.9999	20.9953	20.9318	20.7269	20.5029	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.9418	0.9177	0.8437	0.7004	0.5091	0.3153	0.2069	0.2361	0.4487	0.7234	0.8953	0.9506	(89)
MIT 2	19.7141	19.8240	20.0204	20.1629	20.2132	20.2204	20.2207	20.2207	20.2180	20.1631	19.9390	19.6674	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.1092	20.2102	20.3934	20.5318	20.5841	20.5925	20.5929	20.5929	20.5893	20.5303	20.3153	20.0665	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1092	20.2102	20.3934	20.5318	20.5841	20.5925	20.5929	20.5929	20.5893	20.5303	20.3153	20.0665	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9401	0.9175	0.8496	0.7163	0.5311	0.3386	0.2315	0.2626	0.4764	0.7421	0.8980	0.9485	(94)
Useful gains	421.4798	431.8659	425.8239	388.7493	301.7164	195.7377	126.8696	134.1208	223.6776	322.9303	382.4963	411.6069	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	563.3716	545.2470	486.5160	407.9947	304.5507	195.8813	126.8795	134.1429	224.8256	342.5548	465.5167	565.4519	(97)
Space heating kWh													
	105.5675	76.1921	45.1549	13.8567	2.1087	0.0000	0.0000	0.0000	0.0000	14.6006	59.7747	114.4607	(98a)
Space heating requirement - total per year (kWh/year)												431.7159	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	105.5675	76.1921	45.1549	13.8567	2.1087	0.0000	0.0000	0.0000	0.0000	14.6006	59.7747	114.4607	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												431.7159	
Space heating per m2										(98c) / (4) =		9.9565	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement													
	105.5675	76.1921	45.1549	13.8567	2.1087	0.0000	0.0000	0.0000	0.0000	14.6006	59.7747	114.4607	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	158.3513	114.2882	67.7323	20.7850	3.1631	0.0000	0.0000	0.0000	0.0000	21.9009	89.6620	171.6910	
Space heating requirement													
	158.3513	114.2882	67.7323	20.7850	3.1631	0.0000	0.0000	0.0000	0.0000	21.9009	89.6620	171.6910	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)

Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year	
Space heating fuel - community heating	647.5738 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	3281.4784 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	6.4757 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)	
mechanical ventilation fans (SFP = 0.0920)	11.9235 (330a)
Total electricity for the above, kWh/year	11.9235 (331)
Electricity for lighting (calculated in Appendix L)	130.6818 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	3016.9105 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	647.5738	6.5500	42.4161	(340a)
Space heating total			42.4161	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			242.8172	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1047.7473	0.1581	27.2942	(367)
Electrical energy for heat distribution (space & water)	6.4757	0.0000	5.6414	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			156.0790	(373)
Space and water heating			156.0790	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			43.3191	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1047.7473	1.5851	273.7263	(467)
Electrical energy for heat distribution (space & water)	6.4757	0.0000	60.1545	(472)
Overall CO2 factor for heat network			0.4236	(486)
Total CO2 associated with community systems			1664.2738	(473)
Space and water heating			1664.2738	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			959.9488	(483)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.39	**TER**	16.89
Environmental	99 A	**% DER < TER**			91.77
CO_2 Emissions (t/year)	0.04	**DFEE**	22.87	**TFEE**	37.04
Compliance Check	See BREL	**% DFEE < TFEE**			38.26
% DPER < TPER	72.76	**DPER**	24.85	**TPER**	91.21

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
						(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		10371.4500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							239.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges					(36a) =		0.0000	

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523 (64)
12Total per year (kWh/year)												2188 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(76)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837 (83)
Total gains	419.7672	467.2558	506.0368	555.7052	584.1265	578.6970	555.6038	523.3987	486.8526	437.0989	410.7463	405.5434 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106

alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874		
util living area	0.9673	0.9391	0.8794	0.7447	0.5704	0.4010	0.2876	0.3191	0.5109	0.7927	0.9345	0.9729	(86)
MIT	20.4545	20.6028	20.7778	20.9302	20.9874	20.9988	20.9999	20.9998	20.9949	20.9148	20.6707	20.4133	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house	0.9595	0.9258	0.8561	0.7074	0.5252	0.3525	0.2367	0.2651	0.4549	0.7507	0.9180	0.9663	(89)
MIT 2	19.6081	19.7882	19.9933	20.1575	20.2113	20.2201	20.2207	20.2206	20.2177	20.1463	19.8733	19.5573	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0123	20.1773	20.3680	20.5265	20.5820	20.5920	20.5929	20.5928	20.5889	20.5134	20.2542	19.9662	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0123	20.1773	20.3680	20.5265	20.5820	20.5920	20.5929	20.5928	20.5889	20.5134	20.2542	19.9662	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9571	0.9250	0.8608	0.7224	0.5463	0.3756	0.2610	0.2909	0.4815	0.7671	0.9188	0.9637	(94)
Useful gains	401.7598	432.2106	435.6061	401.4579	319.1330	217.3690	145.0173	152.2566	234.4309	335.3008	377.3945	390.8402	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	570.7504	554.9474	503.7549	422.3338	322.6373	217.6595	145.0404	152.3026	235.7086	360.1025	477.8254	572.7063	(97)
Space heating kWh	125.7290	82.4791	50.7027	15.0307	2.6072	0.0000	0.0000	0.0000	0.0000	18.4524	72.3102	135.3084	(98a)
Space heating requirement - total per year (kWh/year)												502.6198	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	125.7290	82.4791	50.7027	15.0307	2.6072	0.0000	0.0000	0.0000	0.0000	18.4524	72.3102	135.3084	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												502.6198	
Space heating per m2											(98c) / (4) =	11.5918	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	125.7290	82.4791	50.7027	15.0307	2.6072	0.0000	0.0000	0.0000	0.0000	18.4524	72.3102	135.3084	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	188.5935	123.7187	76.0541	22.5460	3.9108	0.0000	0.0000	0.0000	0.0000	27.6786	108.4654	202.9626	
Space heating requirement	188.5935	123.7187	76.0541	22.5460	3.9108	0.0000	0.0000	0.0000	0.0000	27.6786	108.4654	202.9626	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												753.9297	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												7.5393	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3219.7925	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1076.1088	0.1580	31.7701	(367)
Electrical energy for heat distribution (space & water)	7.5393	0.0000	5.8093	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			160.7227	(373)
Space and water heating			160.7227	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			60.1950	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.3900	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1076.1088	1.5850	318.6517	(467)
Electrical energy for heat distribution (space & water)	7.5393	0.0000	61.8392	(472)
Overall CO2 factor for heat network			0.4240	(486)
Total CO2 associated with community systems			1710.8839	(473)
Space and water heating			1710.8839	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			1077.2891	(483)
Dwelling Primary energy Rate (DPER)			24.8500	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)

100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4004	(33)
Main dwelling						
Party Wall			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
E5 Ground floor (normal)	26.1200	0.1600	4.1792
P1 Party wall - Ground floor	6.7000	0.0800	0.5360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	6.5100	19.6403	0.6300	0.7000	0.7700	39.0751	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	39.0751	76.4392	125.8845	183.5950	225.0025	230.3301	219.2837	188.3614	146.4088	90.7015	48.7221	32.1335	(83)
Total gains	408.2958	452.6009	487.6757	532.6961	557.8990	548.9788	526.8301	497.0792	463.7948	421.5301	398.4414	394.6229	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area	0.9835	0.9715	0.9453	0.8705	0.7337	0.5459	0.3986	0.4393	0.6725	0.8975	0.9688	0.9858	(86)
MIT	19.9106	20.0893	20.3508	20.6786	20.8917	20.9802	20.9966	20.9946	20.9463	20.6744	20.2495	19.8847	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house	0.9788	0.9636	0.9300	0.8369	0.6745	0.4660	0.3088	0.3457	0.5907	0.8627	0.9586	0.9817	(89)
MIT 2	18.7312	18.9566	19.2810	19.6746	19.8997	19.9839	19.9936	19.9945	19.9575	19.6814	19.1685	18.7054	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.2945	19.4976	19.7920	20.1541	20.3735	20.4597	20.4726	20.4722	20.4298	20.1557	19.6848	19.2687	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2945	19.4976	19.7920	20.1541	20.3735	20.4597	20.4726	20.4722	20.4298	20.1557	19.6848	19.2687	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9749	0.9591	0.9268	0.8431	0.6982	0.5036	0.3518	0.3904	0.6277	0.8693	0.9550	0.9781	(94)
Useful gains	398.0469	434.0923	451.9850	449.0967	389.5280	276.4737	185.3267	194.0822	291.1077	366.4217	380.5039	385.9848	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	742.0577	720.5526	654.4403	547.4923	420.9954	281.4218	185.9884	195.1855	305.2431	463.8155	613.6442	738.2617	(97)
Space heating kWh	255.9441	192.5013	150.6267	70.8448	23.4117	0.0000	0.0000	0.0000	0.0000	72.4610	167.8610	262.0940	(98a)
Space heating requirement - total per year (kWh/year)												1195.7446	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	255.9441	192.5013	150.6267	70.8448	23.4117	0.0000	0.0000	0.0000	0.0000	72.4610	167.8610	262.0940	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1195.7446	
Space heating per m2										(98c) / (4) =		27.5771	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	255.9441	192.5013	150.6267	70.8448	23.4117	0.0000	0.0000	0.0000	0.0000	72.4610	167.8610	262.0940	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	277.2959	208.5604	163.1925	76.7550	25.3648	0.0000	0.0000	0.0000	0.0000	78.5060	181.8645	283.9588	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.8067	84.4420	83.7496	82.4371	80.9080	79.8000	79.8000	79.8000	79.8000	82.4529	84.1107	84.8812	(217)
Fuel for water heating, kWh/month	216.3157	192.3305	206.6676	186.3399	185.2114	170.5061	169.2907	175.3325	176.4869	188.9442	195.0948	214.0019	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1295.4979	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2276.5223	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3417.0942	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1295.4979	0.2100	272.0546	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2276.5223	0.2100	478.0697	(264)
Space and water heating			750.1242	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			732.4217	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.8900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1295.4979	1.1300	1463.9126	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2276.5223	1.1300	2572.4702	(278)
Space and water heating			4036.3829	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3954.8804	(286)
Target Primary Energy Rate (TPER)			91.2100	(287)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.39	**TER**	16.89
Environmental	99 A	**% DER < TER**			91.77
CO_2 Emissions (t/year)	0.04	**DFEE**	22.87	**TFEE**	37.04
Compliance Check	See BREL	**% DFEE < TFEE**			38.26
% DPER < TPER	72.76	**DPER**	24.85	**TPER**	91.21

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2622	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	38.2833	38.2073	38.1327	37.7826	37.7171	37.4122	37.4122	37.3557	37.5296	37.7171	37.8496	37.9882	(39)
Average = Sum(39)m / 12 =												37.7823	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8829	0.8812	0.8794	0.8714	0.8699	0.8628	0.8628	0.8615	0.8655	0.8699	0.8729	0.8761	(40)
HLP (average)												0.8714	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												449.4572	(64a)
Heat gains from water heating, kWh/month	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.4004	291.4783	279.0119	271.5070	258.2448	250.2442	241.2477	240.9702	247.9561	254.7841	268.8582	277.3654	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(76)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	325.5767	373.9841	414.8872	469.6730	501.1047	498.8545	477.9348	444.2810	405.9847	352.6842	321.4470	312.0492	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.2536	75.4034	75.5508	76.2509	76.3833	77.0059	77.0059	77.1223	76.7649	76.3833	76.1159	75.8383	
alpha	6.0169	6.0269	6.0367	6.0834	6.0922	6.1337	6.1337	6.1415	6.1177	6.0922	6.0744	6.0559	
util living area	0.9915	0.9799	0.9492	0.8470	0.6740	0.4772	0.3441	0.3861	0.6225	0.9003	0.9799	0.9932	(86)
MIT	20.1468	20.3294	20.5708	20.8396	20.9648	20.9962	20.9996	20.9992	20.9831	20.7981	20.4298	20.1140	(87)
Th 2	20.1820	20.1835	20.1850	20.1919	20.1932	20.1992	20.1992	20.2003	20.1969	20.1932	20.1906	20.1879	(88)
util rest of house	0.9890	0.9744	0.9359	0.8144	0.6235	0.4187	0.2817	0.3193	0.5561	0.8698	0.9734	0.9913	(89)

MIT 2	19.4111	19.5916	19.8248	20.0727	20.1718	20.1976	20.1991	20.2001	20.1887	20.0443	19.6975	19.3835	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.7625	19.9440	20.1811	20.4390	20.5506	20.5791	20.5814	20.5818	20.5681	20.4043	20.0472	19.7324	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7625	19.9440	20.1811	20.4390	20.5506	20.5791	20.5814	20.5818	20.5681	20.4043	20.0472	19.7324	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9875	0.9725	0.9358	0.8249	0.6463	0.4466	0.3115	0.3512	0.5873	0.8785	0.9720	0.9899	(94)
Useful gains	321.5005	363.6828	388.2693	387.4510	323.8803	222.7857	148.8737	156.0472	238.4372	309.8350	312.4541	308.9100	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	591.9551	574.7896	521.6975	435.9735	333.8190	223.6897	148.9541	156.2123	242.7460	369.7916	490.0479	590.0469	(97)
Space heating kWh	201.2182	141.8637	99.2706	34.9361	7.3944	0.0000	0.0000	0.0000	0.0000	44.6077	127.8675	209.1658	(98a)
Space heating requirement - total per year (kWh/year)												866.3242	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	201.2182	141.8637	99.2706	34.9361	7.3944	0.0000	0.0000	0.0000	0.0000	44.6077	127.8675	209.1658	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												866.3242	
Space heating per m2											(98c) / (4) =	19.9798	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	351.6746	276.8502	283.9035	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9766	0.9911	0.9854	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	343.4485	274.3912	279.7716	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	554.0542	531.1768	493.2464	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	151.6361	191.0485	158.8253	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	37.9090	47.7621	39.7063	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												125.3775	(107)
Energy for space heating												19.9798	(99)
Energy for space cooling												2.8915	(108)
Total												22.8713	(109)
Fabric Energy Efficiency (DFEE)												22.9	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4383 (18)
Number of sides sheltered		3 (19)
Shelter factor (20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =		0.3397 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4004			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
E5 Ground floor (normal)	26.1200	0.1600	4.1792
P1 Party wall - Ground floor	6.7000	0.0800	0.5360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)													
	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							449.4572	(64a)
Heat gains from water heating, kWh/month													
	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains													
	281.3655	289.2254	276.9770	269.4043	256.2100	248.1415	239.2128	238.9354	245.8534	252.7493	266.7555	275.3306	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	6.5100	19.6403	0.6300	0.7000	0.7700	39.0751	(76)

Solar gains	39.0751	76.4392	125.8845	183.5950	225.0025	230.3301	219.2837	188.3614	146.4088	90.7015	48.7221	32.1335	(83)
Total gains	320.4406	365.6646	402.8615	452.9993	481.2125	478.4717	458.4965	427.2968	392.2623	343.4508	315.4775	307.4640	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area													
	0.9940	0.9878	0.9727	0.9201	0.8045	0.6154	0.4557	0.5067	0.7578	0.9473	0.9876	0.9951	(86)
MIT	19.6977	19.8879	20.1733	20.5578	20.8345	20.9666	20.9938	20.9898	20.9085	20.5380	20.0581	19.6712	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house													
	0.9921	0.9840	0.9640	0.8953	0.7498	0.5296	0.3543	0.4009	0.6774	0.9255	0.9831	0.9935	(89)
MIT 2	18.7944	18.9844	19.2662	19.6392	19.8786	19.9800	19.9931	19.9936	19.9436	19.6305	19.1631	18.7753	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.2258	19.4159	19.6995	20.0780	20.3352	20.4512	20.4711	20.4694	20.4044	20.0640	19.5906	19.2032	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2258	19.4159	19.6995	20.0780	20.3352	20.4512	20.4711	20.4694	20.4044	20.0640	19.5906	19.2032	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9903	0.9814	0.9612	0.8980	0.7700	0.5696	0.4028	0.4515	0.7124	0.9275	0.9809	0.9920	(94)
Useful gains	317.3388	358.8658	387.2348	406.7711	370.5136	272.5577	184.6948	192.9433	279.4651	318.5421	309.4535	304.9947	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	738.6574	716.5197	649.8882	543.7870	419.1347	281.0125	185.9127	195.0519	304.0221	459.3639	609.0488	735.0561	(97)
Space heating kWh													
	313.4610	240.3434	195.4141	98.6514	36.1741	0.0000	0.0000	0.0000	0.0000	104.7714	215.7086	319.9657	(98a)
Space heating requirement - total per year (kWh/year)												1524.4897	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	313.4610	240.3434	195.4141	98.6514	36.1741	0.0000	0.0000	0.0000	0.0000	104.7714	215.7086	319.9657	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1524.4897	
Space heating per m2											(98c) / (4) =	35.1589	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	451.4472	355.3946	364.2795	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8939	0.9440	0.9228	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	403.5707	335.4817	336.1678	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	532.5097	510.6427	475.5231	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	92.8361	130.3198	103.6803	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	23.2090	32.5800	25.9201	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												81.7091	(107)
Energy for space heating												35.1589	(99)
Energy for space cooling												1.8844	(108)
Total												37.0433	(109)
Fabric Energy Efficiency (TFEE)												37.0	(109)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.39	**TER**	16.89
Environmental	99 A	**% DER < TER**			91.77
CO_2 Emissions (t/year)	0.04	**DFEE**	22.87	**TFEE**	37.04
Compliance Check	See BREL	**% DFEE < TFEE**			38.26
% DPER < TPER	72.76	**DPER**	24.85	**TPER**	91.21

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
						(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			10371.4500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							239.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges					(36a) =		0.0000	

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523 (64)
12Total per year (kWh/year)												2188 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(76)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837 (83)
Total gains	419.7672	467.2558	506.0368	555.7052	584.1265	578.6970	555.6038	523.3987	486.8526	437.0989	410.7463	405.5434 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106

alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874		
util living area	0.9673	0.9391	0.8794	0.7447	0.5704	0.4010	0.2876	0.3191	0.5109	0.7927	0.9345	0.9729	(86)
MIT	20.4545	20.6028	20.7778	20.9302	20.9874	20.9988	20.9999	20.9998	20.9949	20.9148	20.6707	20.4133	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house	0.9595	0.9258	0.8561	0.7074	0.5252	0.3525	0.2367	0.2651	0.4549	0.7507	0.9180	0.9663	(89)
MIT 2	19.6081	19.7882	19.9933	20.1575	20.2113	20.2201	20.2207	20.2206	20.2177	20.1463	19.8733	19.5573	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0123	20.1773	20.3680	20.5265	20.5820	20.5920	20.5929	20.5928	20.5889	20.5134	20.2542	19.9662	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0123	20.1773	20.3680	20.5265	20.5820	20.5920	20.5929	20.5928	20.5889	20.5134	20.2542	19.9662	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9571	0.9250	0.8608	0.7224	0.5463	0.3756	0.2610	0.2909	0.4815	0.7671	0.9188	0.9637	(94)
Useful gains	401.7598	432.2106	435.6061	401.4579	319.1330	217.3690	145.0173	152.2566	234.4309	335.3008	377.3945	390.8402	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	570.7504	554.9474	503.7549	422.3338	322.6373	217.6595	145.0404	152.3026	235.7086	360.1025	477.8254	572.7063	(97)
Space heating kWh	125.7290	82.4791	50.7027	15.0307	2.6072	0.0000	0.0000	0.0000	0.0000	18.4524	72.3102	135.3084	(98a)
Space heating requirement - total per year (kWh/year)												502.6198	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	125.7290	82.4791	50.7027	15.0307	2.6072	0.0000	0.0000	0.0000	0.0000	18.4524	72.3102	135.3084	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												502.6198	
Space heating per m2											(98c) / (4) =	11.5918	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	125.7290	82.4791	50.7027	15.0307	2.6072	0.0000	0.0000	0.0000	0.0000	18.4524	72.3102	135.3084	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	188.5935	123.7187	76.0541	22.5460	3.9108	0.0000	0.0000	0.0000	0.0000	27.6786	108.4654	202.9626	
Space heating requirement	188.5935	123.7187	76.0541	22.5460	3.9108	0.0000	0.0000	0.0000	0.0000	27.6786	108.4654	202.9626	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												753.9297	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												7.5393	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3219.7925	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1076.1088	0.1580	31.7701	(367)
Electrical energy for heat distribution (space & water)	7.5393	0.0000	5.8093	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			160.7227	(373)
Space and water heating			160.7227	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			60.1950	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.3900	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1076.1088	1.5850	318.6517	(467)
Electrical energy for heat distribution (space & water)	7.5393	0.0000	61.8392	(472)
Overall CO2 factor for heat network			0.4240	(486)
Total CO2 associated with community systems			1710.8839	(473)
Space and water heating			1710.8839	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			1077.2891	(483)
Dwelling Primary energy Rate (DPER)			24.8500	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
Heatloss Floor 1			43.3600	0.1300	5.6368			(28a)

100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4004	(33)
Main dwelling						
Party Wall			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	26.1200	0.0700	1.8284
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.7000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
E5 Ground floor (normal)	26.1200	0.1600	4.1792
P1 Party wall - Ground floor	6.7000	0.0800	0.5360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2726 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.6730 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	49.4886	49.3609	49.2358	48.6481	48.5382	48.0263	48.0263	47.9315	48.2235	48.5382	48.7606	48.9932	(39)
Average = Sum(39)m / 12 =												48.6476	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1413	1.1384	1.1355	1.1220	1.1194	1.1076	1.1076	1.1054	1.1122	1.1194	1.1246	1.1299	(40)
HLP (average)												1.1219	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	6.5100	19.6403	0.6300	0.7000	0.7700	39.0751	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	39.0751	76.4392	125.8845	183.5950	225.0025	230.3301	219.2837	188.3614	146.4088	90.7015	48.7221	32.1335	(83)
Total gains	408.2958	452.6009	487.6757	532.6961	557.8990	548.9788	526.8301	497.0792	463.7948	421.5301	398.4414	394.6229	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2146	58.3651	58.5135	59.2203	59.3545	59.9871	59.9871	60.1057	59.7418	59.3545	59.0837	58.8033	
alpha	4.8810	4.8910	4.9009	4.9480	4.9570	4.9991	4.9991	5.0070	4.9828	4.9570	4.9389	4.9202	
util living area	0.9835	0.9715	0.9453	0.8705	0.7337	0.5459	0.3986	0.4393	0.6725	0.8975	0.9688	0.9858	(86)
MIT	19.9106	20.0893	20.3508	20.6786	20.8917	20.9802	20.9966	20.9946	20.9463	20.6744	20.2495	19.8847	(87)
Th 2	19.9672	19.9696	19.9719	19.9829	19.9850	19.9946	19.9946	19.9964	19.9909	19.9850	19.9808	19.9765	(88)
util rest of house	0.9788	0.9636	0.9300	0.8369	0.6745	0.4660	0.3088	0.3457	0.5907	0.8627	0.9586	0.9817	(89)
MIT 2	18.7312	18.9566	19.2810	19.6746	19.8997	19.9839	19.9936	19.9945	19.9575	19.6814	19.1685	18.7054	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.2945	19.4976	19.7920	20.1541	20.3735	20.4597	20.4726	20.4722	20.4298	20.1557	19.6848	19.2687	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2945	19.4976	19.7920	20.1541	20.3735	20.4597	20.4726	20.4722	20.4298	20.1557	19.6848	19.2687	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9749	0.9591	0.9268	0.8431	0.6982	0.5036	0.3518	0.3904	0.6277	0.8693	0.9550	0.9781	(94)
Useful gains	398.0469	434.0923	451.9850	449.0967	389.5280	276.4737	185.3267	194.0822	291.1077	366.4217	380.5039	385.9848	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	742.0577	720.5526	654.4403	547.4923	420.9954	281.4218	185.9884	195.1855	305.2431	463.8155	613.6442	738.2617	(97)
Space heating kWh	255.9441	192.5013	150.6267	70.8448	23.4117	0.0000	0.0000	0.0000	0.0000	72.4610	167.8610	262.0940	(98a)
Space heating requirement - total per year (kWh/year)												1195.7446	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	255.9441	192.5013	150.6267	70.8448	23.4117	0.0000	0.0000	0.0000	0.0000	72.4610	167.8610	262.0940	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1195.7446	
Space heating per m2										(98c) / (4) =		27.5771	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	255.9441	192.5013	150.6267	70.8448	23.4117	0.0000	0.0000	0.0000	0.0000	72.4610	167.8610	262.0940	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	277.2959	208.5604	163.1925	76.7550	25.3648	0.0000	0.0000	0.0000	0.0000	78.5060	181.8645	283.9588	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.8067	84.4420	83.7496	82.4371	80.9080	79.8000	79.8000	79.8000	79.8000	82.4529	84.1107	84.8812	(217)
Fuel for water heating, kWh/month	216.3157	192.3305	206.6676	186.3399	185.2114	170.5061	169.2907	175.3325	176.4869	188.9442	195.0948	214.0019	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1295.4979	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2276.5223	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3417.0942	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1295.4979	0.2100	272.0546	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2276.5223	0.2100	478.0697	(264)
Space and water heating			750.1242	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			732.4217	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.8900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1295.4979	1.1300	1463.9126	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2276.5223	1.1300	2572.4702	(278)
Space and water heating			4036.3829	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3954.8804	(286)
Target Primary Energy Rate (TPER)			91.2100	(287)

Full SAP Calculation Printout

Property Reference	Flat GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev D - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.39	**TER**	16.89
Environmental	99 A	**% DER < TER**			91.77
CO_2 Emissions (t/year)	0.04	**DFEE**	22.87	**TFEE**	37.04
Compliance Check	See BREL	**% DFEE < TFEE**			38.26
% DPER < TPER	72.76	**DPER**	24.85	**TPER**	91.21

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
						(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(76)
Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	460.9371	499.3751	541.0594	581.5362	605.2805	592.0631	569.0364	538.2350	504.0534	463.4913	441.8157	444.4008	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874

util living area													
	0.9506	0.9208	0.8509	0.7193	0.5517	0.3920	0.2808	0.3103	0.4941	0.7613	0.9132	0.9589	(86)
MIT	20.5418	20.6601	20.8196	20.9423	20.9895	20.9989	20.9999	20.9998	20.9957	20.9322	20.7241	20.4992	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.9397	0.9048	0.8249	0.6817	0.5076	0.3446	0.2311	0.2578	0.4397	0.7180	0.8932	0.9496	(89)
MIT 2	19.7141	19.8554	20.0390	20.1690	20.2129	20.2202	20.2207	20.2207	20.2182	20.1624	19.9346	19.6624	(90)
Living area fraction											fLA = Living area / (4) =	0.4776	(91)
MIT	20.1094	20.2397	20.4119	20.5384	20.5838	20.5921	20.5929	20.5928	20.5896	20.5301	20.3117	20.0621	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1094	20.2397	20.4119	20.5384	20.5838	20.5921	20.5929	20.5928	20.5896	20.5301	20.3117	20.0621	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9380	0.9053	0.8316	0.6973	0.5283	0.3672	0.2549	0.2829	0.4656	0.7357	0.8958	0.9474	(94)
Useful gains	432.3420	452.0640	449.9610	405.5295	319.7866	217.4085	145.0207	152.2644	234.6742	341.0035	395.7573	421.0203	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	574.2773	557.2156	505.3480	422.7631	322.7042	217.6636	145.0408	152.3034	235.7337	360.7107	479.9145	576.1910	(97)
Space heating kWh													
	105.5999	70.6619	41.2080	12.4082	2.1707	0.0000	0.0000	0.0000	0.0000	14.6621	60.5932	115.4470	(98a)
Space heating requirement - total per year (kWh/year)												422.7510	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	105.5999	70.6619	41.2080	12.4082	2.1707	0.0000	0.0000	0.0000	0.0000	14.6621	60.5932	115.4470	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												422.7510	
Space heating per m2											(98c) / (4) =	9.7498	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	105.5999	70.6619	41.2080	12.4082	2.1707	0.0000	0.0000	0.0000	0.0000	14.6621	60.5932	115.4470	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	158.3998	105.9928	61.8120	18.6123	3.2561	0.0000	0.0000	0.0000	0.0000	21.9932	90.8898	173.1705	
Space heating requirement													
	158.3998	105.9928	61.8120	18.6123	3.2561	0.0000	0.0000	0.0000	0.0000	21.9932	90.8898	173.1705	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												634.1264	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												6.3413	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3099.9892	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	634.1264	4.4400	28.1552	(340a)
Space heating total			28.1552	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			191.4886	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7802	(357)
SAP value		87.3534	
SAP rating (Section 12)		87	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1044.1613	0.1581	26.7384	(367)
Electrical energy for heat distribution (space & water)	6.3413	0.0000	5.6206	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			155.5023	(373)
Space and water heating			155.5023	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			54.9746	(383)
CO2 emissions per m2			1.2700	(384)
EI value			99.1663	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	43.3600 (1b)	x 2.4500 (2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)

Adj infilt rate

	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104 (22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 10371.4500 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)

Thermal bridges (User defined value 0.030 * total exposed area) 2.2962 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)

Average = Sum(39)m / 12 = 36.3250

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Total per year (kWh/year) = Sum(64)m = 2187.6523 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)													

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)												
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874 (72)
Total internal gains												
	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	6.5100	23.7835	0.6800	0.7000	0.7700	51.0736	(76)

Solar gains	51.0736	88.7763	143.8339	211.6843	249.5125	273.8424	255.8751	224.3556	176.4207	111.0901	62.7325	42.2420 (83)
Total gains	469.8344	505.6456	549.0181	595.0545	611.9331	617.2952	588.2244	559.2798	522.4455	476.6813	451.9594	451.9591 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area													
	0.9423	0.9110	0.8276	0.6873	0.5181	0.3410	0.2408	0.2662	0.4570	0.7183	0.8953	0.9522	(86)
MIT	20.5838	20.6918	20.8527	20.9564	20.9929	20.9996	21.0000	20.9999	20.9974	20.9532	20.7668	20.5403	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.9297	0.8933	0.7989	0.6483	0.4738	0.2953	0.1927	0.2157	0.4039	0.6719	0.8721	0.9414	(89)
MIT 2	19.7649	19.8929	20.0754	20.1827	20.2157	20.2205	20.2207	20.2207	20.2192	20.1822	19.9837	19.7127	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.1560	20.2745	20.4467	20.5523	20.5869	20.5926	20.5929	20.5929	20.5909	20.5504	20.3578	20.1080	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1560	20.2745	20.4467	20.5523	20.5869	20.5926	20.5929	20.5929	20.5909	20.5504	20.3578	20.1080	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9286	0.8946	0.8076	0.6652	0.4947	0.3172	0.2157	0.2398	0.4292	0.6920	0.8765	0.9397	(94)
Useful gains	436.2812	452.3702	443.3841	395.8357	302.7368	195.7885	126.8735	134.1312	224.2433	329.8652	396.1579	424.6918	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	565.0732	547.5815	488.4503	408.7382	304.6551	195.8867	126.8799	134.1441	224.8841	343.2869	467.0580	566.9598	(97)
Space heating kWh													
	95.8212	63.9820	33.5292	9.2898	1.4272	0.0000	0.0000	0.0000	0.0000	9.9857	51.0481	105.8474	(98a)
Space heating requirement - total per year (kWh/year)												370.9307	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	95.8212	63.9820	33.5292	9.2898	1.4272	0.0000	0.0000	0.0000	0.0000	9.9857	51.0481	105.8474	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												370.9307	
Space heating per m2											(98c) / (4) =	8.5547	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	95.8212	63.9820	33.5292	9.2898	1.4272	0.0000	0.0000	0.0000	0.0000	9.9857	51.0481	105.8474	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	143.7318	95.9730	50.2938	13.9348	2.1408	0.0000	0.0000	0.0000	0.0000	14.9786	76.5721	158.7711	
Space heating requirement													
	143.7318	95.9730	50.2938	13.9348	2.1408	0.0000	0.0000	0.0000	0.0000	14.9786	76.5721	158.7711	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	556.3960	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	5.5640	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(330a)
Total electricity for the above, kWh/year	11.9235	(331)
Electricity for lighting (calculated in Appendix L)	130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2925.7327	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	556.3960	6.5500	36.4439	(340a)
Space heating total			36.4439	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			236.8450	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1023.4332	0.1586	23.5289	(367)
Electrical energy for heat distribution (space & water)	5.5640	0.0000	5.5002	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			152.1725	(373)
Space and water heating			152.1725	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			39.4126	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1023.4332	1.5870	235.4676	(467)
Electrical energy for heat distribution (space & water)	5.5640	0.0000	58.7198	(472)
Overall CO2 factor for heat network			0.4233	(486)
Total CO2 associated with community systems			1624.5804	(473)
Space and water heating			1624.5804	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			920.2555	(483)

SAP 10 EPC IMPROVEMENTS

Rev D - West

Current energy efficiency rating:	B 87
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 87
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£41	£41	£0
Community scheme	£355	£355	£0
Space heating	£144	£144	£0
Water heating	£215	£215	£0
Lighting	£37	£37	£0
Generated (PV)	-£159	-£159	£0
Total cost of fuels	£237	£237	£0
Total cost of uses	£237	£237	£0
Delivered energy	67 kWh/m²	67 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.0 tonnes	0.0 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	21 kWh/m²	21 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)

Total net area of external elements Aum(A, m2)	76.5400				(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	16.5005			(33)
Main dwelling					
Party Wall	31.3600	0.0000	0.0000	70.0000	2195.2000 (32)
Party Ceiling 1	43.3600			30.0000	1300.8000 (32b)
Internal TF Wall	68.4500			9.0000	616.0500 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(76)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	460.9371	499.3751	541.0594	581.5362	605.2805	592.0631	569.0364	538.2350	504.0534	463.4913	441.8157	444.4008	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area													
	0.9506	0.9208	0.8509	0.7193	0.5517	0.3920	0.2808	0.3103	0.4941	0.7613	0.9132	0.9589	(86)
MIT	20.5418	20.6601	20.8196	20.9423	20.9895	20.9989	20.9999	20.9998	20.9957	20.9322	20.7241	20.4992	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.9397	0.9048	0.8249	0.6817	0.5076	0.3446	0.2311	0.2578	0.4397	0.7180	0.8932	0.9496	(89)
MIT 2	19.7141	19.8554	20.0390	20.1690	20.2129	20.2202	20.2207	20.2207	20.2182	20.1624	19.9346	19.6624	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.1094	20.2397	20.4119	20.5384	20.5838	20.5921	20.5929	20.5928	20.5896	20.5301	20.3117	20.0621	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1094	20.2397	20.4119	20.5384	20.5838	20.5921	20.5929	20.5928	20.5896	20.5301	20.3117	20.0621	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9380	0.9053	0.8316	0.6973	0.5283	0.3672	0.2549	0.2829	0.4656	0.7357	0.8958	0.9474	(94)
Useful gains	432.3420	452.0640	449.9610	405.5295	319.7866	217.4085	145.0207	152.2644	234.6742	341.0035	395.7573	421.0203	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	574.2773	557.2156	505.3480	422.7631	322.7042	217.6636	145.0408	152.3034	235.7337	360.7107	479.9145	576.1910	(97)
Space heating kWh													
	105.5999	70.6619	41.2080	12.4082	2.1707	0.0000	0.0000	0.0000	0.0000	14.6621	60.5932	115.4470	(98a)
Space heating requirement - total per year (kWh/year)												422.7510	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	105.5999	70.6619	41.2080	12.4082	2.1707	0.0000	0.0000	0.0000	0.0000	14.6621	60.5932	115.4470	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												422.7510	
Space heating per m2											(98c) / (4) =	9.7498	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	105.5999	70.6619	41.2080	12.4082	2.1707	0.0000	0.0000	0.0000	0.0000	14.6621	60.5932	115.4470	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	158.3998	105.9928	61.8120	18.6123	3.2561	0.0000	0.0000	0.0000	0.0000	21.9932	90.8898	173.1705	
Space heating requirement													
	158.3998	105.9928	61.8120	18.6123	3.2561	0.0000	0.0000	0.0000	0.0000	21.9932	90.8898	173.1705	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												634.1264	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												6.3413	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)

Appendix Q - special features

Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3099.9892	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	634.1264	4.4400	28.1552	(340a)
Space heating total			28.1552	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			191.4886	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7802	(357)
SAP value		87.3534	
SAP rating (Section 12)		87	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1044.1613	0.1581	26.7384	(367)
Electrical energy for heat distribution (space & water)	6.3413	0.0000	5.6206	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			155.5023	(373)
Space and water heating			155.5023	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			54.9746	(383)
CO2 emissions per m2			1.2700	(384)
EI value			99.1663	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

Measured/design AP50 3.0000 (17)
Infiltration rate 0.1500 (18)
Number of sides sheltered 3 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
Heatloss Floor 1			43.3600	0.1100	4.7696	110.0000	4769.6000	(28a)
100mm Cavity	16.5900	8.3500	8.2400	0.2500	2.0600	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.2000	3.3180	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.5005			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 10371.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.2962 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 18.7967 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	36.3250	(39)
Average = Sum(39)m / 12 =												36.3250	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	0.8378	(40)
HLP (average)												0.8378	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)
Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
									Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	6.5100	23.7835	0.6800	0.7000	0.7700	51.0736	(76)

Solar gains	51.0736	88.7763	143.8339	211.6843	249.5125	273.8424	255.8751	224.3556	176.4207	111.0901	62.7325	42.2420	(83)
Total gains	469.8344	505.6456	549.0181	595.0545	611.9331	617.2952	588.2244	559.2798	522.4455	476.6813	451.9594	451.9591	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	79.3106	
alpha	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	6.2874	
util living area													
	0.9423	0.9110	0.8276	0.6873	0.5181	0.3410	0.2408	0.2662	0.4570	0.7183	0.8953	0.9522	(86)
MIT	20.5838	20.6918	20.8527	20.9564	20.9929	20.9996	21.0000	20.9999	20.9974	20.9532	20.7668	20.5403	(87)
Th 2	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	20.2207	(88)
util rest of house													
	0.9297	0.8933	0.7989	0.6483	0.4738	0.2953	0.1927	0.2157	0.4039	0.6719	0.8721	0.9414	(89)
MIT 2	19.7649	19.8929	20.0754	20.1827	20.2157	20.2205	20.2207	20.2207	20.2192	20.1822	19.9837	19.7127	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.1560	20.2745	20.4467	20.5523	20.5869	20.5926	20.5929	20.5929	20.5909	20.5504	20.3578	20.1080	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1560	20.2745	20.4467	20.5523	20.5869	20.5926	20.5929	20.5929	20.5909	20.5504	20.3578	20.1080	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9286	0.8946	0.8076	0.6652	0.4947	0.3172	0.2157	0.2398	0.4292	0.6920	0.8765	0.9397	(94)
Useful gains	436.2812	452.3702	443.3841	395.8357	302.7368	195.7885	126.8735	134.1312	224.2433	329.8652	396.1579	424.6918	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	565.0732	547.5815	488.4503	408.7382	304.6551	195.8867	126.8799	134.1441	224.8841	343.2869	467.0580	566.9598	(97)
Space heating kWh													
	95.8212	63.9820	33.5292	9.2898	1.4272	0.0000	0.0000	0.0000	0.0000	9.9857	51.0481	105.8474	(98a)
Space heating requirement - total per year (kWh/year)												370.9307	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	95.8212	63.9820	33.5292	9.2898	1.4272	0.0000	0.0000	0.0000	0.0000	9.9857	51.0481	105.8474	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												370.9307	
Space heating per m2											(98c) / (4) =	8.5547	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement													
	95.8212	63.9820	33.5292	9.2898	1.4272	0.0000	0.0000	0.0000	0.0000	9.9857	51.0481	105.8474	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	143.7318	95.9730	50.2938	13.9348	2.1408	0.0000	0.0000	0.0000	0.0000	14.9786	76.5721	158.7711	
Space heating requirement													
	143.7318	95.9730	50.2938	13.9348	2.1408	0.0000	0.0000	0.0000	0.0000	14.9786	76.5721	158.7711	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)

Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	556.3960	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	5.5640	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(330a)
Total electricity for the above, kWh/year	11.9235	(331)
Electricity for lighting (calculated in Appendix L)	130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2925.7327	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	556.3960	6.5500	36.4439	(340a)
Space heating total			36.4439	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			236.8450	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1023.4332	0.1586	23.5289	(367)
Electrical energy for heat distribution (space & water)	5.5640	0.0000	5.5002	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			152.1725	(373)
Space and water heating			152.1725	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			39.4126	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1023.4332	1.5870	235.4676	(467)
Electrical energy for heat distribution (space & water)	5.5640	0.0000	58.7198	(472)
Overall CO2 factor for heat network			0.4233	(486)
Total CO2 associated with community systems			1624.5804	(473)
Space and water heating			1624.5804	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			920.2555	(483)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	82 B	**DER**	3.82	**TER**	14.75
Environmental	98 A	**% DER < TER**			74.10
CO_2 Emissions (t/year)	0.16	**DFEE**	16.05	**TFEE**	26.65
Compliance Check	See BREL	**% DFEE < TFEE**			39.75
% DPER < TPER	48.75	**DPER**	40.83	**TPER**	79.68

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
12Total per year (kWh/year)												2188	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	419.7672	467.2558	506.0368	555.7052	584.1265	578.6970	555.6038	523.3987	486.8526	437.0989	410.7463	405.5434	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761

alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area	0.9267	0.8767	0.7894	0.6359	0.4742	0.3307	0.2370	0.2630	0.4230	0.6861	0.8692	0.9377 (86)
MIT	20.6377	20.7640	20.8873	20.9715	20.9957	20.9996	21.0000	20.9999	20.9983	20.9630	20.8072	20.5993 (87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496 (88)
util rest of house	0.9146	0.8592	0.7647	0.6052	0.4417	0.2972	0.2019	0.2258	0.3836	0.6495	0.8481	0.9270 (89)
MIT 2	19.9451	20.0941	20.2343	20.3232	20.3461	20.3493	20.3495	20.3495	20.3484	20.3165	20.1475	19.8990 (90)
Living area fraction										fLA = Living area / (4) =		0.4776 (91)
MIT	20.2759	20.4141	20.5462	20.6328	20.6563	20.6599	20.6602	20.6602	20.6588	20.6253	20.4626	20.2335 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2759	20.4141	20.5462	20.6328	20.6563	20.6599	20.6602	20.6602	20.6588	20.6253	20.4626	20.2335 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9132	0.8610	0.7724	0.6187	0.4570	0.3132	0.2187	0.2435	0.4024	0.6652	0.8520	0.9249	(94)
Useful gains	383.3117	402.3273	390.8480	343.8261	266.9713	181.2577	121.4910	127.4688	195.8981	290.7775	349.9482	375.0866	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	478.0616	464.2416	420.3162	351.0924	268.0088	181.3367	121.4972	127.4812	196.2661	299.9958	399.8618	479.7839	(97)
Space heating kWh	70.4939	41.6064	21.9243	5.2317	0.7719	0.0000	0.0000	0.0000	0.0000	6.8584	35.9378	77.8947	(98a)
Space heating requirement - total per year (kWh/year)												260.7193	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	70.4939	41.6064	21.9243	5.2317	0.7719	0.0000	0.0000	0.0000	0.0000	6.8584	35.9378	77.8947	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												260.7193	
Space heating per m2											(98c) / (4) =	6.0129	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	70.4939	41.6064	21.9243	5.2317	0.7719	0.0000	0.0000	0.0000	0.0000	6.8584	35.9378	77.8947	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	105.7409	62.4096	32.8865	7.8476	1.1579	0.0000	0.0000	0.0000	0.0000	10.2876	53.9068	116.8421	
Space heating requirement	105.7409	62.4096	32.8865	7.8476	1.1579	0.0000	0.0000	0.0000	0.0000	10.2876	53.9068	116.8421	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												391.0789	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												3.9108	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3815.1626	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	979.3486	0.1588	16.5633	(367)
Electrical energy for heat distribution (space & water)	3.9108	0.0000	5.2390	(372)
Overall CO2 factor for heat network			0.0395	(386)
Total CO2 associated with community systems			144.9457	(373)
Space and water heating			144.9457	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Total CO2, kg/year			165.4610	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.8200	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	979.3486	1.5879	165.5957	(467)
Electrical energy for heat distribution (space & water)	3.9108	0.0000	56.0996	(472)
Overall CO2 factor for heat network			0.4226	(486)
Total CO2 associated with community systems			1552.0883	(473)
Space and water heating			1552.0883	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Total Primary energy kWh/year			1770.5703	(483)
Dwelling Primary energy Rate (DPER)			40.8300	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		13.7636			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 199.1940 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830

E3 Sill	4.7600	0.0500	0.2380	
E4 Jamb	23.1600	0.0500	1.1580	
E7 Party floor between dwellings (in blocks of flats)	52.2400	0.0700	3.6568	
E16 Corner (normal)	5.0000	0.0900	0.4500	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000	
E18 Party wall between dwellings	5.0000	0.0600	0.3000	
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3858 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.1494 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	40.9650	40.8373	40.7122	40.1245	40.0146	39.5027	39.5027	39.4079	39.6999	40.0146	40.2370	40.4696	(39)
Average = Sum(39)m / 12 =												40.1240	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9448	0.9418	0.9389	0.9254	0.9228	0.9110	0.9110	0.9089	0.9156	0.9228	0.9280	0.9333	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)
Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	

Distribution loss (46)m = 0.15 x (45)m

23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)
Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS -22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
							Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)

12Total per year (kWh/year) 1876 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans 3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6300	0.7000	0.7700	39.0751	(80)

Solar gains	39.0751	76.4392	125.8845	183.5950	225.0025	230.3301	219.2837	188.3614	146.4088	90.7015	48.7221	32.1335	(83)
Total gains	408.2958	452.6009	487.6757	532.6961	557.8990	548.9788	526.8301	497.0792	463.7948	421.5301	398.4414	394.6229	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.5666	58.7497	58.9302	59.7934	59.9577	60.7346	60.7346	60.8807	60.4330	59.9577	59.6262	59.2836	
alpha	4.9044	4.9166	4.9287	4.9862	4.9972	5.0490	5.0490	5.0587	5.0289	4.9972	4.9751	4.9522	
util living area	0.9663	0.9442	0.8999	0.7921	0.6348	0.4555	0.3291	0.3633	0.5728	0.8279	0.9387	0.9705	(86)
MIT	20.1073	20.2900	20.5325	20.8032	20.9443	20.9915	20.9987	20.9978	20.9743	20.7919	20.4266	20.0823	(87)
Th 2	20.1296	20.1321	20.1345	20.1460	20.1481	20.1581	20.1581	20.1600	20.1543	20.1481	20.1438	20.1393	(88)
util rest of house	0.9590	0.9327	0.8803	0.7572	0.5854	0.3976	0.2665	0.2976	0.5089	0.7898	0.9243	0.9640	(89)
MIT 2	19.1134	19.3408	19.6362	19.9557	20.1025	20.1530	20.1576	20.1591	20.1370	19.9528	19.5220	19.0897	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.5881	19.7942	20.0643	20.3605	20.5046	20.5535	20.5593	20.5597	20.5369	20.3535	19.9541	19.5638	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5881	19.7942	20.0643	20.3605	20.5046	20.5535	20.5593	20.5597	20.5369	20.3535	19.9541	19.5638	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9536	0.9276	0.8785	0.7664	0.6065	0.4250	0.2964	0.3290	0.5383	0.7996	0.9206	0.9588	(94)
Useful gains	389.3451	419.8155	428.4360	408.2411	338.3719	233.3060	156.1646	163.5224	249.6558	337.0589	366.7973	378.3642	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	626.2782	608.2396	552.2334	459.8455	352.3128	235.1778	156.4037	163.9244	255.5453	390.2837	517.2101	621.7659	(97)
Space heating kWh	176.2783	126.6210	92.1053	37.1552	10.3720	0.0000	0.0000	0.0000	0.0000	39.5992	108.2973	181.0909	(98a)
Space heating requirement - total per year (kWh/year)												771.5190	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	176.2783	126.6210	92.1053	37.1552	10.3720	0.0000	0.0000	0.0000	0.0000	39.5992	108.2973	181.0909	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												771.5190	
Space heating per m2											(98c) / (4) =	17.7933	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 92.3000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	176.2783	126.6210	92.1053	37.1552	10.3720	0.0000	0.0000	0.0000	0.0000	39.5992	108.2973	181.0909	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	190.9841	137.1842	99.7890	40.2548	11.2372	0.0000	0.0000	0.0000	0.0000	42.9027	117.3318	196.1981	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	83.9704	83.5078	82.7116	81.4070	80.3270	79.8000	79.8000	79.8000	79.8000	81.4735	83.1506	84.0529	(217)
Fuel for water heating, kWh/month	218.4700	194.4820	209.2614	188.6979	186.5510	170.5061	169.2907	175.3325	176.4869	191.2155	197.3476	216.1109	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 835.8819 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 79.8000
Water heating fuel used 2293.7526 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
Total electricity for the above, kWh/year 86.0000 (231)
Electricity for lighting (calculated in Appendix L) 116.2701 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation -357.1961 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)

Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2974.7086	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	835.8819	0.2100	175.5352	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2293.7526	0.2100	481.6881	(264)
Space and water heating			657.2233	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			639.5207	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.7500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	835.8819	1.1300	944.5466	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2293.7526	1.1300	2591.9405	(278)
Space and water heating			3536.4870	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3454.9846	(286)
Target Primary Energy Rate (TPER)			79.6800	(287)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	82 B	**DER**	3.82	**TER**	14.75
Environmental	98 A	**% DER < TER**			74.10
CO_2 Emissions (t/year)	0.16	**DFEE**	16.05	**TFEE**	26.65
Compliance Check	See BREL	**% DFEE < TFEE**			39.75
% DPER < TPER	48.75	**DPER**	40.83	**TPER**	79.68

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2622	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	31.8822	31.8062	31.7316	31.3815	31.3160	31.0111	31.0111	30.9546	31.1285	31.3160	31.4485	31.5871	(39)
Average = Sum(39)m / 12 =												31.3812	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7353	0.7335	0.7318	0.7237	0.7222	0.7152	0.7152	0.7139	0.7179	0.7222	0.7253	0.7285	(40)
HLP (average)												0.7237	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		449.4572	(64a)
Heat gains from water heating, kWh/month	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.4004	291.4783	279.0119	271.5070	258.2448	250.2442	241.2477	240.9702	247.9561	254.7841	268.8582	277.3654	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	325.5767	373.9841	414.8872	469.6730	501.1047	498.8545	477.9348	444.2810	405.9847	352.6842	321.4470	312.0492	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.2514	75.4313	75.6085	76.4520	76.6119	77.3652	77.3652	77.5064	77.0733	76.6119	76.2891	75.9545	
alpha	6.0168	6.0288	6.0406	6.0968	6.1075	6.1577	6.1577	6.1671	6.1382	6.1075	6.0859	6.0636	
util living area	0.9792	0.9544	0.8983	0.7541	0.5722	0.3970	0.2854	0.3203	0.5240	0.8229	0.9540	0.9831	(86)
MIT	20.3085	20.4977	20.7168	20.9171	20.9853	20.9987	20.9999	20.9997	20.9933	20.8848	20.5767	20.2742	(87)
Th 2	20.3098	20.3113	20.3128	20.3199	20.3212	20.3274	20.3274	20.3286	20.3250	20.3212	20.3185	20.3157	(88)
util rest of house	0.9747	0.9455	0.8804	0.7223	0.5330	0.3556	0.2418	0.2737	0.4746	0.7890	0.9434	0.9794	(89)

MIT 2	19.6848	19.8690	20.0762	20.2578	20.3119	20.3268	20.3274	20.3285	20.3215	20.2363	19.9537	19.6563	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.9827	20.1693	20.3822	20.5727	20.6335	20.6477	20.6486	20.6491	20.6424	20.5461	20.2513	19.9514	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9827	20.1693	20.3822	20.5727	20.6335	20.6477	20.6486	20.6491	20.6424	20.5461	20.2513	19.9514	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9722	0.9434	0.8823	0.7344	0.5512	0.3754	0.2626	0.2959	0.4980	0.8008	0.9423	0.9771	(94)
Useful gains	316.5357	352.8131	366.0688	344.9320	276.1907	187.2621	125.5261	131.4778	202.1742	282.4211	302.8894	304.9109	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	499.9996	485.6573	440.5044	366.3071	279.7621	187.5456	125.5508	131.5287	203.6550	311.4719	413.5891	497.5408	(97)
Space heating kWh	136.4971	89.2713	55.3801	15.3900	2.6571	0.0000	0.0000	0.0000	0.0000	21.6138	79.7037	143.3166	(98a)
Space heating requirement - total per year (kWh/year)												543.8298	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	136.4971	89.2713	55.3801	15.3900	2.6571	0.0000	0.0000	0.0000	0.0000	21.6138	79.7037	143.3166	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												543.8298	
Space heating per m2											(98c) / (4) =	12.5422	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	291.5043	229.4821	235.2551	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9908	0.9968	0.9945	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	288.8295	228.7378	233.9688	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	554.0542	531.1768	493.2464	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	190.9618	225.0146	192.9026	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	47.7404	56.2537	48.2256	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												152.2197	(107)
Energy for space heating												12.5422	(99)
Energy for space cooling												3.5106	(108)
Total												16.0528	(109)
Fabric Energy Efficiency (DFEE)												16.1	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	13.7636			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	199.1940	(35)
List of Thermal Bridges		

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	52.2400	0.0700	3.6568
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	6.3858	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	20.1494	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	40.9650	40.8373	40.7122	40.1245	40.0146	39.5027	39.5027	39.4079	39.6999	40.0146	40.2370	40.4696	(39)
Average = Sum(39)m / 12 =												40.1240	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9448	0.9418	0.9389	0.9254	0.9228	0.9110	0.9110	0.9089	0.9156	0.9228	0.9280	0.9333	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4982	(42)

Hot water usage for mixer showers

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												47.0349	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	

Distribution loss (46)m = 0.15 x (45)m

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)

Electric shower(s)

	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												449.4572	(64a)

Heat gains from water heating, kWh/month

	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													

	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931 (72)
Total internal gains	281.3655	289.2254	276.9770	269.4043	256.2100	248.1415	239.2128	238.9354	245.8534	252.7493	266.7555	275.3306 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6300	0.7000	0.7700	39.0751	(80)

Solar gains	39.0751	76.4392	125.8845	183.5950	225.0025	230.3301	219.2837	188.3614	146.4088	90.7015	48.7221	32.1335	(83)
Total gains	320.4406	365.6646	402.8615	452.9993	481.2125	478.4717	458.4965	427.2968	392.2623	343.4508	315.4775	307.4640	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.5666	58.7497	58.9302	59.7934	59.9577	60.7346	60.7346	60.8807	60.4330	59.9577	59.6262	59.2836	
alpha	4.9044	4.9166	4.9287	4.9862	4.9972	5.0490	5.0490	5.0587	5.0289	4.9972	4.9751	4.9522	
util living area	0.9870	0.9744	0.9461	0.8604	0.7116	0.5182	0.3773	0.4210	0.6592	0.9021	0.9739	0.9891	(86)
MIT	19.8660	20.0709	20.3543	20.7036	20.9080	20.9849	20.9975	20.9957	20.9524	20.6706	20.2200	19.8386	(87)
Th 2	20.1296	20.1321	20.1345	20.1460	20.1481	20.1581	20.1581	20.1600	20.1543	20.1481	20.1438	20.1393	(88)
util rest of house	0.9838	0.9684	0.9336	0.8313	0.6618	0.4540	0.3060	0.3457	0.5914	0.8743	0.9667	0.9865	(89)
MIT 2	19.1024	19.3056	19.5820	19.9148	20.0875	20.1508	20.1574	20.1586	20.1283	19.8948	19.4634	19.0830	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.4671	19.6711	19.9509	20.2916	20.4794	20.5492	20.5586	20.5584	20.5219	20.2653	19.8248	19.4439	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4671	19.6711	19.9509	20.2916	20.4794	20.5492	20.5586	20.5584	20.5219	20.2653	19.8248	19.4439	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9808	0.9646	0.9305	0.8367	0.6818	0.4842	0.3401	0.3817	0.6218	0.8786	0.9635	0.9838	(94)
Useful gains	314.2852	352.7043	374.8723	379.0078	328.1045	231.6630	155.9246	163.0799	243.9040	301.7465	303.9544	302.4822	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	621.3211	603.2137	547.6150	457.0809	351.3023	235.0097	156.3764	163.8747	254.9492	386.7541	512.0068	616.9138	(97)
Space heating kWh	228.4347	168.3423	128.5206	56.2126	17.2592	0.0000	0.0000	0.0000	0.0000	63.2456	149.7977	233.9371	(98a)
Space heating requirement - total per year (kWh/year)												1045.7499	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	228.4347	168.3423	128.5206	56.2126	17.2592	0.0000	0.0000	0.0000	0.0000	63.2456	149.7977	233.9371	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1045.7499	
Space heating per m2										(98c) / (4) =		24.1178	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	371.3254	292.3200	299.5001	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9447	0.9735	0.9620	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	350.8010	284.5787	288.1146	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	532.5097	510.6427	475.5231	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	130.8303	168.1917	139.4320	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	32.7076	42.0479	34.8580	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												109.6135	(107)
Energy for space heating												24.1178	(99)
Energy for space cooling												2.5280	(108)
Total												26.6458	(109)
Fabric Energy Efficiency (TFEE)												26.6	(109)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	82 B	**DER**	3.82	**TER**	14.75
Environmental	98 A	**% DER < TER**			74.10
CO_2 Emissions (t/year)	0.16	**DFEE**	16.05	**TFEE**	26.65
Compliance Check	See BREL	**% DFEE < TFEE**			39.75
% DPER < TPER	48.75	**DPER**	40.83	**TPER**	79.68

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
12Total per year (kWh/year)												2188	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	419.7672	467.2558	506.0368	555.7052	584.1265	578.6970	555.6038	523.3987	486.8526	437.0989	410.7463	405.5434	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761

alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area	0.9267	0.8767	0.7894	0.6359	0.4742	0.3307	0.2370	0.2630	0.4230	0.6861	0.8692	0.9377 (86)
MIT	20.6377	20.7640	20.8873	20.9715	20.9957	20.9996	21.0000	20.9999	20.9983	20.9630	20.8072	20.5993 (87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496 (88)
util rest of house	0.9146	0.8592	0.7647	0.6052	0.4417	0.2972	0.2019	0.2258	0.3836	0.6495	0.8481	0.9270 (89)
MIT 2	19.9451	20.0941	20.2343	20.3232	20.3461	20.3493	20.3495	20.3495	20.3484	20.3165	20.1475	19.8990 (90)
Living area fraction										fLA = Living area / (4) =		0.4776 (91)
MIT	20.2759	20.4141	20.5462	20.6328	20.6563	20.6599	20.6602	20.6602	20.6588	20.6253	20.4626	20.2335 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2759	20.4141	20.5462	20.6328	20.6563	20.6599	20.6602	20.6602	20.6588	20.6253	20.4626	20.2335 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9132	0.8610	0.7724	0.6187	0.4570	0.3132	0.2187	0.2435	0.4024	0.6652	0.8520	0.9249	(94)
Useful gains	383.3117	402.3273	390.8480	343.8261	266.9713	181.2577	121.4910	127.4688	195.8981	290.7775	349.9482	375.0866	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	478.0616	464.2416	420.3162	351.0924	268.0088	181.3367	121.4972	127.4812	196.2661	299.9958	399.8618	479.7839	(97)
Space heating kWh	70.4939	41.6064	21.9243	5.2317	0.7719	0.0000	0.0000	0.0000	0.0000	6.8584	35.9378	77.8947	(98a)
Space heating requirement - total per year (kWh/year)												260.7193	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	70.4939	41.6064	21.9243	5.2317	0.7719	0.0000	0.0000	0.0000	0.0000	6.8584	35.9378	77.8947	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												260.7193	
Space heating per m2											(98c) / (4) =	6.0129	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	70.4939	41.6064	21.9243	5.2317	0.7719	0.0000	0.0000	0.0000	0.0000	6.8584	35.9378	77.8947	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	105.7409	62.4096	32.8865	7.8476	1.1579	0.0000	0.0000	0.0000	0.0000	10.2876	53.9068	116.8421	
Space heating requirement	105.7409	62.4096	32.8865	7.8476	1.1579	0.0000	0.0000	0.0000	0.0000	10.2876	53.9068	116.8421	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												391.0789	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												3.9108	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3815.1626	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	979.3486	0.1588	16.5633	(367)
Electrical energy for heat distribution (space & water)	3.9108	0.0000	5.2390	(372)
Overall CO2 factor for heat network			0.0395	(386)
Total CO2 associated with community systems			144.9457	(373)
Space and water heating			144.9457	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Total CO2, kg/year			165.4610	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.8200	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	979.3486	1.5879	165.5957	(467)
Electrical energy for heat distribution (space & water)	3.9108	0.0000	56.0996	(472)
Overall CO2 factor for heat network			0.4226	(486)
Total CO2 associated with community systems			1552.0883	(473)
Space and water heating			1552.0883	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Total Primary energy kWh/year			1770.5703	(483)
Dwelling Primary energy Rate (DPER)			40.8300	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		13.7636			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 199.1940 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830

E3 Sill	4.7600	0.0500	0.2380	
E4 Jamb	23.1600	0.0500	1.1580	
E7 Party floor between dwellings (in blocks of flats)	52.2400	0.0700	3.6568	
E16 Corner (normal)	5.0000	0.0900	0.4500	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000	
E18 Party wall between dwellings	5.0000	0.0600	0.3000	
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3858 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.1494 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	40.9650	40.8373	40.7122	40.1245	40.0146	39.5027	39.5027	39.4079	39.6999	40.0146	40.2370	40.4696	(39)
Average = Sum(39)m / 12 =												40.1240	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9448	0.9418	0.9389	0.9254	0.9228	0.9110	0.9110	0.9089	0.9156	0.9228	0.9280	0.9333	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)
Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	

Distribution loss (46)m = 0.15 x (45)m

23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)
Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS -22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
							Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)

12Total per year (kWh/year) 1876 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans 3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6300	0.7000	0.7700	39.0751	(80)

Solar gains	39.0751	76.4392	125.8845	183.5950	225.0025	230.3301	219.2837	188.3614	146.4088	90.7015	48.7221	32.1335	(83)
Total gains	408.2958	452.6009	487.6757	532.6961	557.8990	548.9788	526.8301	497.0792	463.7948	421.5301	398.4414	394.6229	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.5666	58.7497	58.9302	59.7934	59.9577	60.7346	60.7346	60.8807	60.4330	59.9577	59.6262	59.2836	
alpha	4.9044	4.9166	4.9287	4.9862	4.9972	5.0490	5.0490	5.0587	5.0289	4.9972	4.9751	4.9522	
util living area	0.9663	0.9442	0.8999	0.7921	0.6348	0.4555	0.3291	0.3633	0.5728	0.8279	0.9387	0.9705	(86)
MIT	20.1073	20.2900	20.5325	20.8032	20.9443	20.9915	20.9987	20.9978	20.9743	20.7919	20.4266	20.0823	(87)
Th 2	20.1296	20.1321	20.1345	20.1460	20.1481	20.1581	20.1581	20.1600	20.1543	20.1481	20.1438	20.1393	(88)
util rest of house	0.9590	0.9327	0.8803	0.7572	0.5854	0.3976	0.2665	0.2976	0.5089	0.7898	0.9243	0.9640	(89)
MIT 2	19.1134	19.3408	19.6362	19.9557	20.1025	20.1530	20.1576	20.1591	20.1370	19.9528	19.5220	19.0897	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.5881	19.7942	20.0643	20.3605	20.5046	20.5535	20.5593	20.5597	20.5369	20.3535	19.9541	19.5638	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5881	19.7942	20.0643	20.3605	20.5046	20.5535	20.5593	20.5597	20.5369	20.3535	19.9541	19.5638	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9536	0.9276	0.8785	0.7664	0.6065	0.4250	0.2964	0.3290	0.5383	0.7996	0.9206	0.9588	(94)
Useful gains	389.3451	419.8155	428.4360	408.2411	338.3719	233.3060	156.1646	163.5224	249.6558	337.0589	366.7973	378.3642	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	626.2782	608.2396	552.2334	459.8455	352.3128	235.1778	156.4037	163.9244	255.5453	390.2837	517.2101	621.7659	(97)
Space heating kWh	176.2783	126.6210	92.1053	37.1552	10.3720	0.0000	0.0000	0.0000	0.0000	39.5992	108.2973	181.0909	(98a)
Space heating requirement - total per year (kWh/year)												771.5190	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	176.2783	126.6210	92.1053	37.1552	10.3720	0.0000	0.0000	0.0000	0.0000	39.5992	108.2973	181.0909	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												771.5190	
Space heating per m2											(98c) / (4) =	17.7933	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 92.3000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	176.2783	126.6210	92.1053	37.1552	10.3720	0.0000	0.0000	0.0000	0.0000	39.5992	108.2973	181.0909	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	190.9841	137.1842	99.7890	40.2548	11.2372	0.0000	0.0000	0.0000	0.0000	42.9027	117.3318	196.1981	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	83.9704	83.5078	82.7116	81.4070	80.3270	79.8000	79.8000	79.8000	79.8000	81.4735	83.1506	84.0529	(217)
Fuel for water heating, kWh/month	218.4700	194.4820	209.2614	188.6979	186.5510	170.5061	169.2907	175.3325	176.4869	191.2155	197.3476	216.1109	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year
Space heating fuel - main system 1 835.8819 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 79.8000
Water heating fuel used 2293.7526 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
Total electricity for the above, kWh/year 86.0000 (231)
Electricity for lighting (calculated in Appendix L) 116.2701 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation -357.1961 (233)
Wind generation 0.0000 (234)
Hydro-electric generation (Appendix N) 0.0000 (235a)

Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2974.7086	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	835.8819	0.2100	175.5352	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2293.7526	0.2100	481.6881	(264)
Space and water heating			657.2233	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			639.5207	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.7500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	835.8819	1.1300	944.5466	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2293.7526	1.1300	2591.9405	(278)
Space and water heating			3536.4870	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3454.9846	(286)
Target Primary Energy Rate (TPER)			79.6800	(287)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	82 B	**DER**	3.82	**TER**	14.75
Environmental	98 A	**% DER < TER**			74.10
CO_2 Emissions (t/year)	0.16	**DFEE**	16.05	**TFEE**	26.65
Compliance Check	See BREL	**% DFEE < TFEE**			39.75
% DPER < TPER	48.75	**DPER**	40.83	**TPER**	79.68

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		8637.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							199.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							0.9954	(36)
Point Thermal bridges					(36a) =		0.0000	

Total fabric heat loss (33) + (36) + (36a) = 12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	460.9371	499.3751	541.0594	581.5362	605.2805	592.0631	569.0364	538.2350	504.0534	463.4913	441.8157	444.4008	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451

util living area													
	0.8961	0.8479	0.7531	0.6106	0.4580	0.3233	0.2314	0.2557	0.4088	0.6528	0.8364	0.9109	(86)
MIT	20.7164	20.8090	20.9136	20.9772	20.9964	20.9997	21.0000	20.9999	20.9986	20.9718	20.8482	20.6797	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house													
	0.8809	0.8284	0.7275	0.5805	0.4265	0.2905	0.1972	0.2196	0.3706	0.6167	0.8129	0.8972	(89)
MIT 2	20.0380	20.1453	20.2622	20.3285	20.3467	20.3494	20.3496	20.3495	20.3486	20.3247	20.1929	19.9947	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.3620	20.4623	20.5734	20.6383	20.6570	20.6600	20.6602	20.6602	20.6591	20.6337	20.5059	20.3219	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3620	20.4623	20.5734	20.6383	20.6570	20.6600	20.6602	20.6602	20.6591	20.6337	20.5059	20.3219	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8812	0.8319	0.7365	0.5940	0.4414	0.3062	0.2135	0.2368	0.3888	0.6327	0.8188	0.8966	(94)
Useful gains	406.1975	415.4286	398.5023	345.4377	267.1774	181.2688	121.4920	127.4710	195.9715	293.2321	361.7645	398.4587	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	480.6386	465.6856	421.1295	351.2571	268.0296	181.3378	121.4973	127.4814	196.2735	300.2486	401.1566	482.4290	(97)
Space heating kWh	55.3841	33.7727	16.8346	4.1900	0.6341	0.0000	0.0000	0.0000	0.0000	5.2203	28.3624	62.4739	(98a)
Space heating requirement - total per year (kWh/year)												206.8720	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	55.3841	33.7727	16.8346	4.1900	0.6341	0.0000	0.0000	0.0000	0.0000	5.2203	28.3624	62.4739	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												206.8720	
Space heating per m2											(98c) / (4) =	4.7710	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	55.3841	33.7727	16.8346	4.1900	0.6341	0.0000	0.0000	0.0000	0.0000	5.2203	28.3624	62.4739	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	83.0762	50.6591	25.2519	6.2849	0.9511	0.0000	0.0000	0.0000	0.0000	7.8304	42.5435	93.7109	
Space heating requirement	83.0762	50.6591	25.2519	6.2849	0.9511	0.0000	0.0000	0.0000	0.0000	7.8304	42.5435	93.7109	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												310.3080	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												3.1031	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3734.3917	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	310.3080	4.4400	13.7777	(340a)
Space heating total			13.7777	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Total energy cost			274.9909	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1204	(357)
SAP value		81.8386	
SAP rating (Section 12)		82	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	957.8097	0.1589	13.1463	(367)
Electrical energy for heat distribution (space & water)	3.1031	0.0000	5.1109	(372)
Overall CO2 factor for heat network			0.0394	(386)
Total CO2 associated with community systems			141.4005	(373)
Space and water heating			141.4005	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Total CO2, kg/year			161.9159	(383)
CO2 emissions per m2			3.7300	(384)
EI value			97.5445	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.4982 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day)		92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)											Total = Sum(45)m =	1536.8125	
Distribution loss (46)m = 0.15 x (45)m													
	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:		
Store volume		110.0000 (47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)		0.0152 (51)
Volume factor from Table 2a		1.0294 (52)
Temperature factor from Table 2b		0.6000 (53)
Enter (49) or (54) in (55)		1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
									Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	23.7835	0.6800	0.7000	0.7700	51.0736	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	51.0736	88.7763	143.8339	211.6843	249.5125	273.8424	255.8751	224.3556	176.4207	111.0901	62.7325	42.2420	(83)
Total gains	469.8344	505.6456	549.0181	595.0545	611.9331	617.2952	588.2244	559.2798	522.4455	476.6813	451.9594	451.9591	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area	0.8819	0.8332	0.7254	0.5798	0.4292	0.2811	0.1984	0.2194	0.3775	0.6096	0.8109	0.8989	(86)
MIT	20.7500	20.8315	20.9323	20.9834	20.9977	20.9999	21.0000	21.0000	20.9992	20.9815	20.8774	20.7138	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house	0.8652	0.8125	0.6984	0.5496	0.3978	0.2496	0.1653	0.1846	0.3405	0.5728	0.7852	0.8838	(89)
MIT 2	20.0775	20.1710	20.2823	20.3345	20.3478	20.3495	20.3496	20.3496	20.3490	20.3338	20.2252	20.0353	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.3987	20.4865	20.5928	20.6444	20.6582	20.6601	20.6602	20.6602	20.6596	20.6432	20.5367	20.3593	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3987	20.4865	20.5928	20.6444	20.6582	20.6601	20.6602	20.6602	20.6596	20.6432	20.5367	20.3593	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8665	0.8170	0.7087	0.5634	0.4127	0.2646	0.1811	0.2012	0.3582	0.5896	0.7929	0.8840	(94)
Useful gains	407.1210	413.1029	389.0811	335.2603	252.5528	163.3622	106.5340	112.5169	187.1309	281.0281	358.3499	399.5327	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	472.7596	457.4313	406.7486	339.4698	253.1016	163.3884	106.5357	112.5203	187.3102	285.5683	390.1095	474.5735	(97)
Space heating kWh	48.8351	29.7887	13.1446	3.0308	0.4083	0.0000	0.0000	0.0000	0.0000	3.3779	22.8669	55.8303	(98a)
Space heating requirement - total per year (kWh/year)												177.2826	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	48.8351	29.7887	13.1446	3.0308	0.4083	0.0000	0.0000	0.0000	0.0000	3.3779	22.8669	55.8303	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												177.2826	
Space heating per m2										(98c) / (4) =		4.0886	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	48.8351	29.7887	13.1446	3.0308	0.4083	0.0000	0.0000	0.0000	0.0000	3.3779	22.8669	55.8303	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	73.2526	44.6830	19.7169	4.5462	0.6124	0.0000	0.0000	0.0000	0.0000	5.0669	34.3004	83.7455	
Space heating requirement	73.2526	44.6830	19.7169	4.5462	0.6124	0.0000	0.0000	0.0000	0.0000	5.0669	34.3004	83.7455	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												265.9239	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												2.6592	(313)
Space cooling fuel												0.0000	(321)

Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(330a)
Total electricity for the above, kWh/year	11.9235	(331)
Electricity for lighting (calculated in Appendix L)	130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3690.0077	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	265.9239	6.5500	17.4180	(340a)
Space heating total			17.4180	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Total energy cost			376.8975	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	945.9740	0.1593	11.2950	(367)
Electrical energy for heat distribution (space & water)	2.6592	0.0000	5.0414	(372)
Overall CO2 factor for heat network			0.0393	(386)
Total CO2 associated with community systems			139.4798	(373)
Space and water heating			139.4798	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Total CO2, kg/year			159.9951	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	945.9740	1.5896	112.7204	(467)
Electrical energy for heat distribution (space & water)	2.6592	0.0000	54.1168	(472)
Overall CO2 factor for heat network			0.4221	(486)
Total CO2 associated with community systems			1497.2302	(473)
Space and water heating			1497.2302	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Total Primary energy kWh/year			1715.7122	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Be Clean

Current energy efficiency rating:	B 82
Current environmental impact rating:	A 98

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating:	B 82
Potential environmental impact rating:	A 98

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£41	£41	£0
Community scheme	£336	£336	£0
Space heating	£125	£125	£0
Water heating	£215	£215	£0
Lighting	£37	£37	£0

Total cost of fuels	£377	£377	£0
Total cost of uses	£377	£377	£0
Delivered energy	85 kWh/m²	85 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	4 kg/m²	4 kg/m²	0 kg/m²
Primary energy	40 kWh/m²	40 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	12.3956	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers													
	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths													
	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses													
	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m													
	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	460.9371	499.3751	541.0594	581.5362	605.2805	592.0631	569.0364	538.2350	504.0534	463.4913	441.8157	444.4008	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area													
	0.8961	0.8479	0.7531	0.6106	0.4580	0.3233	0.2314	0.2557	0.4088	0.6528	0.8364	0.9109	(86)
MIT	20.7164	20.8090	20.9136	20.9772	20.9964	20.9997	21.0000	20.9999	20.9986	20.9718	20.8482	20.6797	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house													
	0.8809	0.8284	0.7275	0.5805	0.4265	0.2905	0.1972	0.2196	0.3706	0.6167	0.8129	0.8972	(89)
MIT 2	20.0380	20.1453	20.2622	20.3285	20.3467	20.3494	20.3496	20.3495	20.3486	20.3247	20.1929	19.9947	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.3620	20.4623	20.5734	20.6383	20.6570	20.6600	20.6602	20.6602	20.6591	20.6337	20.5059	20.3219	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3620	20.4623	20.5734	20.6383	20.6570	20.6600	20.6602	20.6602	20.6591	20.6337	20.5059	20.3219	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8812	0.8319	0.7365	0.5940	0.4414	0.3062	0.2135	0.2368	0.3888	0.6327	0.8188	0.8966	(94)
Useful gains	406.1975	415.4286	398.5023	345.4377	267.1774	181.2688	121.4920	127.4710	195.9715	293.2321	361.7645	398.4587	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	480.6386	465.6856	421.1295	351.2571	268.0296	181.3378	121.4973	127.4814	196.2735	300.2486	401.1566	482.4290	(97)
Space heating kWh	55.3841	33.7727	16.8346	4.1900	0.6341	0.0000	0.0000	0.0000	0.0000	5.2203	28.3624	62.4739	(98a)
Space heating requirement - total per year (kWh/year)												206.8720	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	55.3841	33.7727	16.8346	4.1900	0.6341	0.0000	0.0000	0.0000	0.0000	5.2203	28.3624	62.4739	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												206.8720	
Space heating per m2											(98c) / (4) =	4.7710	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		
55.3841 33.7727 16.8346 4.1900 0.6341 0.0000 0.0000 0.0000 0.0000 5.2203 28.3624	62.4739	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50		
307a 83.0762 50.6591 25.2519 6.2849 0.9511 0.0000 0.0000 0.0000 0.0000 7.8304 42.5435	93.7109	
Space heating requirement		
83.0762 50.6591 25.2519 6.2849 0.9511 0.0000 0.0000 0.0000 0.0000 7.8304 42.5435	93.7109	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.0000	(309)
Water heating		
Annual water heating requirement		
214.6882 190.1982 202.6545 179.3121 174.6530 158.2600 156.7058 162.3469 163.5105 181.2971 191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50		
310a 322.0323 285.2973 303.9818 268.9682 261.9796 237.3900 235.0587 243.5203 245.2657 271.9456 287.3375	318.7016	
Water heating fuel		
322.0323 285.2973 303.9818 268.9682 261.9796 237.3900 235.0587 243.5203 245.2657 271.9456 287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio	0.0000	(314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.0000	(315)
Pumps and Fa 1.0127 0.9147 1.0127 0.9800 1.0127 0.9800 1.0127 1.0127 0.9800 1.0127 0.9800	1.0127	(331)
Lighting 16.1924 12.9901 11.6962 8.5691 6.6190 5.4078 6.0381 7.8486 10.1945 13.3757 15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		
(333a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)		
(334a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)		
(335a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)		
(333b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)		
(334b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)		
(335b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	0.0000	(335b)
Annual totals kWh/year		
Space heating fuel - community heating	310.3080	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	3.1031	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(330a)
Total electricity for the above, kWh/year	11.9235	(331)
Electricity for lighting (calculated in Appendix L)	130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3734.3917	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	310.3080	4.4400	13.7777	(340a)
Space heating total			13.7777	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Total energy cost			274.9909	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1204	(357)
SAP value		81.8386	
SAP rating (Section 12)		82	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	957.8097	0.1589	13.1463	(367)
Electrical energy for heat distribution (space & water)	3.1031	0.0000	5.1109	(372)
Overall CO2 factor for heat network			0.0394	(386)
Total CO2 associated with community systems			141.4005	(373)
Space and water heating			141.4005	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Total CO2, kg/year			161.9159	(383)
CO2 emissions per m2			3.7300	(384)
EI value			97.5445	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)

Party Ceiling 1	43.3600	30.0000	1300.8000 (32b)
Internal TF Wall	68.4500	9.0000	616.0500 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)											Total = Sum(45)m =	1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	23.7835	0.6800	0.7000	0.7700	51.0736	(80)

Solar gains	51.0736	88.7763	143.8339	211.6843	249.5125	273.8424	255.8751	224.3556	176.4207	111.0901	62.7325	42.2420	(83)
Total gains	469.8344	505.6456	549.0181	595.0545	611.9331	617.2952	588.2244	559.2798	522.4455	476.6813	451.9594	451.9591	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area	0.8819	0.8332	0.7254	0.5798	0.4292	0.2811	0.1984	0.2194	0.3775	0.6096	0.8109	0.8989	(86)
MIT	20.7500	20.8315	20.9323	20.9834	20.9977	20.9999	21.0000	21.0000	20.9992	20.9815	20.8774	20.7138	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house	0.8652	0.8125	0.6984	0.5496	0.3978	0.2496	0.1653	0.1846	0.3405	0.5728	0.7852	0.8838	(89)
MIT 2	20.0775	20.1710	20.2823	20.3345	20.3478	20.3495	20.3496	20.3496	20.3490	20.3338	20.2252	20.0353	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.3987	20.4865	20.5928	20.6444	20.6582	20.6601	20.6602	20.6602	20.6596	20.6432	20.5367	20.3593	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3987	20.4865	20.5928	20.6444	20.6582	20.6601	20.6602	20.6602	20.6596	20.6432	20.5367	20.3593	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8665	0.8170	0.7087	0.5634	0.4127	0.2646	0.1811	0.2012	0.3582	0.5896	0.7929	0.8840	(94)
Useful gains	407.1210	413.1029	389.0811	335.2603	252.5528	163.3622	106.5340	112.5169	187.1309	281.0281	358.3499	399.5327	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	472.7596	457.4313	406.7486	339.4698	253.1016	163.3884	106.5357	112.5203	187.3102	285.5683	390.1095	474.5735	(97)
Space heating kWh	48.8351	29.7887	13.1446	3.0308	0.4083	0.0000	0.0000	0.0000	0.0000	3.3779	22.8669	55.8303	(98a)
Space heating requirement - total per year (kWh/year)												177.2826	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	48.8351	29.7887	13.1446	3.0308	0.4083	0.0000	0.0000	0.0000	0.0000	3.3779	22.8669	55.8303	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												177.2826	
Space heating per m2										(98c) / (4) =		4.0886	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	48.8351	29.7887	13.1446	3.0308	0.4083	0.0000	0.0000	0.0000	0.0000	3.3779	22.8669	55.8303	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	73.2526	44.6830	19.7169	4.5462	0.6124	0.0000	0.0000	0.0000	0.0000	5.0669	34.3004	83.7455	
Space heating requirement	73.2526	44.6830	19.7169	4.5462	0.6124	0.0000	0.0000	0.0000	0.0000	5.0669	34.3004	83.7455	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												265.9239	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												2.6592	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3690.0077	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	265.9239	6.5500	17.4180	(340a)
Space heating total			17.4180	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Total energy cost			376.8975	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	945.9740	0.1593	11.2950	(367)
Electrical energy for heat distribution (space & water)	2.6592	0.0000	5.0414	(372)
Overall CO2 factor for heat network			0.0393	(386)
Total CO2 associated with community systems			139.4798	(373)
Space and water heating			139.4798	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Total CO2, kg/year			159.9951	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	945.9740	1.5896	112.7204	(467)
Electrical energy for heat distribution (space & water)	2.6592	0.0000	54.1168	(472)
Overall CO2 factor for heat network			0.4221	(486)
Total CO2 associated with community systems			1497.2302	(473)
Space and water heating			1497.2302	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Total Primary energy kWh/year			1715.7122	(483)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.02	**TER**	14.75
Environmental	99 A	**% DER < TER**			93.08
CO_2 Emissions (t/year)	0.03	**DFEE**	16.05	**TFEE**	26.65
Compliance Check	See BREL	**% DFEE < TFEE**			39.75
% DPER < TPER	73.41	**DPER**	21.18	**TPER**	79.68

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523 (64)
12Total per year (kWh/year)												2188 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837 (83)
Total gains	419.7672	467.2558	506.0368	555.7052	584.1265	578.6970	555.6038	523.3987	486.8526	437.0989	410.7463	405.5434 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761

alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area	0.9267	0.8767	0.7894	0.6359	0.4742	0.3307	0.2370	0.2630	0.4230	0.6861	0.8692	0.9377 (86)
MIT	20.6377	20.7640	20.8873	20.9715	20.9957	20.9996	21.0000	20.9999	20.9983	20.9630	20.8072	20.5993 (87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496 (88)
util rest of house	0.9146	0.8592	0.7647	0.6052	0.4417	0.2972	0.2019	0.2258	0.3836	0.6495	0.8481	0.9270 (89)
MIT 2	19.9451	20.0941	20.2343	20.3232	20.3461	20.3493	20.3495	20.3495	20.3484	20.3165	20.1475	19.8990 (90)
Living area fraction										fLA = Living area / (4) =		0.4776 (91)
MIT	20.2759	20.4141	20.5462	20.6328	20.6563	20.6599	20.6602	20.6602	20.6588	20.6253	20.4626	20.2335 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2759	20.4141	20.5462	20.6328	20.6563	20.6599	20.6602	20.6602	20.6588	20.6253	20.4626	20.2335 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9132	0.8610	0.7724	0.6187	0.4570	0.3132	0.2187	0.2435	0.4024	0.6652	0.8520	0.9249	(94)
Useful gains	383.3117	402.3273	390.8480	343.8261	266.9713	181.2577	121.4910	127.4688	195.8981	290.7775	349.9482	375.0866	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	478.0616	464.2416	420.3162	351.0924	268.0088	181.3367	121.4972	127.4812	196.2661	299.9958	399.8618	479.7839	(97)
Space heating kWh	70.4939	41.6064	21.9243	5.2317	0.7719	0.0000	0.0000	0.0000	0.0000	6.8584	35.9378	77.8947	(98a)
Space heating requirement - total per year (kWh/year)												260.7193	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	70.4939	41.6064	21.9243	5.2317	0.7719	0.0000	0.0000	0.0000	0.0000	6.8584	35.9378	77.8947	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												260.7193	
Space heating per m2											(98c) / (4) =	6.0129	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	70.4939	41.6064	21.9243	5.2317	0.7719	0.0000	0.0000	0.0000	0.0000	6.8584	35.9378	77.8947	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	105.7409	62.4096	32.8865	7.8476	1.1579	0.0000	0.0000	0.0000	0.0000	10.2876	53.9068	116.8421	
Space heating requirement	105.7409	62.4096	32.8865	7.8476	1.1579	0.0000	0.0000	0.0000	0.0000	10.2876	53.9068	116.8421	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												391.0789	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												3.9108	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2856.9417	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	979.3486	0.1588	16.5633	(367)
Electrical energy for heat distribution (space & water)	3.9108	0.0000	5.2390	(372)
Overall CO2 factor for heat network			0.0395	(386)
Total CO2 associated with community systems			144.9457	(373)
Space and water heating			144.9457	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			44.4179	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.0200	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	979.3486	1.5879	165.5957	(467)
Electrical energy for heat distribution (space & water)	3.9108	0.0000	56.0996	(472)
Overall CO2 factor for heat network			0.4226	(486)
Total CO2 associated with community systems			1552.0883	(473)
Space and water heating			1552.0883	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			918.4935	(483)
Dwelling Primary energy Rate (DPER)			21.1800	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)

Wall to Unheated Common area	16.5900	16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)		33.1800			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		13.7636	(33)
Main dwelling					
Party Wall		31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 199.1940 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	52.2400	0.0700	3.6568
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3858 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 20.1494 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	40.9650	40.8373	40.7122	40.1245	40.0146	39.5027	39.5027	39.4079	39.6999	40.0146	40.2370	40.4696	(39)

Average = Sum(39)m / 12 = 40.1240

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9448	0.9418	0.9389	0.9254	0.9228	0.9110	0.9110	0.9089	0.9156	0.9228	0.9280	0.9333	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)

Energy content (annual) Total = Sum(45)m = 1536.8125

Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)

Total per year (kWh/year) = Sum(64)m = 1875.8483 (64)

12Total per year (kWh/year) 1876 (64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
West					6.5100	19.6403		0.6300	0.7000	0.7700		39.0751	(80)
Solar gains	39.0751	76.4392	125.8845	183.5950	225.0025	230.3301	219.2837	188.3614	146.4088	90.7015	48.7221	32.1335	(83)
Total gains	408.2958	452.6009	487.6757	532.6961	557.8990	548.9788	526.8301	497.0792	463.7948	421.5301	398.4414	394.6229	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.5666	58.7497	58.9302	59.7934	59.9577	60.7346	60.7346	60.8807	60.4330	59.9577	59.6262	59.2836	
alpha	4.9044	4.9166	4.9287	4.9862	4.9972	5.0490	5.0490	5.0587	5.0289	4.9972	4.9751	4.9522	
util living area	0.9663	0.9442	0.8999	0.7921	0.6348	0.4555	0.3291	0.3633	0.5728	0.8279	0.9387	0.9705	(86)
MIT	20.1073	20.2900	20.5325	20.8032	20.9443	20.9915	20.9987	20.9978	20.9743	20.7919	20.4266	20.0823	(87)
Th 2	20.1296	20.1321	20.1345	20.1460	20.1481	20.1581	20.1581	20.1600	20.1543	20.1481	20.1438	20.1393	(88)
util rest of house	0.9590	0.9327	0.8803	0.7572	0.5854	0.3976	0.2665	0.2976	0.5089	0.7898	0.9243	0.9640	(89)
MIT 2	19.1134	19.3408	19.6362	19.9557	20.1025	20.1530	20.1576	20.1591	20.1370	19.9528	19.5220	19.0897	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.5881	19.7942	20.0643	20.3605	20.5046	20.5535	20.5593	20.5597	20.5369	20.3535	19.9541	19.5638	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5881	19.7942	20.0643	20.3605	20.5046	20.5535	20.5593	20.5597	20.5369	20.3535	19.9541	19.5638	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9536	0.9276	0.8785	0.7664	0.6065	0.4250	0.2964	0.3290	0.5383	0.7996	0.9206	0.9588	(94)
Useful gains	389.3451	419.8155	428.4360	408.2411	338.3719	233.3060	156.1646	163.5224	249.6558	337.0589	366.7973	378.3642	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	626.2782	608.2396	552.2334	459.8455	352.3128	235.1778	156.4037	163.9244	255.5453	390.2837	517.2101	621.7659	(97)
Space heating kWh	176.2783	126.6210	92.1053	37.1552	10.3720	0.0000	0.0000	0.0000	0.0000	39.5992	108.2973	181.0909	(98a)
Space heating requirement - total per year (kWh/year)												771.5190	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	176.2783	126.6210	92.1053	37.1552	10.3720	0.0000	0.0000	0.0000	0.0000	39.5992	108.2973	181.0909	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												771.5190	
Space heating per m2											(98c) / (4) =	17.7933	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	176.2783	126.6210	92.1053	37.1552	10.3720	0.0000	0.0000	0.0000	0.0000	39.5992	108.2973	181.0909	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	190.9841	137.1842	99.7890	40.2548	11.2372	0.0000	0.0000	0.0000	0.0000	42.9027	117.3318	196.1981	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	83.9704	83.5078	82.7116	81.4070	80.3270	79.8000	79.8000	79.8000	79.8000	81.4735	83.1506	84.0529	(217)
Fuel for water heating, kWh/month	218.4700	194.4820	209.2614	188.6979	186.5510	170.5061	169.2907	175.3325	176.4869	191.2155	197.3476	216.1109	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												835.8819	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2293.7526	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2974.7086	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	835.8819	0.2100	175.5352	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2293.7526	0.2100	481.6881	(264)
Space and water heating			657.2233	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			639.5207	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.7500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	835.8819	1.1300	944.5466	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2293.7526	1.1300	2591.9405	(278)
Space and water heating			3536.4870	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3454.9846	(286)
Target Primary Energy Rate (TPER)			79.6800	(287)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.02	**TER**	14.75
Environmental	99 A	**% DER < TER**			93.08
CO_2 Emissions (t/year)	0.03	**DFEE**	16.05	**TFEE**	26.65
Compliance Check	See BREL	**% DFEE < TFEE**			39.75
% DPER < TPER	73.41	**DPER**	21.18	**TPER**	79.68

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area		Storey height		Volume	
Main dwelling		(m2)		(m)		(m3)	
Ground floor		43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2622	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		8637.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							199.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							0.9954	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		12.3956	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	31.8822	31.8062	31.7316	31.3815	31.3160	31.0111	31.0111	30.9546	31.1285	31.3160	31.4485	31.5871	(39)
Average = Sum(39)m / 12 =												31.3812	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7353	0.7335	0.7318	0.7237	0.7222	0.7152	0.7152	0.7139	0.7179	0.7222	0.7253	0.7285	(40)
HLP (average)												0.7237	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		449.4572	(64a)
Heat gains from water heating, kWh/month	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.4004	291.4783	279.0119	271.5070	258.2448	250.2442	241.2477	240.9702	247.9561	254.7841	268.8582	277.3654	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	325.5767	373.9841	414.8872	469.6730	501.1047	498.8545	477.9348	444.2810	405.9847	352.6842	321.4470	312.0492	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.2514	75.4313	75.6085	76.4520	76.6119	77.3652	77.3652	77.5064	77.0733	76.6119	76.2891	75.9545	
alpha	6.0168	6.0288	6.0406	6.0968	6.1075	6.1577	6.1577	6.1671	6.1382	6.1075	6.0859	6.0636	
util living area	0.9792	0.9544	0.8983	0.7541	0.5722	0.3970	0.2854	0.3203	0.5240	0.8229	0.9540	0.9831	(86)
MIT	20.3085	20.4977	20.7168	20.9171	20.9853	20.9987	20.9999	20.9997	20.9933	20.8848	20.5767	20.2742	(87)
Th 2	20.3098	20.3113	20.3128	20.3199	20.3212	20.3274	20.3274	20.3286	20.3250	20.3212	20.3185	20.3157	(88)
util rest of house	0.9747	0.9455	0.8804	0.7223	0.5330	0.3556	0.2418	0.2737	0.4746	0.7890	0.9434	0.9794	(89)

MIT 2	19.6848	19.8690	20.0762	20.2578	20.3119	20.3268	20.3274	20.3285	20.3215	20.2363	19.9537	19.6563	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.9827	20.1693	20.3822	20.5727	20.6335	20.6477	20.6486	20.6491	20.6424	20.5461	20.2513	19.9514	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9827	20.1693	20.3822	20.5727	20.6335	20.6477	20.6486	20.6491	20.6424	20.5461	20.2513	19.9514	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9722	0.9434	0.8823	0.7344	0.5512	0.3754	0.2626	0.2959	0.4980	0.8008	0.9423	0.9771	(94)
Useful gains	316.5357	352.8131	366.0688	344.9320	276.1907	187.2621	125.5261	131.4778	202.1742	282.4211	302.8894	304.9109	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	499.9996	485.6573	440.5044	366.3071	279.7621	187.5456	125.5508	131.5287	203.6550	311.4719	413.5891	497.5408	(97)
Space heating kWh	136.4971	89.2713	55.3801	15.3900	2.6571	0.0000	0.0000	0.0000	0.0000	21.6138	79.7037	143.3166	(98a)
Space heating requirement - total per year (kWh/year)												543.8298	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	136.4971	89.2713	55.3801	15.3900	2.6571	0.0000	0.0000	0.0000	0.0000	21.6138	79.7037	143.3166	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												543.8298	
Space heating per m2											(98c) / (4) =	12.5422	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	291.5043	229.4821	235.2551	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9908	0.9968	0.9945	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	288.8295	228.7378	233.9688	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	554.0542	531.1768	493.2464	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	190.9618	225.0146	192.9026	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	47.7404	56.2537	48.2256	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												152.2197	(107)
Energy for space heating												12.5422	(99)
Energy for space cooling												3.5106	(108)
Total												16.0528	(109)
Fabric Energy Efficiency (DFEE)												16.1	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	13.7636			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	199.1940	(35)
List of Thermal Bridges		

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	52.2400	0.0700	3.6568
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	6.3858	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	20.1494	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	40.9650	40.8373	40.7122	40.1245	40.0146	39.5027	39.5027	39.4079	39.6999	40.0146	40.2370	40.4696	(39)
Average = Sum(39)m / 12 =												40.1240	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9448	0.9418	0.9389	0.9254	0.9228	0.9110	0.9110	0.9089	0.9156	0.9228	0.9280	0.9333	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4982	(42)

Hot water usage for mixer showers

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												47.0349	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	

Distribution loss (46)m = 0.15 x (45)m

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)

Electric shower(s)

	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												449.4572	(64a)

Heat gains from water heating, kWh/month

	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													

	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931 (72)
Total internal gains	281.3655	289.2254	276.9770	269.4043	256.2100	248.1415	239.2128	238.9354	245.8534	252.7493	266.7555	275.3306 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6300	0.7000	0.7700	39.0751	(80)

Solar gains	39.0751	76.4392	125.8845	183.5950	225.0025	230.3301	219.2837	188.3614	146.4088	90.7015	48.7221	32.1335	(83)
Total gains	320.4406	365.6646	402.8615	452.9993	481.2125	478.4717	458.4965	427.2968	392.2623	343.4508	315.4775	307.4640	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.5666	58.7497	58.9302	59.7934	59.9577	60.7346	60.7346	60.8807	60.4330	59.9577	59.6262	59.2836	
alpha	4.9044	4.9166	4.9287	4.9862	4.9972	5.0490	5.0490	5.0587	5.0289	4.9972	4.9751	4.9522	
util living area	0.9870	0.9744	0.9461	0.8604	0.7116	0.5182	0.3773	0.4210	0.6592	0.9021	0.9739	0.9891	(86)
MIT	19.8660	20.0709	20.3543	20.7036	20.9080	20.9849	20.9975	20.9957	20.9524	20.6706	20.2200	19.8386	(87)
Th 2	20.1296	20.1321	20.1345	20.1460	20.1481	20.1581	20.1581	20.1600	20.1543	20.1481	20.1438	20.1393	(88)
util rest of house	0.9838	0.9684	0.9336	0.8313	0.6618	0.4540	0.3060	0.3457	0.5914	0.8743	0.9667	0.9865	(89)
MIT 2	19.1024	19.3056	19.5820	19.9148	20.0875	20.1508	20.1574	20.1586	20.1283	19.8948	19.4634	19.0830	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.4671	19.6711	19.9509	20.2916	20.4794	20.5492	20.5586	20.5584	20.5219	20.2653	19.8248	19.4439	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4671	19.6711	19.9509	20.2916	20.4794	20.5492	20.5586	20.5584	20.5219	20.2653	19.8248	19.4439	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9808	0.9646	0.9305	0.8367	0.6818	0.4842	0.3401	0.3817	0.6218	0.8786	0.9635	0.9838	(94)
Useful gains	314.2852	352.7043	374.8723	379.0078	328.1045	231.6630	155.9246	163.0799	243.9040	301.7465	303.9544	302.4822	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	621.3211	603.2137	547.6150	457.0809	351.3023	235.0097	156.3764	163.8747	254.9492	386.7541	512.0068	616.9138	(97)
Space heating kWh	228.4347	168.3423	128.5206	56.2126	17.2592	0.0000	0.0000	0.0000	0.0000	63.2456	149.7977	233.9371	(98a)
Space heating requirement - total per year (kWh/year)												1045.7499	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	228.4347	168.3423	128.5206	56.2126	17.2592	0.0000	0.0000	0.0000	0.0000	63.2456	149.7977	233.9371	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1045.7499	
Space heating per m2										(98c) / (4) =		24.1178	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	371.3254	292.3200	299.5001	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9447	0.9735	0.9620	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	350.8010	284.5787	288.1146	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	532.5097	510.6427	475.5231	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	130.8303	168.1917	139.4320	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	32.7076	42.0479	34.8580	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												109.6135	(107)
Energy for space heating												24.1178	(99)
Energy for space cooling												2.5280	(108)
Total												26.6458	(109)
Fabric Energy Efficiency (TFEE)												26.6	(109)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.02	**TER**	14.75
Environmental	99 A	**% DER < TER**			93.08
CO_2 Emissions (t/year)	0.03	**DFEE**	16.05	**TFEE**	26.65
Compliance Check	See BREL	**% DFEE < TFEE**			39.75
% DPER < TPER	73.41	**DPER**	21.18	**TPER**	79.68

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523 (64)
12Total per year (kWh/year)												2188 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837 (83)
Total gains	419.7672	467.2558	506.0368	555.7052	584.1265	578.6970	555.6038	523.3987	486.8526	437.0989	410.7463	405.5434 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761

alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area	0.9267	0.8767	0.7894	0.6359	0.4742	0.3307	0.2370	0.2630	0.4230	0.6861	0.8692	0.9377 (86)
MIT	20.6377	20.7640	20.8873	20.9715	20.9957	20.9996	21.0000	20.9999	20.9983	20.9630	20.8072	20.5993 (87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496 (88)
util rest of house	0.9146	0.8592	0.7647	0.6052	0.4417	0.2972	0.2019	0.2258	0.3836	0.6495	0.8481	0.9270 (89)
MIT 2	19.9451	20.0941	20.2343	20.3232	20.3461	20.3493	20.3495	20.3495	20.3484	20.3165	20.1475	19.8990 (90)
Living area fraction										fLA = Living area / (4) =		0.4776 (91)
MIT	20.2759	20.4141	20.5462	20.6328	20.6563	20.6599	20.6602	20.6602	20.6588	20.6253	20.4626	20.2335 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2759	20.4141	20.5462	20.6328	20.6563	20.6599	20.6602	20.6602	20.6588	20.6253	20.4626	20.2335 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9132	0.8610	0.7724	0.6187	0.4570	0.3132	0.2187	0.2435	0.4024	0.6652	0.8520	0.9249	(94)
Useful gains	383.3117	402.3273	390.8480	343.8261	266.9713	181.2577	121.4910	127.4688	195.8981	290.7775	349.9482	375.0866	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	478.0616	464.2416	420.3162	351.0924	268.0088	181.3367	121.4972	127.4812	196.2661	299.9958	399.8618	479.7839	(97)
Space heating kWh	70.4939	41.6064	21.9243	5.2317	0.7719	0.0000	0.0000	0.0000	0.0000	6.8584	35.9378	77.8947	(98a)
Space heating requirement - total per year (kWh/year)												260.7193	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	70.4939	41.6064	21.9243	5.2317	0.7719	0.0000	0.0000	0.0000	0.0000	6.8584	35.9378	77.8947	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												260.7193	
Space heating per m2											(98c) / (4) =	6.0129	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	70.4939	41.6064	21.9243	5.2317	0.7719	0.0000	0.0000	0.0000	0.0000	6.8584	35.9378	77.8947	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	105.7409	62.4096	32.8865	7.8476	1.1579	0.0000	0.0000	0.0000	0.0000	10.2876	53.9068	116.8421	
Space heating requirement	105.7409	62.4096	32.8865	7.8476	1.1579	0.0000	0.0000	0.0000	0.0000	10.2876	53.9068	116.8421	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												391.0789	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												3.9108	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2856.9417	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	979.3486	0.1588	16.5633	(367)
Electrical energy for heat distribution (space & water)	3.9108	0.0000	5.2390	(372)
Overall CO2 factor for heat network			0.0395	(386)
Total CO2 associated with community systems			144.9457	(373)
Space and water heating			144.9457	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			44.4179	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.0200	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	979.3486	1.5879	165.5957	(467)
Electrical energy for heat distribution (space & water)	3.9108	0.0000	56.0996	(472)
Overall CO2 factor for heat network			0.4226	(486)
Total CO2 associated with community systems			1552.0883	(473)
Space and water heating			1552.0883	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			918.4935	(483)
Dwelling Primary energy Rate (DPER)			21.1800	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)

Wall to Unheated Common area	16.5900	16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)		33.1800			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		13.7636	(33)
Main dwelling					
Party Wall		31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 199.1940 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	52.2400	0.0700	3.6568
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3858 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 20.1494 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	40.9650	40.8373	40.7122	40.1245	40.0146	39.5027	39.5027	39.4079	39.6999	40.0146	40.2370	40.4696	(39)

Average = Sum(39)m / 12 = 40.1240

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9448	0.9418	0.9389	0.9254	0.9228	0.9110	0.9110	0.9089	0.9156	0.9228	0.9280	0.9333	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)

Energy content (annual) Total = Sum(45)m = 1536.8125

Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)

Total per year (kWh/year) = Sum(64)m = 1875.8483 (64)

12Total per year (kWh/year) 1876 (64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
West					6.5100	19.6403		0.6300	0.7000	0.7700		39.0751	(80)
Solar gains	39.0751	76.4392	125.8845	183.5950	225.0025	230.3301	219.2837	188.3614	146.4088	90.7015	48.7221	32.1335	(83)
Total gains	408.2958	452.6009	487.6757	532.6961	557.8990	548.9788	526.8301	497.0792	463.7948	421.5301	398.4414	394.6229	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.5666	58.7497	58.9302	59.7934	59.9577	60.7346	60.7346	60.8807	60.4330	59.9577	59.6262	59.2836	
alpha	4.9044	4.9166	4.9287	4.9862	4.9972	5.0490	5.0490	5.0587	5.0289	4.9972	4.9751	4.9522	
util living area	0.9663	0.9442	0.8999	0.7921	0.6348	0.4555	0.3291	0.3633	0.5728	0.8279	0.9387	0.9705	(86)
MIT	20.1073	20.2900	20.5325	20.8032	20.9443	20.9915	20.9987	20.9978	20.9743	20.7919	20.4266	20.0823	(87)
Th 2	20.1296	20.1321	20.1345	20.1460	20.1481	20.1581	20.1581	20.1600	20.1543	20.1481	20.1438	20.1393	(88)
util rest of house	0.9590	0.9327	0.8803	0.7572	0.5854	0.3976	0.2665	0.2976	0.5089	0.7898	0.9243	0.9640	(89)
MIT 2	19.1134	19.3408	19.6362	19.9557	20.1025	20.1530	20.1576	20.1591	20.1370	19.9528	19.5220	19.0897	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.5881	19.7942	20.0643	20.3605	20.5046	20.5535	20.5593	20.5597	20.5369	20.3535	19.9541	19.5638	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5881	19.7942	20.0643	20.3605	20.5046	20.5535	20.5593	20.5597	20.5369	20.3535	19.9541	19.5638	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9536	0.9276	0.8785	0.7664	0.6065	0.4250	0.2964	0.3290	0.5383	0.7996	0.9206	0.9588	(94)
Useful gains	389.3451	419.8155	428.4360	408.2411	338.3719	233.3060	156.1646	163.5224	249.6558	337.0589	366.7973	378.3642	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	626.2782	608.2396	552.2334	459.8455	352.3128	235.1778	156.4037	163.9244	255.5453	390.2837	517.2101	621.7659	(97)
Space heating kWh	176.2783	126.6210	92.1053	37.1552	10.3720	0.0000	0.0000	0.0000	0.0000	39.5992	108.2973	181.0909	(98a)
Space heating requirement - total per year (kWh/year)												771.5190	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	176.2783	126.6210	92.1053	37.1552	10.3720	0.0000	0.0000	0.0000	0.0000	39.5992	108.2973	181.0909	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												771.5190	
Space heating per m2											(98c) / (4) =	17.7933	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	176.2783	126.6210	92.1053	37.1552	10.3720	0.0000	0.0000	0.0000	0.0000	39.5992	108.2973	181.0909	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	190.9841	137.1842	99.7890	40.2548	11.2372	0.0000	0.0000	0.0000	0.0000	42.9027	117.3318	196.1981	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	83.9704	83.5078	82.7116	81.4070	80.3270	79.8000	79.8000	79.8000	79.8000	81.4735	83.1506	84.0529	(217)
Fuel for water heating, kWh/month	218.4700	194.4820	209.2614	188.6979	186.5510	170.5061	169.2907	175.3325	176.4869	191.2155	197.3476	216.1109	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												835.8819	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2293.7526	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2974.7086	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	835.8819	0.2100	175.5352	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2293.7526	0.2100	481.6881	(264)
Space and water heating			657.2233	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			639.5207	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.7500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	835.8819	1.1300	944.5466	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2293.7526	1.1300	2591.9405	(278)
Space and water heating			3536.4870	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3454.9846	(286)
Target Primary Energy Rate (TPER)			79.6800	(287)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.02	**TER**	14.75
Environmental	99 A	**% DER < TER**			93.08
CO_2 Emissions (t/year)	0.03	**DFEE**	16.05	**TFEE**	26.65
Compliance Check	See BREL	**% DFEE < TFEE**			39.75
% DPER < TPER	73.41	**DPER**	21.18	**TPER**	79.68

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross (m2)	Openings (m2)	NetArea (m2)	U-value (W/m2K)	A x U (W/K)	K-value (kJ/m2K)	A x K (kJ/K)	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		8637.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							199.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							0.9954	(36)
Point Thermal bridges					(36a) =		0.0000	

Total fabric heat loss (33) + (36) + (36a) = 12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	460.9371	499.3751	541.0594	581.5362	605.2805	592.0631	569.0364	538.2350	504.0534	463.4913	441.8157	444.4008	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451

util living area													
	0.8961	0.8479	0.7531	0.6106	0.4580	0.3233	0.2314	0.2557	0.4088	0.6528	0.8364	0.9109	(86)
MIT	20.7164	20.8090	20.9136	20.9772	20.9964	20.9997	21.0000	20.9999	20.9986	20.9718	20.8482	20.6797	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house													
	0.8809	0.8284	0.7275	0.5805	0.4265	0.2905	0.1972	0.2196	0.3706	0.6167	0.8129	0.8972	(89)
MIT 2	20.0380	20.1453	20.2622	20.3285	20.3467	20.3494	20.3496	20.3495	20.3486	20.3247	20.1929	19.9947	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.3620	20.4623	20.5734	20.6383	20.6570	20.6600	20.6602	20.6602	20.6591	20.6337	20.5059	20.3219	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3620	20.4623	20.5734	20.6383	20.6570	20.6600	20.6602	20.6602	20.6591	20.6337	20.5059	20.3219	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8812	0.8319	0.7365	0.5940	0.4414	0.3062	0.2135	0.2368	0.3888	0.6327	0.8188	0.8966	(94)
Useful gains	406.1975	415.4286	398.5023	345.4377	267.1774	181.2688	121.4920	127.4710	195.9715	293.2321	361.7645	398.4587	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	480.6386	465.6856	421.1295	351.2571	268.0296	181.3378	121.4973	127.4814	196.2735	300.2486	401.1566	482.4290	(97)
Space heating kWh													
	55.3841	33.7727	16.8346	4.1900	0.6341	0.0000	0.0000	0.0000	0.0000	5.2203	28.3624	62.4739	(98a)
Space heating requirement - total per year (kWh/year)												206.8720	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	55.3841	33.7727	16.8346	4.1900	0.6341	0.0000	0.0000	0.0000	0.0000	5.2203	28.3624	62.4739	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												206.8720	
Space heating per m2											(98c) / (4) =	4.7710	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	55.3841	33.7727	16.8346	4.1900	0.6341	0.0000	0.0000	0.0000	0.0000	5.2203	28.3624	62.4739	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	83.0762	50.6591	25.2519	6.2849	0.9511	0.0000	0.0000	0.0000	0.0000	7.8304	42.5435	93.7109	
Space heating requirement													
	83.0762	50.6591	25.2519	6.2849	0.9511	0.0000	0.0000	0.0000	0.0000	7.8304	42.5435	93.7109	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												310.3080	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												3.1031	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2776.1708	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	310.3080	4.4400	13.7777	(340a)
Space heating total			13.7777	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			177.1111	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7216	(357)
SAP value		88.3030	
SAP rating (Section 12)		88	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	957.8097	0.1589	13.1463	(367)
Electrical energy for heat distribution (space & water)	3.1031	0.0000	5.1109	(372)
Overall CO2 factor for heat network			0.0394	(386)
Total CO2 associated with community systems			141.4005	(373)
Space and water heating			141.4005	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			40.8728	(383)
CO2 emissions per m2			0.9400	(384)
EI value			99.3802	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	43.3600 (1b)	x 2.4500 (2b)	= 106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)

Adj infilt rate

	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104 (22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)

Heat transfer coeff

	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)

Average = Sum(39)m / 12 = 29.9239

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m													
	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Total per year (kWh/year) = Sum(64)m = 2187.6523 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)												
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874 (72)
Total internal gains												
	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	23.7835	0.6800	0.7000	0.7700	51.0736	(80)

Solar gains	51.0736	88.7763	143.8339	211.6843	249.5125	273.8424	255.8751	224.3556	176.4207	111.0901	62.7325	42.2420 (83)
Total gains	469.8344	505.6456	549.0181	595.0545	611.9331	617.2952	588.2244	559.2798	522.4455	476.6813	451.9594	451.9591 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area													
	0.8819	0.8332	0.7254	0.5798	0.4292	0.2811	0.1984	0.2194	0.3775	0.6096	0.8109	0.8989	(86)
MIT	20.7500	20.8315	20.9323	20.9834	20.9977	20.9999	21.0000	21.0000	20.9992	20.9815	20.8774	20.7138	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house													
	0.8652	0.8125	0.6984	0.5496	0.3978	0.2496	0.1653	0.1846	0.3405	0.5728	0.7852	0.8838	(89)
MIT 2	20.0775	20.1710	20.2823	20.3345	20.3478	20.3495	20.3496	20.3496	20.3490	20.3338	20.2252	20.0353	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.3987	20.4865	20.5928	20.6444	20.6582	20.6601	20.6602	20.6602	20.6596	20.6432	20.5367	20.3593	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3987	20.4865	20.5928	20.6444	20.6582	20.6601	20.6602	20.6602	20.6596	20.6432	20.5367	20.3593	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8665	0.8170	0.7087	0.5634	0.4127	0.2646	0.1811	0.2012	0.3582	0.5896	0.7929	0.8840	(94)
Useful gains	407.1210	413.1029	389.0811	335.2603	252.5528	163.3622	106.5340	112.5169	187.1309	281.0281	358.3499	399.5327	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	472.7596	457.4313	406.7486	339.4698	253.1016	163.3884	106.5357	112.5203	187.3102	285.5683	390.1095	474.5735	(97)
Space heating kWh													
	48.8351	29.7887	13.1446	3.0308	0.4083	0.0000	0.0000	0.0000	0.0000	3.3779	22.8669	55.8303	(98a)
Space heating requirement - total per year (kWh/year)												177.2826	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	48.8351	29.7887	13.1446	3.0308	0.4083	0.0000	0.0000	0.0000	0.0000	3.3779	22.8669	55.8303	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												177.2826	
Space heating per m2											(98c) / (4) =	4.0886	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	48.8351	29.7887	13.1446	3.0308	0.4083	0.0000	0.0000	0.0000	0.0000	3.3779	22.8669	55.8303	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	73.2526	44.6830	19.7169	4.5462	0.6124	0.0000	0.0000	0.0000	0.0000	5.0669	34.3004	83.7455	
Space heating requirement													
	73.2526	44.6830	19.7169	4.5462	0.6124	0.0000	0.0000	0.0000	0.0000	5.0669	34.3004	83.7455	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	265.9239	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	2.6592	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(330a)
Total electricity for the above, kWh/year	11.9235	(331)
Electricity for lighting (calculated in Appendix L)	130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2635.2607	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	265.9239	6.5500	17.4180	(340a)
Space heating total			17.4180	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			217.8191	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	945.9740	0.1593	11.2950	(367)
Electrical energy for heat distribution (space & water)	2.6592	0.0000	5.0414	(372)
Overall CO2 factor for heat network			0.0393	(386)
Total CO2 associated with community systems			139.4798	(373)
Space and water heating			139.4798	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			26.7199	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	945.9740	1.5896	112.7204	(467)
Electrical energy for heat distribution (space & water)	2.6592	0.0000	54.1168	(472)
Overall CO2 factor for heat network			0.4221	(486)
Total CO2 associated with community systems			1497.2302	(473)
Space and water heating			1497.2302	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			792.9052	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Be Green

Current energy efficiency rating:	B 88
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£41	£41	£0
Community scheme	£336	£336	£0
Space heating	£125	£125	£0
Water heating	£215	£215	£0
Lighting	£37	£37	£0
Generated (PV)	-£159	-£159	£0
Total cost of fuels	£218	£218	£0
Total cost of uses	£218	£218	£0
Delivered energy	61 kWh/m²	61 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.0 tonnes	0.0 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	18 kWh/m²	18 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)

Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	11.4002	(33)
Main dwelling					
Party Wall	31.3600	0.0000	0.0000	70.0000	2195.2000 (32)
Party Floor	43.3600			70.0000	3035.2000 (32d)
Party Ceiling 1	43.3600			30.0000	1300.8000 (32b)
Internal TF Wall	68.4500			9.0000	616.0500 (32c)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =		8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K					199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)					0.9954 (36)
Point Thermal bridges				(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =		12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	460.9371	499.3751	541.0594	581.5362	605.2805	592.0631	569.0364	538.2350	504.0534	463.4913	441.8157	444.4008	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area	0.8961	0.8479	0.7531	0.6106	0.4580	0.3233	0.2314	0.2557	0.4088	0.6528	0.8364	0.9109	(86)
MIT	20.7164	20.8090	20.9136	20.9772	20.9964	20.9997	21.0000	20.9999	20.9986	20.9718	20.8482	20.6797	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house	0.8809	0.8284	0.7275	0.5805	0.4265	0.2905	0.1972	0.2196	0.3706	0.6167	0.8129	0.8972	(89)
MIT 2	20.0380	20.1453	20.2622	20.3285	20.3467	20.3494	20.3496	20.3495	20.3486	20.3247	20.1929	19.9947	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.3620	20.4623	20.5734	20.6383	20.6570	20.6600	20.6602	20.6602	20.6591	20.6337	20.5059	20.3219	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3620	20.4623	20.5734	20.6383	20.6570	20.6600	20.6602	20.6602	20.6591	20.6337	20.5059	20.3219	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8812	0.8319	0.7365	0.5940	0.4414	0.3062	0.2135	0.2368	0.3888	0.6327	0.8188	0.8966	(94)
Useful gains	406.1975	415.4286	398.5023	345.4377	267.1774	181.2688	121.4920	127.4710	195.9715	293.2321	361.7645	398.4587	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	480.6386	465.6856	421.1295	351.2571	268.0296	181.3378	121.4973	127.4814	196.2735	300.2486	401.1566	482.4290	(97)
Space heating kWh	55.3841	33.7727	16.8346	4.1900	0.6341	0.0000	0.0000	0.0000	0.0000	5.2203	28.3624	62.4739	(98a)
Space heating requirement - total per year (kWh/year)												206.8720	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	55.3841	33.7727	16.8346	4.1900	0.6341	0.0000	0.0000	0.0000	0.0000	5.2203	28.3624	62.4739	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												206.8720	
Space heating per m2											(98c) / (4) =	4.7710	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

Space heating:

Space heating requirement												
	55.3841	33.7727	16.8346	4.1900	0.6341	0.0000	0.0000	0.0000	0.0000	5.2203	28.3624	62.4739 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	83.0762	50.6591	25.2519	6.2849	0.9511	0.0000	0.0000	0.0000	0.0000	7.8304	42.5435	93.7109
Space heating requirement												
	83.0762	50.6591	25.2519	6.2849	0.9511	0.0000	0.0000	0.0000	0.0000	7.8304	42.5435	93.7109 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement												
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016
Water heating fuel												
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127 (331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year
Space heating fuel - community heating 310.3080 (307)
Space heating fuel - secondary 0.0000 (309)
Water heating fuel - community heating 3281.4784 (310)
Efficiency of water heater 0.0000 (311)
Electricity used for heat distribution 3.1031 (313)
Space cooling fuel 0.0000 (321)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)
mechanical ventilation fans (SFP = 0.0920) 11.9235 (330a)
Total electricity for the above, kWh/year 11.9235 (331)
Electricity for lighting (calculated in Appendix L) 130.6818 (332)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation -958.2209 (333)
Wind generation 0.0000 (334)
Hydro-electric generation (Appendix N) 0.0000 (335a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (335)

Appendix Q - special features

Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2776.1708	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	310.3080	4.4400	13.7777	(340a)
Space heating total			13.7777	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			177.1111	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7216	(357)
SAP value		88.3030	
SAP rating (Section 12)		88	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	957.8097	0.1589	13.1463	(367)
Electrical energy for heat distribution (space & water)	3.1031	0.0000	5.1109	(372)
Overall CO2 factor for heat network			0.0394	(386)
Total CO2 associated with community systems			141.4005	(373)
Space and water heating			141.4005	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			40.8728	(383)
CO2 emissions per m2			0.9400	(384)
EI value			99.3802	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

Measured/design AP50												3.0000	(17)
Infiltration rate												0.1500	(18)
Number of sides sheltered												3	(19)
Shelter factor									(20) = 1 - [0.075 x (19)] =			0.7750	(20)
Infiltration rate adjusted to include shelter factor									(21) = (18) x (20) =			0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4982	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)

Water heating gains (Table 5)

	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)

Total internal gains

	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	23.7835	0.6800	0.7000	0.7700	51.0736	(80)

Solar gains	51.0736	88.7763	143.8339	211.6843	249.5125	273.8424	255.8751	224.3556	176.4207	111.0901	62.7325	42.2420	(83)
Total gains	469.8344	505.6456	549.0181	595.0545	611.9331	617.2952	588.2244	559.2798	522.4455	476.6813	451.9594	451.9591	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area	0.8819	0.8332	0.7254	0.5798	0.4292	0.2811	0.1984	0.2194	0.3775	0.6096	0.8109	0.8989	(86)
MIT	20.7500	20.8315	20.9323	20.9834	20.9977	20.9999	21.0000	21.0000	20.9992	20.9815	20.8774	20.7138	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house	0.8652	0.8125	0.6984	0.5496	0.3978	0.2496	0.1653	0.1846	0.3405	0.5728	0.7852	0.8838	(89)
MIT 2	20.0775	20.1710	20.2823	20.3345	20.3478	20.3495	20.3496	20.3496	20.3490	20.3338	20.2252	20.0353	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.3987	20.4865	20.5928	20.6444	20.6582	20.6601	20.6602	20.6602	20.6596	20.6432	20.5367	20.3593	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3987	20.4865	20.5928	20.6444	20.6582	20.6601	20.6602	20.6602	20.6596	20.6432	20.5367	20.3593	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8665	0.8170	0.7087	0.5634	0.4127	0.2646	0.1811	0.2012	0.3582	0.5896	0.7929	0.8840	(94)
Useful gains	407.1210	413.1029	389.0811	335.2603	252.5528	163.3622	106.5340	112.5169	187.1309	281.0281	358.3499	399.5327	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	472.7596	457.4313	406.7486	339.4698	253.1016	163.3884	106.5357	112.5203	187.3102	285.5683	390.1095	474.5735	(97)
Space heating kWh	48.8351	29.7887	13.1446	3.0308	0.4083	0.0000	0.0000	0.0000	0.0000	3.3779	22.8669	55.8303	(98a)
Space heating requirement - total per year (kWh/year)												177.2826	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	48.8351	29.7887	13.1446	3.0308	0.4083	0.0000	0.0000	0.0000	0.0000	3.3779	22.8669	55.8303	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												177.2826	
Space heating per m2										(98c) / (4) =		4.0886	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement

	48.8351	29.7887	13.1446	3.0308	0.4083	0.0000	0.0000	0.0000	0.0000	3.3779	22.8669	55.8303	(98)

Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50

307a	73.2526	44.6830	19.7169	4.5462	0.6124	0.0000	0.0000	0.0000	0.0000	5.0669	34.3004	83.7455	

Space heating requirement

	73.2526	44.6830	19.7169	4.5462	0.6124	0.0000	0.0000	0.0000	0.0000	5.0669	34.3004	83.7455	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)

Space heating fuel for secondary/supplementary system

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement

	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50

310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	

Water heating fuel

	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)

Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	265.9239	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	2.6592	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(330a)
Total electricity for the above, kWh/year	11.9235	(331)
Electricity for lighting (calculated in Appendix L)	130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2635.2607	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	265.9239	6.5500	17.4180	(340a)
Space heating total			17.4180	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			217.8191	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	945.9740	0.1593	11.2950	(367)
Electrical energy for heat distribution (space & water)	2.6592	0.0000	5.0414	(372)
Overall CO2 factor for heat network			0.0393	(386)
Total CO2 associated with community systems			139.4798	(373)
Space and water heating			139.4798	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			26.7199	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	945.9740	1.5896	112.7204	(467)
Electrical energy for heat distribution (space & water)	2.6592	0.0000	54.1168	(472)
Overall CO2 factor for heat network			0.4221	(486)
Total CO2 associated with community systems			1497.2302	(473)
Space and water heating			1497.2302	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			792.9052	(483)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	86 B	**DER**	12.05	**TER**	15.20
Environmental	92 A	**% DER < TER**			20.72
CO_2 Emissions (t/year)	0.5	**DFEE**	16.05	**TFEE**	26.65
Compliance Check	See BREL	**% DFEE < TFEE**			39.75
% DPER < TPER	16.14	**DPER**	68.85	**TPER**	82.10

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.1391	12.7569	14.0957	13.5903	14.0106	13.5270	13.9607	13.9788	13.5484	14.0374	13.6339	14.1338	(61)
Total heat required for water heating calculated for each month	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
										Total per year (kWh/year) = Sum(64)m =		1702.2253	(64)
12Total per year (kWh/year)												1702	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	56.5391	49.8293	52.5270	45.2322	43.1953	38.2165	37.2153	39.0955	39.9677	45.4111	49.3150	55.7994	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	75.9934	74.1507	70.6008	62.8225	58.0581	53.0785	50.0206	52.5477	55.5107	61.0364	68.4930	74.9992	(72)
Total internal gains	325.9046	333.0584	318.4605	305.8206	289.5371	275.3462	264.1703	265.3477	274.0909	287.4783	306.4540	319.1715	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)
Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	368.0809	415.5642	454.3358	503.9866	532.3970	523.9565	500.8574	468.6585	432.1195	385.3784	359.0429	353.8553	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area	0.9577	0.9188	0.8432	0.6912	0.5186	0.3651	0.2628	0.2936	0.4755	0.7570	0.9186	0.9655	(86)
MIT	20.5183	20.6729	20.8338	20.9551	20.9929	20.9993	20.9999	20.9999	20.9967	20.9363	20.7182	20.4729	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)

util rest of house													
	0.9497	0.9053	0.8211	0.6598	0.4836	0.3282	0.2240	0.2521	0.4316	0.7209	0.9027	0.9588	(89)
MIT 2	19.8008	19.9881	20.1758	20.3073	20.3438	20.3491	20.3495	20.3495	20.3474	20.2911	20.0458	19.7450	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.1435	20.3152	20.4901	20.6167	20.6538	20.6597	20.6602	20.6601	20.6575	20.5992	20.3669	20.0927	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.9935	20.1652	20.3401	20.4667	20.5038	20.5097	20.5102	20.5101	20.5075	20.4492	20.2169	19.9427	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9447	0.9011	0.8208	0.6656	0.4919	0.3373	0.2336	0.2624	0.4423	0.7266	0.8992	0.9539	(94)
Useful gains	347.7140	374.4712	372.9038	335.4543	261.9026	176.7220	116.9991	122.9726	191.1215	280.0331	322.8370	337.5295	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	469.6098	456.7940	414.1492	346.1211	263.4439	176.8410	117.0079	122.9913	191.7380	294.7278	392.5093	471.0822	(97)
Space heating kWh	90.6905	55.3209	30.6865	7.6801	1.1467	0.0000	0.0000	0.0000	0.0000	10.9329	50.1640	99.3632	(98a)
Space heating requirement - total per year (kWh/year)												345.9849	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	90.6905	55.3209	30.6865	7.6801	1.1467	0.0000	0.0000	0.0000	0.0000	10.9329	50.1640	99.3632	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												345.9849	
Space heating per m2											(98c) / (4) =	7.9794	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	90.6905	55.3209	30.6865	7.6801	1.1467	0.0000	0.0000	0.0000	0.0000	10.9329	50.1640	99.3632	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	101.8995	62.1583	34.4792	8.6293	1.2885	0.0000	0.0000	0.0000	0.0000	12.2842	56.3641	111.6440	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
Efficiency of water heater												87.3000	(216)
(217)m	87.8761	87.7450	87.5671	87.3872	87.3142	87.3000	87.3000	87.3000	87.3000	87.4209	87.7164	87.9164	(217)
Fuel for water heating, kWh/month	197.4946	174.4004	184.3996	159.5301	152.7665	135.5021	132.1761	138.6584	141.5408	160.2108	172.9421	194.8723	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.3168	7.5119	8.3168	8.0485	8.3168	8.0485	8.3168	8.3168	8.0485	8.3168	8.0485	8.3168	(231)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												388.7471	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.3000	
Water heating fuel used												1944.4938	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												97.9235	(231)
Electricity for lighting (calculated in Appendix L)												130.6818	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2561.8462	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	388.7471	0.2100	81.6369	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1944.4938	0.2100	408.3437	(264)
Space and water heating			489.9806	(265)
Pumps, fans and electric keep-hot	97.9235	0.1387	13.5832	(267)
Energy for lighting	130.6818	0.1443	18.8614	(268)
Total CO2, kg/year			522.4252	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.0500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	388.7471	1.1300	439.2842	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1944.4938	1.1300	2197.2780	(278)
Space and water heating			2636.5622	(279)
Pumps, fans and electric keep-hot	97.9235	1.5128	148.1386	(281)
Energy for lighting	130.6818	1.5338	200.4441	(282)
Total Primary energy kWh/year			2985.1450	(286)
Dwelling Primary energy Rate (DPER)			68.8500	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4383 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		13.7636			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 199.1940 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580

E7 Party floor between dwellings (in blocks of flats)	52.2400	0.0700	3.6568	
E16 Corner (normal)	5.0000	0.0900	0.4500	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000	
E18 Party wall between dwellings	5.0000	0.0600	0.3000	
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3858 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.1494 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	40.9650	40.8373	40.7122	40.1245	40.0146	39.5027	39.5027	39.4079	39.6999	40.0146	40.2370	40.4696	(39)
Average = Sum(39)m / 12 =												40.1240	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9448	0.9418	0.9389	0.9254	0.9228	0.9110	0.9110	0.9089	0.9156	0.9228	0.9280	0.9333	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)
Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)											Total = Sum(45)m =	1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	45.3396	48.8639	45.3249	45.1888	42.0176	42.7373	44.0650	43.9987	47.3242	47.7907	50.9589	(61)
Total heat required for water heating calculated for each month	210.3703	185.6104	196.2416	171.1433	164.5651	146.7839	144.1663	151.1351	154.0155	173.3445	185.8554	208.1498	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	187.8142	165.6616	175.3524	153.8462	148.4448	132.9897	131.2364	137.3854	139.7435	156.5194	166.7945	186.0115	(64)
										Total per year (kWh/year) = Sum(64)m =		1881.7996	(64)
12Total per year (kWh/year)												1882	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	65.7440	57.9749	61.2191	53.1659	50.9898	45.3392	44.4095	46.6171	47.5803	53.7328	57.8542	65.0057	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	88.3656	86.2722	82.2837	73.8415	68.5347	62.9711	59.6902	62.6573	66.0837	72.2215	80.3530	87.3733	(72)
Total internal gains	336.2419	342.9271	328.1085	314.7368	297.9788	283.1360	271.8050	273.4225	282.5612	296.6285	316.2113	329.5107	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6300	0.7000	0.7700	39.0751	(80)

Solar gains	39.0751	76.4392	125.8845	183.5950	225.0025	230.3301	219.2837	188.3614	146.4088	90.7015	48.7221	32.1335	(83)
Total gains	375.3170	419.3663	453.9930	498.3318	522.9813	513.4662	491.0887	461.7839	428.9701	387.3301	364.9334	361.6442	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

tau	58.5666	58.7497	58.9302	59.7934	59.9577	60.7346	60.7346	60.8807	60.4330	59.9577	59.6262	59.2836	
alpha	4.9044	4.9166	4.9287	4.9862	4.9972	5.0490	5.0490	5.0587	5.0289	4.9972	4.9751	4.9522	
util living area													
	0.9755	0.9573	0.9198	0.8219	0.6685	0.4853	0.3527	0.3904	0.6126	0.8617	0.9549	0.9790	(86)
MIT	20.0197	20.2102	20.4667	20.7649	20.9302	20.9887	20.9982	20.9970	20.9655	20.7447	20.3477	19.9929	(87)
Th 2	20.1296	20.1321	20.1345	20.1460	20.1481	20.1581	20.1581	20.1600	20.1543	20.1481	20.1438	20.1393	(88)
util rest of house													
	0.9700	0.9481	0.9029	0.7891	0.6185	0.4242	0.2858	0.3202	0.5465	0.8275	0.9436	0.9742	(89)
MIT 2	19.0046	19.2436	19.5595	19.9155	20.0902	20.1512	20.1574	20.1587	20.1307	19.9034	19.4271	18.9782	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.4894	19.7053	19.9928	20.3212	20.4914	20.5512	20.5590	20.5591	20.5294	20.3053	19.8668	19.4628	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4894	19.7053	19.9928	20.3212	20.4914	20.5512	20.5590	20.5591	20.5294	20.3053	19.8668	19.4628	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9650	0.9427	0.8998	0.7962	0.6392	0.4530	0.3178	0.3537	0.5765	0.8344	0.9393	0.9695	(94)
Useful gains	362.1733	395.3416	408.5059	396.7791	334.2866	232.5993	156.0596	163.3393	247.3043	323.1689	342.7750	350.6074	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	622.2355	604.6096	549.3225	458.2692	351.7847	235.0894	156.3900	163.9008	255.2470	388.3514	513.6966	617.6795	(97)
Space heating kWh													
	193.4863	140.6281	104.7675	44.2729	13.0186	0.0000	0.0000	0.0000	0.0000	48.4958	123.0636	198.7016	(98a)
Space heating requirement - total per year (kWh/year)												866.4344	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	193.4863	140.6281	104.7675	44.2729	13.0186	0.0000	0.0000	0.0000	0.0000	48.4958	123.0636	198.7016	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												866.4344	
Space heating per m2											(98c) / (4) =	19.9823	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	193.4863	140.6281	104.7675	44.2729	13.0186	0.0000	0.0000	0.0000	0.0000	48.4958	123.0636	198.7016	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	209.4007	152.1949	113.3848	47.9144	14.0893	0.0000	0.0000	0.0000	0.0000	52.4846	133.1857	215.0451	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	187.8142	165.6616	175.3524	153.8462	148.4448	132.9897	131.2364	137.3854	139.7435	156.5194	166.7945	186.0115	(64)
Efficiency of water heater												80.3000	(216)
(217)m	84.4453	84.0324	83.3144	82.0743	80.9313	80.3000	80.3000	80.3000	80.3000	82.1805	83.7393	84.5232	(217)
Fuel for water heating, kWh/month													
	222.4093	197.1402	210.4708	187.4476	183.4208	165.6160	163.4327	171.0902	174.0267	190.4579	199.1831	220.0716	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												937.6996	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2284.7671	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-357.1961	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												3067.5407	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	937.6996	0.2100	196.9169	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2284.7671	0.2100	479.8011	(264)
Space and water heating			676.7180	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			659.0154	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.2000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	937.6996	1.1300	1059.6005	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2284.7671	1.1300	2581.7868	(278)
Space and water heating			3641.3873	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3559.8849	(286)
Target Primary Energy Rate (TPER)			82.1000	(287)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	86 B	**DER**	12.05	**TER**	15.20
Environmental	92 A	**% DER < TER**			20.72
CO_2 Emissions (t/year)	0.5	**DFEE**	16.05	**TFEE**	26.65
Compliance Check	See BREL	**% DFEE < TFEE**			39.75
% DPER < TPER	16.14	**DPER**	68.85	**TPER**	82.10

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area		Storey height		Volume	
Main dwelling		(m2)		(m)		(m3)	
Ground floor		43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2622	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		8637.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							199.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							0.9954	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		12.3956	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	31.8822	31.8062	31.7316	31.3815	31.3160	31.0111	31.0111	30.9546	31.1285	31.3160	31.4485	31.5871	(39)
Average = Sum(39)m / 12 =												31.3812	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7353	0.7335	0.7318	0.7237	0.7222	0.7152	0.7152	0.7139	0.7179	0.7222	0.7253	0.7285	(40)
HLP (average)												0.7237	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		449.4572	(64a)
Heat gains from water heating, kWh/month	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.4004	291.4783	279.0119	271.5070	258.2448	250.2442	241.2477	240.9702	247.9561	254.7841	268.8582	277.3654	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	325.5767	373.9841	414.8872	469.6730	501.1047	498.8545	477.9348	444.2810	405.9847	352.6842	321.4470	312.0492	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.2514	75.4313	75.6085	76.4520	76.6119	77.3652	77.3652	77.5064	77.0733	76.6119	76.2891	75.9545	
alpha	6.0168	6.0288	6.0406	6.0968	6.1075	6.1577	6.1577	6.1671	6.1382	6.1075	6.0859	6.0636	
util living area	0.9792	0.9544	0.8983	0.7541	0.5722	0.3970	0.2854	0.3203	0.5240	0.8229	0.9540	0.9831	(86)
MIT	20.3085	20.4977	20.7168	20.9171	20.9853	20.9987	20.9999	20.9997	20.9933	20.8848	20.5767	20.2742	(87)
Th 2	20.3098	20.3113	20.3128	20.3199	20.3212	20.3274	20.3274	20.3286	20.3250	20.3212	20.3185	20.3157	(88)
util rest of house	0.9747	0.9455	0.8804	0.7223	0.5330	0.3556	0.2418	0.2737	0.4746	0.7890	0.9434	0.9794	(89)

MIT 2	19.6848	19.8690	20.0762	20.2578	20.3119	20.3268	20.3274	20.3285	20.3215	20.2363	19.9537	19.6563	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.9827	20.1693	20.3822	20.5727	20.6335	20.6477	20.6486	20.6491	20.6424	20.5461	20.2513	19.9514	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9827	20.1693	20.3822	20.5727	20.6335	20.6477	20.6486	20.6491	20.6424	20.5461	20.2513	19.9514	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9722	0.9434	0.8823	0.7344	0.5512	0.3754	0.2626	0.2959	0.4980	0.8008	0.9423	0.9771	(94)
Useful gains	316.5357	352.8131	366.0688	344.9320	276.1907	187.2621	125.5261	131.4778	202.1742	282.4211	302.8894	304.9109	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	499.9996	485.6573	440.5044	366.3071	279.7621	187.5456	125.5508	131.5287	203.6550	311.4719	413.5891	497.5408	(97)
Space heating kWh	136.4971	89.2713	55.3801	15.3900	2.6571	0.0000	0.0000	0.0000	0.0000	21.6138	79.7037	143.3166	(98a)
Space heating requirement - total per year (kWh/year)												543.8298	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	136.4971	89.2713	55.3801	15.3900	2.6571	0.0000	0.0000	0.0000	0.0000	21.6138	79.7037	143.3166	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												543.8298	
Space heating per m2											(98c) / (4) =	12.5422	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	291.5043	229.4821	235.2551	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9908	0.9968	0.9945	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	288.8295	228.7378	233.9688	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	554.0542	531.1768	493.2464	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	190.9618	225.0146	192.9026	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	47.7404	56.2537	48.2256	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												152.2197	(107)
Energy for space heating												12.5422	(99)
Energy for space cooling												3.5106	(108)
Total												16.0528	(109)
Fabric Energy Efficiency (DFEE)												16.1	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	13.7636			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	199.1940	(35)
List of Thermal Bridges		

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	52.2400	0.0700	3.6568
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	6.3858	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	20.1494	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	40.9650	40.8373	40.7122	40.1245	40.0146	39.5027	39.5027	39.4079	39.6999	40.0146	40.2370	40.4696	(39)
Average = Sum(39)m / 12 =												40.1240	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9448	0.9418	0.9389	0.9254	0.9228	0.9110	0.9110	0.9089	0.9156	0.9228	0.9280	0.9333	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4982	(42)

Hot water usage for mixer showers

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												47.0349	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	

Distribution loss (46)m = 0.15 x (45)m

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)

Electric shower(s)

	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												449.4572	(64a)

Heat gains from water heating, kWh/month

	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													

	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931 (72)
Total internal gains	281.3655	289.2254	276.9770	269.4043	256.2100	248.1415	239.2128	238.9354	245.8534	252.7493	266.7555	275.3306 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6300	0.7000	0.7700	39.0751	(80)

Solar gains	39.0751	76.4392	125.8845	183.5950	225.0025	230.3301	219.2837	188.3614	146.4088	90.7015	48.7221	32.1335	(83)
Total gains	320.4406	365.6646	402.8615	452.9993	481.2125	478.4717	458.4965	427.2968	392.2623	343.4508	315.4775	307.4640	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.5666	58.7497	58.9302	59.7934	59.9577	60.7346	60.7346	60.8807	60.4330	59.9577	59.6262	59.2836	
alpha	4.9044	4.9166	4.9287	4.9862	4.9972	5.0490	5.0490	5.0587	5.0289	4.9972	4.9751	4.9522	
util living area	0.9870	0.9744	0.9461	0.8604	0.7116	0.5182	0.3773	0.4210	0.6592	0.9021	0.9739	0.9891	(86)
MIT	19.8660	20.0709	20.3543	20.7036	20.9080	20.9849	20.9975	20.9957	20.9524	20.6706	20.2200	19.8386	(87)
Th 2	20.1296	20.1321	20.1345	20.1460	20.1481	20.1581	20.1581	20.1600	20.1543	20.1481	20.1438	20.1393	(88)
util rest of house	0.9838	0.9684	0.9336	0.8313	0.6618	0.4540	0.3060	0.3457	0.5914	0.8743	0.9667	0.9865	(89)
MIT 2	19.1024	19.3056	19.5820	19.9148	20.0875	20.1508	20.1574	20.1586	20.1283	19.8948	19.4634	19.0830	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.4671	19.6711	19.9509	20.2916	20.4794	20.5492	20.5586	20.5584	20.5219	20.2653	19.8248	19.4439	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4671	19.6711	19.9509	20.2916	20.4794	20.5492	20.5586	20.5584	20.5219	20.2653	19.8248	19.4439	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9808	0.9646	0.9305	0.8367	0.6818	0.4842	0.3401	0.3817	0.6218	0.8786	0.9635	0.9838	(94)
Useful gains	314.2852	352.7043	374.8723	379.0078	328.1045	231.6630	155.9246	163.0799	243.9040	301.7465	303.9544	302.4822	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	621.3211	603.2137	547.6150	457.0809	351.3023	235.0097	156.3764	163.8747	254.9492	386.7541	512.0068	616.9138	(97)
Space heating kWh	228.4347	168.3423	128.5206	56.2126	17.2592	0.0000	0.0000	0.0000	0.0000	63.2456	149.7977	233.9371	(98a)
Space heating requirement - total per year (kWh/year)												1045.7499	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	228.4347	168.3423	128.5206	56.2126	17.2592	0.0000	0.0000	0.0000	0.0000	63.2456	149.7977	233.9371	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1045.7499	
Space heating per m2										(98c) / (4) =		24.1178	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	371.3254	292.3200	299.5001	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9447	0.9735	0.9620	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	350.8010	284.5787	288.1146	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	532.5097	510.6427	475.5231	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	130.8303	168.1917	139.4320	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	32.7076	42.0479	34.8580	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												109.6135	(107)
Energy for space heating												24.1178	(99)
Energy for space cooling												2.5280	(108)
Total												26.6458	(109)
Fabric Energy Efficiency (TFEE)												26.6	(109)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	86 B	**DER**	12.05	**TER**	15.20
Environmental	92 A	**% DER < TER**			20.72
CO_2 Emissions (t/year)	0.5	**DFEE**	16.05	**TFEE**	26.65
Compliance Check	See BREL	**% DFEE < TFEE**			39.75
% DPER < TPER	16.14	**DPER**	68.85	**TPER**	82.10

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.1391	12.7569	14.0957	13.5903	14.0106	13.5270	13.9607	13.9788	13.5484	14.0374	13.6339	14.1338	(61)
Total heat required for water heating calculated for each month	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
										Total per year (kWh/year) = Sum(64)m =		1702.2253	(64)
12Total per year (kWh/year)												1702	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	56.5391	49.8293	52.5270	45.2322	43.1953	38.2165	37.2153	39.0955	39.9677	45.4111	49.3150	55.7994	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	75.9934	74.1507	70.6008	62.8225	58.0581	53.0785	50.0206	52.5477	55.5107	61.0364	68.4930	74.9992	(72)
Total internal gains	325.9046	333.0584	318.4605	305.8206	289.5371	275.3462	264.1703	265.3477	274.0909	287.4783	306.4540	319.1715	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)
Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	368.0809	415.5642	454.3358	503.9866	532.3970	523.9565	500.8574	468.6585	432.1195	385.3784	359.0429	353.8553	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area	0.9577	0.9188	0.8432	0.6912	0.5186	0.3651	0.2628	0.2936	0.4755	0.7570	0.9186	0.9655	(86)
MIT	20.5183	20.6729	20.8338	20.9551	20.9929	20.9993	20.9999	20.9999	20.9967	20.9363	20.7182	20.4729	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)

util rest of house													
	0.9497	0.9053	0.8211	0.6598	0.4836	0.3282	0.2240	0.2521	0.4316	0.7209	0.9027	0.9588	(89)
MIT 2	19.8008	19.9881	20.1758	20.3073	20.3438	20.3491	20.3495	20.3495	20.3474	20.2911	20.0458	19.7450	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.1435	20.3152	20.4901	20.6167	20.6538	20.6597	20.6602	20.6601	20.6575	20.5992	20.3669	20.0927	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.9935	20.1652	20.3401	20.4667	20.5038	20.5097	20.5102	20.5101	20.5075	20.4492	20.2169	19.9427	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9447	0.9011	0.8208	0.6656	0.4919	0.3373	0.2336	0.2624	0.4423	0.7266	0.8992	0.9539	(94)
Useful gains	347.7140	374.4712	372.9038	335.4543	261.9026	176.7220	116.9991	122.9726	191.1215	280.0331	322.8370	337.5295	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	469.6098	456.7940	414.1492	346.1211	263.4439	176.8410	117.0079	122.9913	191.7380	294.7278	392.5093	471.0822	(97)
Space heating kWh	90.6905	55.3209	30.6865	7.6801	1.1467	0.0000	0.0000	0.0000	0.0000	10.9329	50.1640	99.3632	(98a)
Space heating requirement - total per year (kWh/year)												345.9849	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	90.6905	55.3209	30.6865	7.6801	1.1467	0.0000	0.0000	0.0000	0.0000	10.9329	50.1640	99.3632	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												345.9849	
Space heating per m2											(98c) / (4) =	7.9794	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	90.6905	55.3209	30.6865	7.6801	1.1467	0.0000	0.0000	0.0000	0.0000	10.9329	50.1640	99.3632	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	101.8995	62.1583	34.4792	8.6293	1.2885	0.0000	0.0000	0.0000	0.0000	12.2842	56.3641	111.6440	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
Efficiency of water heater												87.3000	(216)
(217)m	87.8761	87.7450	87.5671	87.3872	87.3142	87.3000	87.3000	87.3000	87.3000	87.4209	87.7164	87.9164	(217)
Fuel for water heating, kWh/month	197.4946	174.4004	184.3996	159.5301	152.7665	135.5021	132.1761	138.6584	141.5408	160.2108	172.9421	194.8723	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.3168	7.5119	8.3168	8.0485	8.3168	8.0485	8.3168	8.3168	8.0485	8.3168	8.0485	8.3168	(231)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												388.7471	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.3000	
Water heating fuel used												1944.4938	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												97.9235	(231)
Electricity for lighting (calculated in Appendix L)												130.6818	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2561.8462	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	388.7471	0.2100	81.6369	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1944.4938	0.2100	408.3437	(264)
Space and water heating			489.9806	(265)
Pumps, fans and electric keep-hot	97.9235	0.1387	13.5832	(267)
Energy for lighting	130.6818	0.1443	18.8614	(268)
Total CO2, kg/year			522.4252	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.0500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	388.7471	1.1300	439.2842	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1944.4938	1.1300	2197.2780	(278)
Space and water heating			2636.5622	(279)
Pumps, fans and electric keep-hot	97.9235	1.5128	148.1386	(281)
Energy for lighting	130.6818	1.5338	200.4441	(282)
Total Primary energy kWh/year			2985.1450	(286)
Dwelling Primary energy Rate (DPER)			68.8500	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4383 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		13.7636			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 199.1940 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580

E7 Party floor between dwellings (in blocks of flats)	52.2400	0.0700	3.6568	
E16 Corner (normal)	5.0000	0.0900	0.4500	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000	
E18 Party wall between dwellings	5.0000	0.0600	0.3000	
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3858 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.1494 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	40.9650	40.8373	40.7122	40.1245	40.0146	39.5027	39.5027	39.4079	39.6999	40.0146	40.2370	40.4696	(39)
Average = Sum(39)m / 12 =												40.1240	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9448	0.9418	0.9389	0.9254	0.9228	0.9110	0.9110	0.9089	0.9156	0.9228	0.9280	0.9333	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)
Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)											Total = Sum(45)m =	1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	45.3396	48.8639	45.3249	45.1888	42.0176	42.7373	44.0650	43.9987	47.3242	47.7907	50.9589	(61)
Total heat required for water heating calculated for each month	210.3703	185.6104	196.2416	171.1433	164.5651	146.7839	144.1663	151.1351	154.0155	173.3445	185.8554	208.1498	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	187.8142	165.6616	175.3524	153.8462	148.4448	132.9897	131.2364	137.3854	139.7435	156.5194	166.7945	186.0115	(64)
										Total per year (kWh/year) = Sum(64)m =		1881.7996	(64)
12Total per year (kWh/year)												1882	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	65.7440	57.9749	61.2191	53.1659	50.9898	45.3392	44.4095	46.6171	47.5803	53.7328	57.8542	65.0057	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	88.3656	86.2722	82.2837	73.8415	68.5347	62.9711	59.6902	62.6573	66.0837	72.2215	80.3530	87.3733	(72)
Total internal gains	336.2419	342.9271	328.1085	314.7368	297.9788	283.1360	271.8050	273.4225	282.5612	296.6285	316.2113	329.5107	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6300	0.7000	0.7700	39.0751	(80)

Solar gains	39.0751	76.4392	125.8845	183.5950	225.0025	230.3301	219.2837	188.3614	146.4088	90.7015	48.7221	32.1335	(83)
Total gains	375.3170	419.3663	453.9930	498.3318	522.9813	513.4662	491.0887	461.7839	428.9701	387.3301	364.9334	361.6442	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

tau	58.5666	58.7497	58.9302	59.7934	59.9577	60.7346	60.7346	60.8807	60.4330	59.9577	59.6262	59.2836	
alpha	4.9044	4.9166	4.9287	4.9862	4.9972	5.0490	5.0490	5.0587	5.0289	4.9972	4.9751	4.9522	
util living area													
	0.9755	0.9573	0.9198	0.8219	0.6685	0.4853	0.3527	0.3904	0.6126	0.8617	0.9549	0.9790	(86)
MIT	20.0197	20.2102	20.4667	20.7649	20.9302	20.9887	20.9982	20.9970	20.9655	20.7447	20.3477	19.9929	(87)
Th 2	20.1296	20.1321	20.1345	20.1460	20.1481	20.1581	20.1581	20.1600	20.1543	20.1481	20.1438	20.1393	(88)
util rest of house													
	0.9700	0.9481	0.9029	0.7891	0.6185	0.4242	0.2858	0.3202	0.5465	0.8275	0.9436	0.9742	(89)
MIT 2	19.0046	19.2436	19.5595	19.9155	20.0902	20.1512	20.1574	20.1587	20.1307	19.9034	19.4271	18.9782	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.4894	19.7053	19.9928	20.3212	20.4914	20.5512	20.5590	20.5591	20.5294	20.3053	19.8668	19.4628	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4894	19.7053	19.9928	20.3212	20.4914	20.5512	20.5590	20.5591	20.5294	20.3053	19.8668	19.4628	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9650	0.9427	0.8998	0.7962	0.6392	0.4530	0.3178	0.3537	0.5765	0.8344	0.9393	0.9695	(94)
Useful gains	362.1733	395.3416	408.5059	396.7791	334.2866	232.5993	156.0596	163.3393	247.3043	323.1689	342.7750	350.6074	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	622.2355	604.6096	549.3225	458.2692	351.7847	235.0894	156.3900	163.9008	255.2470	388.3514	513.6966	617.6795	(97)
Space heating kWh													
	193.4863	140.6281	104.7675	44.2729	13.0186	0.0000	0.0000	0.0000	0.0000	48.4958	123.0636	198.7016	(98a)
Space heating requirement - total per year (kWh/year)												866.4344	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	193.4863	140.6281	104.7675	44.2729	13.0186	0.0000	0.0000	0.0000	0.0000	48.4958	123.0636	198.7016	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												866.4344	
Space heating per m2											(98c) / (4) =	19.9823	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	193.4863	140.6281	104.7675	44.2729	13.0186	0.0000	0.0000	0.0000	0.0000	48.4958	123.0636	198.7016	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	209.4007	152.1949	113.3848	47.9144	14.0893	0.0000	0.0000	0.0000	0.0000	52.4846	133.1857	215.0451	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	187.8142	165.6616	175.3524	153.8462	148.4448	132.9897	131.2364	137.3854	139.7435	156.5194	166.7945	186.0115	(64)
Efficiency of water heater												80.3000	(216)
(217)m	84.4453	84.0324	83.3144	82.0743	80.9313	80.3000	80.3000	80.3000	80.3000	82.1805	83.7393	84.5232	(217)
Fuel for water heating, kWh/month													
	222.4093	197.1402	210.4708	187.4476	183.4208	165.6160	163.4327	171.0902	174.0267	190.4579	199.1831	220.0716	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												937.6996	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2284.7671	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-357.1961	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												3067.5407	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	937.6996	0.2100	196.9169	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2284.7671	0.2100	479.8011	(264)
Space and water heating			676.7180	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			659.0154	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.2000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	937.6996	1.1300	1059.6005	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2284.7671	1.1300	2581.7868	(278)
Space and water heating			3641.3873	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3559.8849	(286)
Target Primary Energy Rate (TPER)			82.1000	(287)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	86 B	**DER**	12.05	**TER**	15.20
Environmental	92 A	**% DER < TER**			20.72
CO_2 Emissions (t/year)	0.5	**DFEE**	16.05	**TFEE**	26.65
Compliance Check	See BREL	**% DFEE < TFEE**			39.75
% DPER < TPER	16.14	**DPER**	68.85	**TPER**	82.10

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		8637.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							199.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							0.9954	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.1391	12.7569	14.0957	13.5903	14.0106	13.5270	13.9607	13.9788	13.5484	14.0374	13.6339	14.1338	(61)
Total heat required for water heating calculated for each month	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
										Total per year (kWh/year) = Sum(64)m =		1702.2253	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	56.5391	49.8293	52.5270	45.2322	43.1953	38.2165	37.2153	39.0955	39.9677	45.4111	49.3150	55.7994	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	75.9934	74.1507	70.6008	62.8225	58.0581	53.0785	50.0206	52.5477	55.5107	61.0364	68.4930	74.9992	(72)
Total internal gains	367.0744	365.1778	353.4832	331.6516	310.6911	288.7122	277.6029	280.1839	291.2917	313.8707	337.5234	358.0289	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	409.2507	447.6836	489.3585	529.8176	553.5510	537.3225	514.2901	483.4947	449.3203	411.7708	390.1123	392.7127	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area	0.9337	0.8934	0.8068	0.6628	0.4995	0.3561	0.2560	0.2846	0.4577	0.7200	0.8899	0.9454	(86)
MIT	20.6152	20.7323	20.8722	20.9643	20.9942	20.9994	20.9999	20.9999	20.9974	20.9518	20.7750	20.5699	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house													

	0.9225	0.8773	0.7828	0.6317	0.4656	0.3200	0.2182	0.2444	0.4153	0.6833	0.8707	0.9358	(89)
MIT 2	19.9182	20.0576	20.2179	20.3162	20.3449	20.3492	20.3495	20.3495	20.3478	20.3060	20.1111	19.8635	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.2511	20.3799	20.5304	20.6258	20.6550	20.6598	20.6602	20.6602	20.6580	20.6144	20.4282	20.2009	(92)
Temperature adjustment												-0.1500	
adjusted MIT	20.1011	20.2299	20.3804	20.4758	20.5050	20.5098	20.5102	20.5102	20.5080	20.4644	20.2782	20.0509	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9177	0.8741	0.7840	0.6378	0.4737	0.3289	0.2275	0.2543	0.4257	0.6900	0.8685	0.9308	(94)
Useful gains	375.5820	391.3425	383.6547	337.9306	262.2324	176.7405	117.0006	122.9762	191.2578	284.1104	338.8001	365.5281	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	472.8317	458.7289	415.3553	346.3922	263.4805	176.8432	117.0081	122.9917	191.7538	295.1820	394.3428	474.3214	(97)
Space heating kWh	72.3538	45.2837	23.5852	6.0923	0.9286	0.0000	0.0000	0.0000	0.0000	8.2373	39.9908	80.9422	(98a)
Space heating requirement - total per year (kWh/year)												277.4139	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	72.3538	45.2837	23.5852	6.0923	0.9286	0.0000	0.0000	0.0000	0.0000	8.2373	39.9908	80.9422	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												277.4139	
Space heating per m2											(98c) / (4) =	6.3979	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	72.3538	45.2837	23.5852	6.0923	0.9286	0.0000	0.0000	0.0000	0.0000	8.2373	39.9908	80.9422	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	81.2964	50.8805	26.5003	6.8453	1.0434	0.0000	0.0000	0.0000	0.0000	9.2554	44.9335	90.9463	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
Efficiency of water heater												87.3000	(216)
(217)m	87.7934	87.6824	87.5130	87.3699	87.3115	87.3000	87.3000	87.3000	87.3000	87.3927	87.6493	87.8383	(217)
Fuel for water heating, kWh/month	197.6806	174.5249	184.5136	159.5616	152.7712	135.5021	132.1761	138.6584	141.5408	160.2625	173.0745	195.0455	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.3168	7.5119	8.3168	8.0485	8.3168	8.0485	8.3168	8.3168	8.0485	8.3168	8.0485	8.3168	(231)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	311.7010	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	1945.3117	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	97.9235	(231)
Electricity for lighting (calculated in Appendix L)	130.6818	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2485.6180	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	311.7010	3.6400	11.3459	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1945.3117	3.6400	70.8093	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	97.9235	16.4900	16.1476	(249)
Energy for lighting	130.6818	16.4900	21.5494	(250)
Additional standing charges			92.0000	(251)
Total energy cost			211.8523	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8631	(257)
SAP value		86.0085	
SAP rating (Section 12)		86	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	311.7010	0.2100	65.4572	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1945.3117	0.2100	408.5155	(264)
Space and water heating			473.9727	(265)
Pumps, fans and electric keep-hot	97.9235	0.1387	13.5832	(267)
Energy for lighting	130.6818	0.1443	18.8614	(268)
Total CO2, kg/year			506.4173	(272)
CO2 emissions per m2			11.6800	(273)
EI value			92.3201	
EI rating			92	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.4982 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day)		92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.1391	12.7569	14.0957	13.5903	14.0106	13.5270	13.9607	13.9788	13.5484	14.0374	13.6339	14.1338	(61)
Total heat required for water heating calculated for each month	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
										Total per year (kWh/year) = Sum(64)m =		1702.2253	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	56.5391	49.8293	52.5270	45.2322	43.1953	38.2165	37.2153	39.0955	39.9677	45.4111	49.3150	55.7994	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	75.9934	74.1507	70.6008	62.8225	58.0581	53.0785	50.0206	52.5477	55.5107	61.0364	68.4930	74.9992	(72)
Total internal gains	367.0744	365.1778	353.4832	331.6516	310.6911	288.7122	277.6029	280.1839	291.2917	313.8707	337.5234	358.0289	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	23.7835	0.6800	0.7000	0.7700	51.0736	(80)

Solar gains	51.0736	88.7763	143.8339	211.6843	249.5125	273.8424	255.8751	224.3556	176.4207	111.0901	62.7325	42.2420	(83)
Total gains	418.1480	453.9541	497.3171	543.3359	560.2036	562.5546	533.4780	504.5395	467.7124	424.9608	400.2559	400.2709	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area	0.9225	0.8808	0.7800	0.6297	0.4680	0.3084	0.2187	0.2431	0.4212	0.6741	0.8678	0.9364	(86)
MIT	20.6564	20.7612	20.8984	20.9739	20.9962	20.9998	21.0000	21.0000	20.9984	20.9680	20.8147	20.6109	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house	0.9097	0.8633	0.7541	0.5981	0.4341	0.2739	0.1823	0.2046	0.3801	0.6357	0.8459	0.9254	(89)
MIT 2	19.9680	20.0916	20.2468	20.3257	20.3466	20.3494	20.3496	20.3495	20.3486	20.3217	20.1567	19.9134	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.2968	20.4114	20.5580	20.6353	20.6569	20.6601	20.6602	20.6602	20.6590	20.6304	20.4710	20.2465	(92)
Temperature adjustment												-0.1500	
adjusted MIT	20.1468	20.2614	20.4080	20.4853	20.5069	20.5101	20.5102	20.5102	20.5090	20.4804	20.3210	20.0965	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9053	0.8607	0.7565	0.6048	0.4423	0.2824	0.1913	0.2141	0.3902	0.6436	0.8449	0.9206	(94)
Useful gains	378.5654	390.7290	376.2018	328.5912	247.7744	158.8601	102.0447	108.0266	182.5162	273.4966	338.1704	368.4714	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	465.2210	450.6963	401.2209	334.7076	248.5737	158.8976	102.0470	108.0314	182.8036	280.6975	383.6545	466.7084	(97)
Space heating kWh	64.4718	40.2980	18.6142	4.4038	0.5947	0.0000	0.0000	0.0000	0.0000	5.3575	32.7485	73.0884	(98a)
Space heating requirement - total per year (kWh/year)												239.5770	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	64.4718	40.2980	18.6142	4.4038	0.5947	0.0000	0.0000	0.0000	0.0000	5.3575	32.7485	73.0884	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												239.5770	
Space heating per m2											(98c) / (4) =	5.5253	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	64.4718	40.2980	18.6142	4.4038	0.5947	0.0000	0.0000	0.0000	0.0000	5.3575	32.7485	73.0884	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	72.4402	45.2787	20.9149	4.9481	0.6682	0.0000	0.0000	0.0000	0.0000	6.0196	36.7961	82.1218	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
Efficiency of water heater												87.3000	(216)
(217)m	87.7540	87.6490	87.4727	87.3511	87.3074	87.3000	87.3000	87.3000	87.3000	87.3615	87.5971	87.8015	(217)
Fuel for water heating, kWh/month	197.7693	174.5915	184.5987	159.5959	152.7784	135.5021	132.1761	138.6584	141.5408	160.3198	173.1777	195.1273	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.3168	7.5119	8.3168	8.0485	8.3168	8.0485	8.3168	8.3168	8.0485	8.3168	8.0485	8.3168	(231)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	269.1876	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	1945.8360	(219)
Space cooling fuel	0.0000	(221)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)

mechanical ventilation fans (SFP = 0.0920) 11.9235 (230a)

central heating pump		41.0000 (230c)
main heating flue fan		45.0000 (230e)
Total electricity for the above, kWh/year		97.9235 (231)
Electricity for lighting (calculated in Appendix L)		130.6818 (232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation		0.0000 (233)
Wind generation		0.0000 (234)
Hydro-electric generation (Appendix N)		0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)		0.0000 (235)
Appendix Q - special features		
Energy saved or generated		-0.0000 (236)
Energy used		0.0000 (237)
Total delivered energy for all uses		2443.6289 (238)

10a. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	269.1876	6.5500	17.6318	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1945.8360	6.5500	127.4523	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	97.9235	28.4300	27.8396	(249)
Energy for lighting	130.6818	28.4300	37.1528	(250)
Additional standing charges			104.0000	(251)
Total energy cost			314.0765	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	269.1876	0.2100	56.5294	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1945.8360	0.2100	408.6256	(264)
Space and water heating			465.1550	(265)
Pumps, fans and electric keep-hot	97.9235	0.1387	13.5832	(267)
Energy for lighting	130.6818	0.1443	18.8614	(268)
Total CO2, kg/year			497.5996	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	269.1876	1.1300	304.1820	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1945.8360	1.1300	2198.7947	(278)
Space and water heating			2502.9767	(279)
Pumps, fans and electric keep-hot	97.9235	1.5128	148.1386	(281)
Energy for lighting	130.6818	1.5338	200.4441	(282)
Total Primary energy kWh/year			2851.5594	(286)

SAP 10 EPC IMPROVEMENTS

Rev C - Be Lean

Current energy efficiency rating: B 86
Current environmental impact rating: A 92

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 86
Potential environmental impact rating: A 92

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£65	£65	£0
Mains gas	£249	£249	£0
Space heating	£149	£149	£0
Water heating	£127	£127	£0
Lighting	£37	£37	£0
Total cost of fuels	£314	£314	£0
Total cost of uses	£313	£313	£0
Delivered energy	56 kWh/m²	56 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.5 tonnes	0.5 tonnes	0.0 tonnes
CO2 emissions per m²	11 kg/m²	11 kg/m²	0 kg/m²
Primary energy	66 kWh/m²	66 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		8637.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							199.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							0.9954	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		12.3956	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4982	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths
21.3409 21.0240 20.5777 19.7547 19.1385 18.4553 18.0862 18.5294 19.0120 19.7431 20.5830 21.2688 (42b)
Hot water usage for other uses
29.9733 28.8834 27.7935 26.7035 25.6136 24.5236 24.5236 25.6136 26.7035 27.7935 28.8834 29.9733 (42c)
Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m													
	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.1391	12.7569	14.0957	13.5903	14.0106	13.5270	13.9607	13.9788	13.5484	14.0374	13.6339	14.1338	(61)
Total heat required for water heating calculated for each month													
	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
										Total per year (kWh/year) = Sum(64)m =		1702.2253	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						0.0000	(64a)
Heat gains from water heating, kWh/month													
	56.5391	49.8293	52.5270	45.2322	43.1953	38.2165	37.2153	39.0955	39.9677	45.4111	49.3150	55.7994	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	75.9934	74.1507	70.6008	62.8225	58.0581	53.0785	50.0206	52.5477	55.5107	61.0364	68.4930	74.9992	(72)
Total internal gains													
	367.0744	365.1778	353.4832	331.6516	310.6911	288.7122	277.6029	280.1839	291.2917	313.8707	337.5234	358.0289	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	409.2507	447.6836	489.3585	529.8176	553.5510	537.3225	514.2901	483.4947	449.3203	411.7708	390.1123	392.7127	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area													
	0.9337	0.8934	0.8068	0.6628	0.4995	0.3561	0.2560	0.2846	0.4577	0.7200	0.8899	0.9454	(86)
MIT	20.6152	20.7323	20.8722	20.9643	20.9942	20.9994	20.9999	20.9999	20.9974	20.9518	20.7750	20.5699	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house													
	0.9225	0.8773	0.7828	0.6317	0.4656	0.3200	0.2182	0.2444	0.4153	0.6833	0.8707	0.9358	(89)
MIT 2	19.9182	20.0576	20.2179	20.3162	20.3449	20.3492	20.3495	20.3495	20.3478	20.3060	20.1111	19.8635	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.2511	20.3799	20.5304	20.6258	20.6550	20.6598	20.6602	20.6602	20.6580	20.6144	20.4282	20.2009	(92)
Temperature adjustment												-0.1500	
adjusted MIT	20.1011	20.2299	20.3804	20.4758	20.5050	20.5098	20.5102	20.5102	20.5080	20.4644	20.2782	20.0509	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9177	0.8741	0.7840	0.6378	0.4737	0.3289	0.2275	0.2543	0.4257	0.6900	0.8685	0.9308	(94)
Useful gains	375.5820	391.3425	383.6547	337.9306	262.2324	176.7405	117.0006	122.9762	191.2578	284.1104	338.8001	365.5281	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	472.8317	458.7289	415.3553	346.3922	263.4805	176.8432	117.0081	122.9917	191.7538	295.1820	394.3428	474.3214	(97)
Space heating kWh													
	72.3538	45.2837	23.5852	6.0923	0.9286	0.0000	0.0000	0.0000	0.0000	8.2373	39.9908	80.9422	(98a)
Space heating requirement - total per year (kWh/year)												277.4139	
Solar heating kWh													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)											0.0000	
Space heating kWh												
	72.3538	45.2837	23.5852	6.0923	0.9286	0.0000	0.0000	0.0000	0.0000	8.2373	39.9908	80.9422 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)											277.4139	
Space heating per m2										(98c) / (4) =	6.3979	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)											0.0000	(201)
Fraction of space heat from main system(s)											1.0000	(202)
Efficiency of main space heating system 1 (in %)											89.0000	(206)
Efficiency of main space heating system 2 (in %)											0.0000	(207)
Efficiency of secondary/supplementary heating system, %											0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	72.3538	45.2837	23.5852	6.0923	0.9286	0.0000	0.0000	0.0000	0.0000	8.2373	39.9908	80.9422	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	81.2964	50.8805	26.5003	6.8453	1.0434	0.0000	0.0000	0.0000	0.0000	9.2554	44.9335	90.9463	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
Efficiency of water heater												87.3000	(216)
(217)m	87.7934	87.6824	87.5130	87.3699	87.3115	87.3000	87.3000	87.3000	87.3000	87.3927	87.6493	87.8383	(217)
Fuel for water heating, kWh/month													
	197.6806	174.5249	184.5136	159.5616	152.7712	135.5021	132.1761	138.6584	141.5408	160.2625	173.0745	195.0455	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.3168	7.5119	8.3168	8.0485	8.3168	8.0485	8.3168	8.3168	8.0485	8.3168	8.0485	8.3168	(231)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1											311.7010		(211)
Space heating fuel - main system 2											0.0000		(213)
Space heating fuel - secondary											0.0000		(215)
Efficiency of water heater											87.3000		
Water heating fuel used											1945.3117		(219)
Space cooling fuel											0.0000		(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)											11.9235		(230a)
central heating pump											41.0000		(230c)
main heating flue fan											45.0000		(230e)
Total electricity for the above, kWh/year											97.9235		(231)
Electricity for lighting (calculated in Appendix L)											130.6818		(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation											0.0000		(233)
Wind generation											0.0000		(234)
Hydro-electric generation (Appendix N)											0.0000		(235a)
Electricity generated - Micro CHP (Appendix N)											0.0000		(235)
Appendix Q - special features													
Energy saved or generated											-0.0000		(236)
Energy used											0.0000		(237)
Total delivered energy for all uses											2485.6180		(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	311.7010	3.6400	11.3459	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1945.3117	3.6400	70.8093	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	97.9235	16.4900	16.1476	(249)
Energy for lighting	130.6818	16.4900	21.5494	(250)
Additional standing charges			92.0000	(251)
Total energy cost			211.8523	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8631	(257)
SAP value		86.0085	
SAP rating (Section 12)		86	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	311.7010	0.2100	65.4572	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1945.3117	0.2100	408.5155	(264)
Space and water heating			473.9727	(265)
Pumps, fans and electric keep-hot	97.9235	0.1387	13.5832	(267)
Energy for lighting	130.6818	0.1443	18.8614	(268)
Total CO2, kg/year			506.4173	(272)
CO2 emissions per m2			11.6800	(273)
EI value			92.3201	
EI rating			92	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff													
	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers													
	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths													
	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses													
	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m													
	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.1391	12.7569	14.0957	13.5903	14.0106	13.5270	13.9607	13.9788	13.5484	14.0374	13.6339	14.1338	(61)
Total heat required for water heating calculated for each month													
	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
										Total per year (kWh/year) = Sum(64)m =		1702.2253	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	56.5391	49.8293	52.5270	45.2322	43.1953	38.2165	37.2153	39.0955	39.9677	45.4111	49.3150	55.7994	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	75.9934	74.1507	70.6008	62.8225	58.0581	53.0785	50.0206	52.5477	55.5107	61.0364	68.4930	74.9992	(72)
Total internal gains													
	367.0744	365.1778	353.4832	331.6516	310.6911	288.7122	277.6029	280.1839	291.2917	313.8707	337.5234	358.0289	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	23.7835	0.6800	0.7000	0.7700	51.0736	(80)

Solar gains	51.0736	88.7763	143.8339	211.6843	249.5125	273.8424	255.8751	224.3556	176.4207	111.0901	62.7325	42.2420	(83)
Total gains	418.1480	453.9541	497.3171	543.3359	560.2036	562.5546	533.4780	504.5395	467.7124	424.9608	400.2559	400.2709	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area													
	0.9225	0.8808	0.7800	0.6297	0.4680	0.3084	0.2187	0.2431	0.4212	0.6741	0.8678	0.9364	(86)
MIT	20.6564	20.7612	20.8984	20.9739	20.9962	20.9998	21.0000	21.0000	20.9984	20.9680	20.8147	20.6109	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house													
	0.9097	0.8633	0.7541	0.5981	0.4341	0.2739	0.1823	0.2046	0.3801	0.6357	0.8459	0.9254	(89)
MIT 2	19.9680	20.0916	20.2468	20.3257	20.3466	20.3494	20.3496	20.3495	20.3486	20.3217	20.1567	19.9134	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.2968	20.4114	20.5580	20.6353	20.6569	20.6601	20.6602	20.6602	20.6590	20.6304	20.4710	20.2465	(92)

Temperature adjustment												-0.1500	
adjusted MIT	20.1468	20.2614	20.4080	20.4853	20.5069	20.5101	20.5102	20.5102	20.5090	20.4804	20.3210	20.0965	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9053	0.8607	0.7565	0.6048	0.4423	0.2824	0.1913	0.2141	0.3902	0.6436	0.8449	0.9206	(94)
Useful gains	378.5654	390.7290	376.2018	328.5912	247.7744	158.8601	102.0447	108.0266	182.5162	273.4966	338.1704	368.4714	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	465.2210	450.6963	401.2209	334.7076	248.5737	158.8976	102.0470	108.0314	182.8036	280.6975	383.6545	466.7084	(97)
Space heating kWh	64.4718	40.2980	18.6142	4.4038	0.5947	0.0000	0.0000	0.0000	0.0000	5.3575	32.7485	73.0884	(98a)
Space heating requirement - total per year (kWh/year)												239.5770	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	64.4718	40.2980	18.6142	4.4038	0.5947	0.0000	0.0000	0.0000	0.0000	5.3575	32.7485	73.0884	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												239.5770	
Space heating per m2											(98c) / (4) =	5.5253	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	64.4718	40.2980	18.6142	4.4038	0.5947	0.0000	0.0000	0.0000	0.0000	5.3575	32.7485	73.0884	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	72.4402	45.2787	20.9149	4.9481	0.6682	0.0000	0.0000	0.0000	0.0000	6.0196	36.7961	82.1218	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
Efficiency of water heater												87.3000	(216)
(217)m	87.7540	87.6490	87.4727	87.3511	87.3074	87.3000	87.3000	87.3000	87.3000	87.3615	87.5971	87.8015	(217)
Fuel for water heating, kWh/month	197.7693	174.5915	184.5987	159.5959	152.7784	135.5021	132.1761	138.6584	141.5408	160.3198	173.1777	195.1273	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.3168	7.5119	8.3168	8.0485	8.3168	8.0485	8.3168	8.3168	8.0485	8.3168	8.0485	8.3168	(231)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	269.1876	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	1945.8360	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	97.9235	(231)
Electricity for lighting (calculated in Appendix L)	130.6818	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2443.6289	(238)

10a. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	269.1876	6.5500	17.6318	(240)

Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1945.8360	6.5500	127.4523	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	97.9235	28.4300	27.8396	(249)
Energy for lighting	130.6818	28.4300	37.1528	(250)
Additional standing charges			104.0000	(251)
Total energy cost			314.0765	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	269.1876	0.2100	56.5294	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1945.8360	0.2100	408.6256	(264)
Space and water heating			465.1550	(265)
Pumps, fans and electric keep-hot	97.9235	0.1387	13.5832	(267)
Energy for lighting	130.6818	0.1443	18.8614	(268)
Total CO2, kg/year			497.5996	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	269.1876	1.1300	304.1820	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1945.8360	1.1300	2198.7947	(278)
Space and water heating			2502.9767	(279)
Pumps, fans and electric keep-hot	97.9235	1.5128	148.1386	(281)
Energy for lighting	130.6818	1.5338	200.4441	(282)
Total Primary energy kWh/year			2851.5594	(286)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.02	**TER**	14.75
Environmental	99 A	**% DER < TER**			93.08
CO_2 Emissions (t/year)	0.03	**DFEE**	16.05	**TFEE**	26.65
Compliance Check	See BREL	**% DFEE < TFEE**			39.75
% DPER < TPER	73.41	**DPER**	21.18	**TPER**	79.68

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		8637.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							199.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							0.9954	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523 (64)
12Total per year (kWh/year)												2188 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837 (83)
Total gains	419.7672	467.2558	506.0368	555.7052	584.1265	578.6970	555.6038	523.3987	486.8526	437.0989	410.7463	405.5434 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761

alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area	0.9267	0.8767	0.7894	0.6359	0.4742	0.3307	0.2370	0.2630	0.4230	0.6861	0.8692	0.9377 (86)
MIT	20.6377	20.7640	20.8873	20.9715	20.9957	20.9996	21.0000	20.9999	20.9983	20.9630	20.8072	20.5993 (87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496 (88)
util rest of house	0.9146	0.8592	0.7647	0.6052	0.4417	0.2972	0.2019	0.2258	0.3836	0.6495	0.8481	0.9270 (89)
MIT 2	19.9451	20.0941	20.2343	20.3232	20.3461	20.3493	20.3495	20.3495	20.3484	20.3165	20.1475	19.8990 (90)
Living area fraction										fLA = Living area / (4) =		0.4776 (91)
MIT	20.2759	20.4141	20.5462	20.6328	20.6563	20.6599	20.6602	20.6602	20.6588	20.6253	20.4626	20.2335 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2759	20.4141	20.5462	20.6328	20.6563	20.6599	20.6602	20.6602	20.6588	20.6253	20.4626	20.2335 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9132	0.8610	0.7724	0.6187	0.4570	0.3132	0.2187	0.2435	0.4024	0.6652	0.8520	0.9249	(94)
Useful gains	383.3117	402.3273	390.8480	343.8261	266.9713	181.2577	121.4910	127.4688	195.8981	290.7775	349.9482	375.0866	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	478.0616	464.2416	420.3162	351.0924	268.0088	181.3367	121.4972	127.4812	196.2661	299.9958	399.8618	479.7839	(97)
Space heating kWh	70.4939	41.6064	21.9243	5.2317	0.7719	0.0000	0.0000	0.0000	0.0000	6.8584	35.9378	77.8947	(98a)
Space heating requirement - total per year (kWh/year)												260.7193	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	70.4939	41.6064	21.9243	5.2317	0.7719	0.0000	0.0000	0.0000	0.0000	6.8584	35.9378	77.8947	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												260.7193	
Space heating per m2											(98c) / (4) =	6.0129	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	70.4939	41.6064	21.9243	5.2317	0.7719	0.0000	0.0000	0.0000	0.0000	6.8584	35.9378	77.8947	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	105.7409	62.4096	32.8865	7.8476	1.1579	0.0000	0.0000	0.0000	0.0000	10.2876	53.9068	116.8421	
Space heating requirement	105.7409	62.4096	32.8865	7.8476	1.1579	0.0000	0.0000	0.0000	0.0000	10.2876	53.9068	116.8421	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												391.0789	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												3.9108	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2856.9417	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	979.3486	0.1588	16.5633	(367)
Electrical energy for heat distribution (space & water)	3.9108	0.0000	5.2390	(372)
Overall CO2 factor for heat network			0.0395	(386)
Total CO2 associated with community systems			144.9457	(373)
Space and water heating			144.9457	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			44.4179	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.0200	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	979.3486	1.5879	165.5957	(467)
Electrical energy for heat distribution (space & water)	3.9108	0.0000	56.0996	(472)
Overall CO2 factor for heat network			0.4226	(486)
Total CO2 associated with community systems			1552.0883	(473)
Space and water heating			1552.0883	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			918.4935	(483)
Dwelling Primary energy Rate (DPER)			21.1800	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)

Wall to Unheated Common area	16.5900	16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)		33.1800			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		13.7636	(33)
Main dwelling					
Party Wall		31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 199.1940 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	52.2400	0.0700	3.6568
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3858 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 20.1494 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	40.9650	40.8373	40.7122	40.1245	40.0146	39.5027	39.5027	39.4079	39.6999	40.0146	40.2370	40.4696	(39)

Average = Sum(39)m / 12 = 40.1240

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9448	0.9418	0.9389	0.9254	0.9228	0.9110	0.9110	0.9089	0.9156	0.9228	0.9280	0.9333	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)

Energy content (annual) Total = Sum(45)m = 1536.8125

Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)

Total per year (kWh/year) = Sum(64)m = 1875.8483 (64)

12Total per year (kWh/year) 1876 (64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
West					6.5100	19.6403		0.6300	0.7000	0.7700		39.0751	(80)
Solar gains	39.0751	76.4392	125.8845	183.5950	225.0025	230.3301	219.2837	188.3614	146.4088	90.7015	48.7221	32.1335	(83)
Total gains	408.2958	452.6009	487.6757	532.6961	557.8990	548.9788	526.8301	497.0792	463.7948	421.5301	398.4414	394.6229	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.5666	58.7497	58.9302	59.7934	59.9577	60.7346	60.7346	60.8807	60.4330	59.9577	59.6262	59.2836	
alpha	4.9044	4.9166	4.9287	4.9862	4.9972	5.0490	5.0490	5.0587	5.0289	4.9972	4.9751	4.9522	
util living area	0.9663	0.9442	0.8999	0.7921	0.6348	0.4555	0.3291	0.3633	0.5728	0.8279	0.9387	0.9705	(86)
MIT	20.1073	20.2900	20.5325	20.8032	20.9443	20.9915	20.9987	20.9978	20.9743	20.7919	20.4266	20.0823	(87)
Th 2	20.1296	20.1321	20.1345	20.1460	20.1481	20.1581	20.1581	20.1600	20.1543	20.1481	20.1438	20.1393	(88)
util rest of house	0.9590	0.9327	0.8803	0.7572	0.5854	0.3976	0.2665	0.2976	0.5089	0.7898	0.9243	0.9640	(89)
MIT 2	19.1134	19.3408	19.6362	19.9557	20.1025	20.1530	20.1576	20.1591	20.1370	19.9528	19.5220	19.0897	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.5881	19.7942	20.0643	20.3605	20.5046	20.5535	20.5593	20.5597	20.5369	20.3535	19.9541	19.5638	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5881	19.7942	20.0643	20.3605	20.5046	20.5535	20.5593	20.5597	20.5369	20.3535	19.9541	19.5638	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9536	0.9276	0.8785	0.7664	0.6065	0.4250	0.2964	0.3290	0.5383	0.7996	0.9206	0.9588	(94)
Useful gains	389.3451	419.8155	428.4360	408.2411	338.3719	233.3060	156.1646	163.5224	249.6558	337.0589	366.7973	378.3642	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	626.2782	608.2396	552.2334	459.8455	352.3128	235.1778	156.4037	163.9244	255.5453	390.2837	517.2101	621.7659	(97)
Space heating kWh	176.2783	126.6210	92.1053	37.1552	10.3720	0.0000	0.0000	0.0000	0.0000	39.5992	108.2973	181.0909	(98a)
Space heating requirement - total per year (kWh/year)												771.5190	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	176.2783	126.6210	92.1053	37.1552	10.3720	0.0000	0.0000	0.0000	0.0000	39.5992	108.2973	181.0909	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												771.5190	
Space heating per m2											(98c) / (4) =	17.7933	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	176.2783	126.6210	92.1053	37.1552	10.3720	0.0000	0.0000	0.0000	0.0000	39.5992	108.2973	181.0909	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	190.9841	137.1842	99.7890	40.2548	11.2372	0.0000	0.0000	0.0000	0.0000	42.9027	117.3318	196.1981	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	83.9704	83.5078	82.7116	81.4070	80.3270	79.8000	79.8000	79.8000	79.8000	81.4735	83.1506	84.0529	(217)
Fuel for water heating, kWh/month	218.4700	194.4820	209.2614	188.6979	186.5510	170.5061	169.2907	175.3325	176.4869	191.2155	197.3476	216.1109	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												835.8819	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2293.7526	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2974.7086	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	835.8819	0.2100	175.5352	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2293.7526	0.2100	481.6881	(264)
Space and water heating			657.2233	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			639.5207	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.7500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	835.8819	1.1300	944.5466	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2293.7526	1.1300	2591.9405	(278)
Space and water heating			3536.4870	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3454.9846	(286)
Target Primary Energy Rate (TPER)			79.6800	(287)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.02	**TER**	14.75
Environmental	99 A	**% DER < TER**			93.08
CO_2 Emissions (t/year)	0.03	**DFEE**	16.05	**TFEE**	26.65
Compliance Check	See BREL	**% DFEE < TFEE**			39.75
% DPER < TPER	73.41	**DPER**	21.18	**TPER**	79.68

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area		Storey height		Volume	
Main dwelling		(m2)		(m)		(m3)	
Ground floor		43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2622	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		8637.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							199.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							0.9954	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		12.3956	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	31.8822	31.8062	31.7316	31.3815	31.3160	31.0111	31.0111	30.9546	31.1285	31.3160	31.4485	31.5871	(39)
Average = Sum(39)m / 12 =												31.3812	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7353	0.7335	0.7318	0.7237	0.7222	0.7152	0.7152	0.7139	0.7179	0.7222	0.7253	0.7285	(40)
HLP (average)												0.7237	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		449.4572	(64a)
Heat gains from water heating, kWh/month	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.4004	291.4783	279.0119	271.5070	258.2448	250.2442	241.2477	240.9702	247.9561	254.7841	268.8582	277.3654	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	325.5767	373.9841	414.8872	469.6730	501.1047	498.8545	477.9348	444.2810	405.9847	352.6842	321.4470	312.0492	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.2514	75.4313	75.6085	76.4520	76.6119	77.3652	77.3652	77.5064	77.0733	76.6119	76.2891	75.9545	
alpha	6.0168	6.0288	6.0406	6.0968	6.1075	6.1577	6.1577	6.1671	6.1382	6.1075	6.0859	6.0636	
util living area	0.9792	0.9544	0.8983	0.7541	0.5722	0.3970	0.2854	0.3203	0.5240	0.8229	0.9540	0.9831	(86)
MIT	20.3085	20.4977	20.7168	20.9171	20.9853	20.9987	20.9999	20.9997	20.9933	20.8848	20.5767	20.2742	(87)
Th 2	20.3098	20.3113	20.3128	20.3199	20.3212	20.3274	20.3274	20.3286	20.3250	20.3212	20.3185	20.3157	(88)
util rest of house	0.9747	0.9455	0.8804	0.7223	0.5330	0.3556	0.2418	0.2737	0.4746	0.7890	0.9434	0.9794	(89)

MIT 2	19.6848	19.8690	20.0762	20.2578	20.3119	20.3268	20.3274	20.3285	20.3215	20.2363	19.9537	19.6563	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.9827	20.1693	20.3822	20.5727	20.6335	20.6477	20.6486	20.6491	20.6424	20.5461	20.2513	19.9514	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9827	20.1693	20.3822	20.5727	20.6335	20.6477	20.6486	20.6491	20.6424	20.5461	20.2513	19.9514	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9722	0.9434	0.8823	0.7344	0.5512	0.3754	0.2626	0.2959	0.4980	0.8008	0.9423	0.9771	(94)
Useful gains	316.5357	352.8131	366.0688	344.9320	276.1907	187.2621	125.5261	131.4778	202.1742	282.4211	302.8894	304.9109	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	499.9996	485.6573	440.5044	366.3071	279.7621	187.5456	125.5508	131.5287	203.6550	311.4719	413.5891	497.5408	(97)
Space heating kWh	136.4971	89.2713	55.3801	15.3900	2.6571	0.0000	0.0000	0.0000	0.0000	21.6138	79.7037	143.3166	(98a)
Space heating requirement - total per year (kWh/year)												543.8298	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	136.4971	89.2713	55.3801	15.3900	2.6571	0.0000	0.0000	0.0000	0.0000	21.6138	79.7037	143.3166	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												543.8298	
Space heating per m2											(98c) / (4) =	12.5422	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	291.5043	229.4821	235.2551	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9908	0.9968	0.9945	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	288.8295	228.7378	233.9688	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	554.0542	531.1768	493.2464	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	190.9618	225.0146	192.9026	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	47.7404	56.2537	48.2256	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												152.2197	(107)
Energy for space heating												12.5422	(99)
Energy for space cooling												3.5106	(108)
Total												16.0528	(109)
Fabric Energy Efficiency (DFEE)												16.1	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	13.7636			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	199.1940	(35)
List of Thermal Bridges		

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	52.2400	0.0700	3.6568
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	6.3858	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	20.1494	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	40.9650	40.8373	40.7122	40.1245	40.0146	39.5027	39.5027	39.4079	39.6999	40.0146	40.2370	40.4696	(39)
Average = Sum(39)m / 12 =												40.1240	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9448	0.9418	0.9389	0.9254	0.9228	0.9110	0.9110	0.9089	0.9156	0.9228	0.9280	0.9333	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4982	(42)

Hot water usage for mixer showers

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												47.0349	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	

Distribution loss (46)m = 0.15 x (45)m

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)

Electric shower(s)

	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												449.4572	(64a)

Heat gains from water heating, kWh/month

	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													

	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931 (72)
Total internal gains	281.3655	289.2254	276.9770	269.4043	256.2100	248.1415	239.2128	238.9354	245.8534	252.7493	266.7555	275.3306 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6300	0.7000	0.7700	39.0751	(80)

Solar gains	39.0751	76.4392	125.8845	183.5950	225.0025	230.3301	219.2837	188.3614	146.4088	90.7015	48.7221	32.1335	(83)
Total gains	320.4406	365.6646	402.8615	452.9993	481.2125	478.4717	458.4965	427.2968	392.2623	343.4508	315.4775	307.4640	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.5666	58.7497	58.9302	59.7934	59.9577	60.7346	60.7346	60.8807	60.4330	59.9577	59.6262	59.2836	
alpha	4.9044	4.9166	4.9287	4.9862	4.9972	5.0490	5.0490	5.0587	5.0289	4.9972	4.9751	4.9522	
util living area	0.9870	0.9744	0.9461	0.8604	0.7116	0.5182	0.3773	0.4210	0.6592	0.9021	0.9739	0.9891	(86)
MIT	19.8660	20.0709	20.3543	20.7036	20.9080	20.9849	20.9975	20.9957	20.9524	20.6706	20.2200	19.8386	(87)
Th 2	20.1296	20.1321	20.1345	20.1460	20.1481	20.1581	20.1581	20.1600	20.1543	20.1481	20.1438	20.1393	(88)
util rest of house	0.9838	0.9684	0.9336	0.8313	0.6618	0.4540	0.3060	0.3457	0.5914	0.8743	0.9667	0.9865	(89)
MIT 2	19.1024	19.3056	19.5820	19.9148	20.0875	20.1508	20.1574	20.1586	20.1283	19.8948	19.4634	19.0830	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.4671	19.6711	19.9509	20.2916	20.4794	20.5492	20.5586	20.5584	20.5219	20.2653	19.8248	19.4439	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4671	19.6711	19.9509	20.2916	20.4794	20.5492	20.5586	20.5584	20.5219	20.2653	19.8248	19.4439	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9808	0.9646	0.9305	0.8367	0.6818	0.4842	0.3401	0.3817	0.6218	0.8786	0.9635	0.9838	(94)
Useful gains	314.2852	352.7043	374.8723	379.0078	328.1045	231.6630	155.9246	163.0799	243.9040	301.7465	303.9544	302.4822	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	621.3211	603.2137	547.6150	457.0809	351.3023	235.0097	156.3764	163.8747	254.9492	386.7541	512.0068	616.9138	(97)
Space heating kWh	228.4347	168.3423	128.5206	56.2126	17.2592	0.0000	0.0000	0.0000	0.0000	63.2456	149.7977	233.9371	(98a)
Space heating requirement - total per year (kWh/year)												1045.7499	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	228.4347	168.3423	128.5206	56.2126	17.2592	0.0000	0.0000	0.0000	0.0000	63.2456	149.7977	233.9371	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1045.7499	
Space heating per m2										(98c) / (4) =		24.1178	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	371.3254	292.3200	299.5001	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9447	0.9735	0.9620	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	350.8010	284.5787	288.1146	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	532.5097	510.6427	475.5231	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	130.8303	168.1917	139.4320	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	32.7076	42.0479	34.8580	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												109.6135	(107)
Energy for space heating												24.1178	(99)
Energy for space cooling												2.5280	(108)
Total												26.6458	(109)
Fabric Energy Efficiency (TFEE)												26.6	(109)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.02	**TER**	14.75
Environmental	99 A	**% DER < TER**			93.08
CO_2 Emissions (t/year)	0.03	**DFEE**	16.05	**TFEE**	26.65
Compliance Check	See BREL	**% DFEE < TFEE**			39.75
% DPER < TPER	73.41	**DPER**	21.18	**TPER**	79.68

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		8637.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							199.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							0.9954	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523 (64)
12Total per year (kWh/year)												2188 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837 (83)
Total gains	419.7672	467.2558	506.0368	555.7052	584.1265	578.6970	555.6038	523.3987	486.8526	437.0989	410.7463	405.5434 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761

alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area	0.9267	0.8767	0.7894	0.6359	0.4742	0.3307	0.2370	0.2630	0.4230	0.6861	0.8692	0.9377 (86)
MIT	20.6377	20.7640	20.8873	20.9715	20.9957	20.9996	21.0000	20.9999	20.9983	20.9630	20.8072	20.5993 (87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496 (88)
util rest of house	0.9146	0.8592	0.7647	0.6052	0.4417	0.2972	0.2019	0.2258	0.3836	0.6495	0.8481	0.9270 (89)
MIT 2	19.9451	20.0941	20.2343	20.3232	20.3461	20.3493	20.3495	20.3495	20.3484	20.3165	20.1475	19.8990 (90)
Living area fraction										fLA = Living area / (4) =		0.4776 (91)
MIT	20.2759	20.4141	20.5462	20.6328	20.6563	20.6599	20.6602	20.6602	20.6588	20.6253	20.4626	20.2335 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2759	20.4141	20.5462	20.6328	20.6563	20.6599	20.6602	20.6602	20.6588	20.6253	20.4626	20.2335 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9132	0.8610	0.7724	0.6187	0.4570	0.3132	0.2187	0.2435	0.4024	0.6652	0.8520	0.9249	(94)
Useful gains	383.3117	402.3273	390.8480	343.8261	266.9713	181.2577	121.4910	127.4688	195.8981	290.7775	349.9482	375.0866	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	478.0616	464.2416	420.3162	351.0924	268.0088	181.3367	121.4972	127.4812	196.2661	299.9958	399.8618	479.7839	(97)
Space heating kWh	70.4939	41.6064	21.9243	5.2317	0.7719	0.0000	0.0000	0.0000	0.0000	6.8584	35.9378	77.8947	(98a)
Space heating requirement - total per year (kWh/year)												260.7193	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	70.4939	41.6064	21.9243	5.2317	0.7719	0.0000	0.0000	0.0000	0.0000	6.8584	35.9378	77.8947	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												260.7193	
Space heating per m2											(98c) / (4) =	6.0129	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	70.4939	41.6064	21.9243	5.2317	0.7719	0.0000	0.0000	0.0000	0.0000	6.8584	35.9378	77.8947	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	105.7409	62.4096	32.8865	7.8476	1.1579	0.0000	0.0000	0.0000	0.0000	10.2876	53.9068	116.8421	
Space heating requirement	105.7409	62.4096	32.8865	7.8476	1.1579	0.0000	0.0000	0.0000	0.0000	10.2876	53.9068	116.8421	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												391.0789	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												3.9108	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2856.9417	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	979.3486	0.1588	16.5633	(367)
Electrical energy for heat distribution (space & water)	3.9108	0.0000	5.2390	(372)
Overall CO2 factor for heat network			0.0395	(386)
Total CO2 associated with community systems			144.9457	(373)
Space and water heating			144.9457	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			44.4179	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.0200	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	979.3486	1.5879	165.5957	(467)
Electrical energy for heat distribution (space & water)	3.9108	0.0000	56.0996	(472)
Overall CO2 factor for heat network			0.4226	(486)
Total CO2 associated with community systems			1552.0883	(473)
Space and water heating			1552.0883	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			918.4935	(483)
Dwelling Primary energy Rate (DPER)			21.1800	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)

Wall to Unheated Common area	16.5900	16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)		33.1800			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		13.7636	(33)
Main dwelling					
Party Wall		31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 199.1940 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	52.2400	0.0700	3.6568
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3858 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 20.1494 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	40.9650	40.8373	40.7122	40.1245	40.0146	39.5027	39.5027	39.4079	39.6999	40.0146	40.2370	40.4696	(39)

Average = Sum(39)m / 12 = 40.1240

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9448	0.9418	0.9389	0.9254	0.9228	0.9110	0.9110	0.9089	0.9156	0.9228	0.9280	0.9333	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)

Energy content (annual) Total = Sum(45)m = 1536.8125

Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)

Total per year (kWh/year) = Sum(64)m = 1875.8483 (64)

12Total per year (kWh/year) 1876 (64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
West					6.5100	19.6403		0.6300	0.7000	0.7700		39.0751	(80)
Solar gains	39.0751	76.4392	125.8845	183.5950	225.0025	230.3301	219.2837	188.3614	146.4088	90.7015	48.7221	32.1335	(83)
Total gains	408.2958	452.6009	487.6757	532.6961	557.8990	548.9788	526.8301	497.0792	463.7948	421.5301	398.4414	394.6229	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.5666	58.7497	58.9302	59.7934	59.9577	60.7346	60.7346	60.8807	60.4330	59.9577	59.6262	59.2836	
alpha	4.9044	4.9166	4.9287	4.9862	4.9972	5.0490	5.0490	5.0587	5.0289	4.9972	4.9751	4.9522	
util living area	0.9663	0.9442	0.8999	0.7921	0.6348	0.4555	0.3291	0.3633	0.5728	0.8279	0.9387	0.9705	(86)
MIT	20.1073	20.2900	20.5325	20.8032	20.9443	20.9915	20.9987	20.9978	20.9743	20.7919	20.4266	20.0823	(87)
Th 2	20.1296	20.1321	20.1345	20.1460	20.1481	20.1581	20.1581	20.1600	20.1543	20.1481	20.1438	20.1393	(88)
util rest of house	0.9590	0.9327	0.8803	0.7572	0.5854	0.3976	0.2665	0.2976	0.5089	0.7898	0.9243	0.9640	(89)
MIT 2	19.1134	19.3408	19.6362	19.9557	20.1025	20.1530	20.1576	20.1591	20.1370	19.9528	19.5220	19.0897	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.5881	19.7942	20.0643	20.3605	20.5046	20.5535	20.5593	20.5597	20.5369	20.3535	19.9541	19.5638	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5881	19.7942	20.0643	20.3605	20.5046	20.5535	20.5593	20.5597	20.5369	20.3535	19.9541	19.5638	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9536	0.9276	0.8785	0.7664	0.6065	0.4250	0.2964	0.3290	0.5383	0.7996	0.9206	0.9588	(94)
Useful gains	389.3451	419.8155	428.4360	408.2411	338.3719	233.3060	156.1646	163.5224	249.6558	337.0589	366.7973	378.3642	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	626.2782	608.2396	552.2334	459.8455	352.3128	235.1778	156.4037	163.9244	255.5453	390.2837	517.2101	621.7659	(97)
Space heating kWh	176.2783	126.6210	92.1053	37.1552	10.3720	0.0000	0.0000	0.0000	0.0000	39.5992	108.2973	181.0909	(98a)
Space heating requirement - total per year (kWh/year)												771.5190	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	176.2783	126.6210	92.1053	37.1552	10.3720	0.0000	0.0000	0.0000	0.0000	39.5992	108.2973	181.0909	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												771.5190	
Space heating per m2											(98c) / (4) =	17.7933	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	176.2783	126.6210	92.1053	37.1552	10.3720	0.0000	0.0000	0.0000	0.0000	39.5992	108.2973	181.0909	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	190.9841	137.1842	99.7890	40.2548	11.2372	0.0000	0.0000	0.0000	0.0000	42.9027	117.3318	196.1981	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	83.9704	83.5078	82.7116	81.4070	80.3270	79.8000	79.8000	79.8000	79.8000	81.4735	83.1506	84.0529	(217)
Fuel for water heating, kWh/month	218.4700	194.4820	209.2614	188.6979	186.5510	170.5061	169.2907	175.3325	176.4869	191.2155	197.3476	216.1109	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												835.8819	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2293.7526	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2974.7086	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	835.8819	0.2100	175.5352	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2293.7526	0.2100	481.6881	(264)
Space and water heating			657.2233	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			639.5207	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.7500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	835.8819	1.1300	944.5466	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2293.7526	1.1300	2591.9405	(278)
Space and water heating			3536.4870	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3454.9846	(286)
Target Primary Energy Rate (TPER)			79.6800	(287)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.02	**TER**	14.75
Environmental	99 A	**% DER < TER**			93.08
CO_2 Emissions (t/year)	0.03	**DFEE**	16.05	**TFEE**	26.65
Compliance Check	See BREL	**% DFEE < TFEE**			39.75
% DPER < TPER	73.41	**DPER**	21.18	**TPER**	79.68

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		8637.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							199.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							0.9954	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	460.9371	499.3751	541.0594	581.5362	605.2805	592.0631	569.0364	538.2350	504.0534	463.4913	441.8157	444.4008	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451

util living area													
	0.8961	0.8479	0.7531	0.6106	0.4580	0.3233	0.2314	0.2557	0.4088	0.6528	0.8364	0.9109	(86)
MIT	20.7164	20.8090	20.9136	20.9772	20.9964	20.9997	21.0000	20.9999	20.9986	20.9718	20.8482	20.6797	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house													
	0.8809	0.8284	0.7275	0.5805	0.4265	0.2905	0.1972	0.2196	0.3706	0.6167	0.8129	0.8972	(89)
MIT 2	20.0380	20.1453	20.2622	20.3285	20.3467	20.3494	20.3496	20.3495	20.3486	20.3247	20.1929	19.9947	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.3620	20.4623	20.5734	20.6383	20.6570	20.6600	20.6602	20.6602	20.6591	20.6337	20.5059	20.3219	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3620	20.4623	20.5734	20.6383	20.6570	20.6600	20.6602	20.6602	20.6591	20.6337	20.5059	20.3219	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8812	0.8319	0.7365	0.5940	0.4414	0.3062	0.2135	0.2368	0.3888	0.6327	0.8188	0.8966	(94)
Useful gains	406.1975	415.4286	398.5023	345.4377	267.1774	181.2688	121.4920	127.4710	195.9715	293.2321	361.7645	398.4587	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	480.6386	465.6856	421.1295	351.2571	268.0296	181.3378	121.4973	127.4814	196.2735	300.2486	401.1566	482.4290	(97)
Space heating kWh													
	55.3841	33.7727	16.8346	4.1900	0.6341	0.0000	0.0000	0.0000	0.0000	5.2203	28.3624	62.4739	(98a)
Space heating requirement - total per year (kWh/year)												206.8720	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	55.3841	33.7727	16.8346	4.1900	0.6341	0.0000	0.0000	0.0000	0.0000	5.2203	28.3624	62.4739	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												206.8720	
Space heating per m2											(98c) / (4) =	4.7710	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	55.3841	33.7727	16.8346	4.1900	0.6341	0.0000	0.0000	0.0000	0.0000	5.2203	28.3624	62.4739	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	83.0762	50.6591	25.2519	6.2849	0.9511	0.0000	0.0000	0.0000	0.0000	7.8304	42.5435	93.7109	
Space heating requirement													
	83.0762	50.6591	25.2519	6.2849	0.9511	0.0000	0.0000	0.0000	0.0000	7.8304	42.5435	93.7109	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												310.3080	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												3.1031	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2776.1708	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	310.3080	4.4400	13.7777	(340a)
Space heating total			13.7777	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			177.1111	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7216	(357)
SAP value		88.3030	
SAP rating (Section 12)		88	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	957.8097	0.1589	13.1463	(367)
Electrical energy for heat distribution (space & water)	3.1031	0.0000	5.1109	(372)
Overall CO2 factor for heat network			0.0394	(386)
Total CO2 associated with community systems			141.4005	(373)
Space and water heating			141.4005	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			40.8728	(383)
CO2 emissions per m2			0.9400	(384)
EI value			99.3802	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	43.3600 (1b)	x 2.4500 (2b)	= 106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)

Adj infilt rate

	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104 (22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)

Heat transfer coeff

	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)

Average = Sum(39)m / 12 = 29.9239

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m													
	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Total per year (kWh/year) = Sum(64)m = 2187.6523 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	23.7835	0.6800	0.7000	0.7700	51.0736	(80)

Solar gains	51.0736	88.7763	143.8339	211.6843	249.5125	273.8424	255.8751	224.3556	176.4207	111.0901	62.7325	42.2420	(83)
Total gains	469.8344	505.6456	549.0181	595.0545	611.9331	617.2952	588.2244	559.2798	522.4455	476.6813	451.9594	451.9591	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area													
	0.8819	0.8332	0.7254	0.5798	0.4292	0.2811	0.1984	0.2194	0.3775	0.6096	0.8109	0.8989	(86)
MIT	20.7500	20.8315	20.9323	20.9834	20.9977	20.9999	21.0000	21.0000	20.9992	20.9815	20.8774	20.7138	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house													
	0.8652	0.8125	0.6984	0.5496	0.3978	0.2496	0.1653	0.1846	0.3405	0.5728	0.7852	0.8838	(89)
MIT 2	20.0775	20.1710	20.2823	20.3345	20.3478	20.3495	20.3496	20.3496	20.3490	20.3338	20.2252	20.0353	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.3987	20.4865	20.5928	20.6444	20.6582	20.6601	20.6602	20.6602	20.6596	20.6432	20.5367	20.3593	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3987	20.4865	20.5928	20.6444	20.6582	20.6601	20.6602	20.6602	20.6596	20.6432	20.5367	20.3593	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8665	0.8170	0.7087	0.5634	0.4127	0.2646	0.1811	0.2012	0.3582	0.5896	0.7929	0.8840	(94)
Useful gains	407.1210	413.1029	389.0811	335.2603	252.5528	163.3622	106.5340	112.5169	187.1309	281.0281	358.3499	399.5327	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	472.7596	457.4313	406.7486	339.4698	253.1016	163.3884	106.5357	112.5203	187.3102	285.5683	390.1095	474.5735	(97)
Space heating kWh													
	48.8351	29.7887	13.1446	3.0308	0.4083	0.0000	0.0000	0.0000	0.0000	3.3779	22.8669	55.8303	(98a)
Space heating requirement - total per year (kWh/year)												177.2826	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	48.8351	29.7887	13.1446	3.0308	0.4083	0.0000	0.0000	0.0000	0.0000	3.3779	22.8669	55.8303	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												177.2826	
Space heating per m2											(98c) / (4) =	4.0886	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	48.8351	29.7887	13.1446	3.0308	0.4083	0.0000	0.0000	0.0000	0.0000	3.3779	22.8669	55.8303	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	73.2526	44.6830	19.7169	4.5462	0.6124	0.0000	0.0000	0.0000	0.0000	5.0669	34.3004	83.7455	
Space heating requirement													
	73.2526	44.6830	19.7169	4.5462	0.6124	0.0000	0.0000	0.0000	0.0000	5.0669	34.3004	83.7455	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year	
Space heating fuel - community heating	265.9239 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	3281.4784 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	2.6592 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)	
mechanical ventilation fans (SFP = 0.0920)	11.9235 (330a)
Total electricity for the above, kWh/year	11.9235 (331)
Electricity for lighting (calculated in Appendix L)	130.6818 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	2635.2607 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	265.9239	6.5500	17.4180	(340a)
Space heating total			17.4180	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			217.8191	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	945.9740	0.1593	11.2950	(367)
Electrical energy for heat distribution (space & water)	2.6592	0.0000	5.0414	(372)
Overall CO2 factor for heat network			0.0393	(386)
Total CO2 associated with community systems			139.4798	(373)
Space and water heating			139.4798	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			26.7199	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	945.9740	1.5896	112.7204	(467)
Electrical energy for heat distribution (space & water)	2.6592	0.0000	54.1168	(472)
Overall CO2 factor for heat network			0.4221	(486)
Total CO2 associated with community systems			1497.2302	(473)
Space and water heating			1497.2302	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			792.9052	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - East

Current energy efficiency rating:	B 88
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£41	£41	£0
Community scheme	£336	£336	£0
Space heating	£125	£125	£0
Water heating	£215	£215	£0
Lighting	£37	£37	£0
Generated (PV)	-£159	-£159	£0
Total cost of fuels	£218	£218	£0
Total cost of uses	£218	£218	£0
Delivered energy	61 kWh/m²	61 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.0 tonnes	0.0 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	18 kWh/m²	18 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)

Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	11.4002	(33)
Main dwelling					
Party Wall	31.3600	0.0000	0.0000	70.0000	2195.2000 (32)
Party Floor	43.3600			70.0000	3035.2000 (32d)
Party Ceiling 1	43.3600			30.0000	1300.8000 (32b)
Internal TF Wall	68.4500			9.0000	616.0500 (32c)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =		8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K					199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)					0.9954 (36)
Point Thermal bridges				(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =		12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(80)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	460.9371	499.3751	541.0594	581.5362	605.2805	592.0631	569.0364	538.2350	504.0534	463.4913	441.8157	444.4008	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area	0.8961	0.8479	0.7531	0.6106	0.4580	0.3233	0.2314	0.2557	0.4088	0.6528	0.8364	0.9109	(86)
MIT	20.7164	20.8090	20.9136	20.9772	20.9964	20.9997	21.0000	20.9999	20.9986	20.9718	20.8482	20.6797	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house	0.8809	0.8284	0.7275	0.5805	0.4265	0.2905	0.1972	0.2196	0.3706	0.6167	0.8129	0.8972	(89)
MIT 2	20.0380	20.1453	20.2622	20.3285	20.3467	20.3494	20.3496	20.3495	20.3486	20.3247	20.1929	19.9947	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.3620	20.4623	20.5734	20.6383	20.6570	20.6600	20.6602	20.6602	20.6591	20.6337	20.5059	20.3219	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3620	20.4623	20.5734	20.6383	20.6570	20.6600	20.6602	20.6602	20.6591	20.6337	20.5059	20.3219	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8812	0.8319	0.7365	0.5940	0.4414	0.3062	0.2135	0.2368	0.3888	0.6327	0.8188	0.8966	(94)
Useful gains	406.1975	415.4286	398.5023	345.4377	267.1774	181.2688	121.4920	127.4710	195.9715	293.2321	361.7645	398.4587	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	480.6386	465.6856	421.1295	351.2571	268.0296	181.3378	121.4973	127.4814	196.2735	300.2486	401.1566	482.4290	(97)
Space heating kWh	55.3841	33.7727	16.8346	4.1900	0.6341	0.0000	0.0000	0.0000	0.0000	5.2203	28.3624	62.4739	(98a)
Space heating requirement - total per year (kWh/year)												206.8720	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	55.3841	33.7727	16.8346	4.1900	0.6341	0.0000	0.0000	0.0000	0.0000	5.2203	28.3624	62.4739	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												206.8720	
Space heating per m2											(98c) / (4) =	4.7710	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

Space heating:

Space heating requirement												
	55.3841	33.7727	16.8346	4.1900	0.6341	0.0000	0.0000	0.0000	0.0000	5.2203	28.3624	62.4739 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	83.0762	50.6591	25.2519	6.2849	0.9511	0.0000	0.0000	0.0000	0.0000	7.8304	42.5435	93.7109
Space heating requirement												
	83.0762	50.6591	25.2519	6.2849	0.9511	0.0000	0.0000	0.0000	0.0000	7.8304	42.5435	93.7109 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement												
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016
Water heating fuel												
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127 (331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year
Space heating fuel - community heating 310.3080 (307)
Space heating fuel - secondary 0.0000 (309)
Water heating fuel - community heating 3281.4784 (310)
Efficiency of water heater 0.0000 (311)
Electricity used for heat distribution 3.1031 (313)
Space cooling fuel 0.0000 (321)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)
mechanical ventilation fans (SFP = 0.0920) 11.9235 (330a)
Total electricity for the above, kWh/year 11.9235 (331)
Electricity for lighting (calculated in Appendix L) 130.6818 (332)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation -958.2209 (333)
Wind generation 0.0000 (334)
Hydro-electric generation (Appendix N) 0.0000 (335a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (335)

Appendix Q - special features

Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2776.1708	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	310.3080	4.4400	13.7777	(340a)
Space heating total			13.7777	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			177.1111	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7216	(357)
SAP value		88.3030	
SAP rating (Section 12)		88	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	957.8097	0.1589	13.1463	(367)
Electrical energy for heat distribution (space & water)	3.1031	0.0000	5.1109	(372)
Overall CO2 factor for heat network			0.0394	(386)
Total CO2 associated with community systems			141.4005	(373)
Space and water heating			141.4005	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			40.8728	(383)
CO2 emissions per m2			0.9400	(384)
EI value			99.3802	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

Measured/design AP50												3.0000	(17)
Infiltration rate												0.1500	(18)
Number of sides sheltered												3	(19)
Shelter factor									(20) = 1 - [0.075 x (19)] =			0.7750	(20)
Infiltration rate adjusted to include shelter factor									(21) = (18) x (20) =			0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4982	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)

Water heating gains (Table 5)

	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)

Total internal gains

	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.5100	23.7835	0.6800	0.7000	0.7700	51.0736	(80)

Solar gains	51.0736	88.7763	143.8339	211.6843	249.5125	273.8424	255.8751	224.3556	176.4207	111.0901	62.7325	42.2420	(83)
Total gains	469.8344	505.6456	549.0181	595.0545	611.9331	617.2952	588.2244	559.2798	522.4455	476.6813	451.9594	451.9591	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area	0.8819	0.8332	0.7254	0.5798	0.4292	0.2811	0.1984	0.2194	0.3775	0.6096	0.8109	0.8989	(86)
MIT	20.7500	20.8315	20.9323	20.9834	20.9977	20.9999	21.0000	21.0000	20.9992	20.9815	20.8774	20.7138	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house	0.8652	0.8125	0.6984	0.5496	0.3978	0.2496	0.1653	0.1846	0.3405	0.5728	0.7852	0.8838	(89)
MIT 2	20.0775	20.1710	20.2823	20.3345	20.3478	20.3495	20.3496	20.3496	20.3490	20.3338	20.2252	20.0353	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.3987	20.4865	20.5928	20.6444	20.6582	20.6601	20.6602	20.6602	20.6596	20.6432	20.5367	20.3593	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3987	20.4865	20.5928	20.6444	20.6582	20.6601	20.6602	20.6602	20.6596	20.6432	20.5367	20.3593	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8665	0.8170	0.7087	0.5634	0.4127	0.2646	0.1811	0.2012	0.3582	0.5896	0.7929	0.8840	(94)
Useful gains	407.1210	413.1029	389.0811	335.2603	252.5528	163.3622	106.5340	112.5169	187.1309	281.0281	358.3499	399.5327	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	472.7596	457.4313	406.7486	339.4698	253.1016	163.3884	106.5357	112.5203	187.3102	285.5683	390.1095	474.5735	(97)
Space heating kWh	48.8351	29.7887	13.1446	3.0308	0.4083	0.0000	0.0000	0.0000	0.0000	3.3779	22.8669	55.8303	(98a)
Space heating requirement - total per year (kWh/year)												177.2826	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	48.8351	29.7887	13.1446	3.0308	0.4083	0.0000	0.0000	0.0000	0.0000	3.3779	22.8669	55.8303	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												177.2826	
Space heating per m2										(98c) / (4) =		4.0886	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement

	48.8351	29.7887	13.1446	3.0308	0.4083	0.0000	0.0000	0.0000	0.0000	3.3779	22.8669	55.8303	(98)

Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50

307a	73.2526	44.6830	19.7169	4.5462	0.6124	0.0000	0.0000	0.0000	0.0000	5.0669	34.3004	83.7455	

Space heating requirement

	73.2526	44.6830	19.7169	4.5462	0.6124	0.0000	0.0000	0.0000	0.0000	5.0669	34.3004	83.7455	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)

Space heating fuel for secondary/supplementary system

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement

	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50

310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	

Water heating fuel

	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)

Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	265.9239	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	2.6592	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(330a)
Total electricity for the above, kWh/year	11.9235	(331)
Electricity for lighting (calculated in Appendix L)	130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2635.2607	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	265.9239	6.5500	17.4180	(340a)
Space heating total			17.4180	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			217.8191	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	945.9740	0.1593	11.2950	(367)
Electrical energy for heat distribution (space & water)	2.6592	0.0000	5.0414	(372)
Overall CO2 factor for heat network			0.0393	(386)
Total CO2 associated with community systems			139.4798	(373)
Space and water heating			139.4798	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			26.7199	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	945.9740	1.5896	112.7204	(467)
Electrical energy for heat distribution (space & water)	2.6592	0.0000	54.1168	(472)
Overall CO2 factor for heat network			0.4221	(486)
Total CO2 associated with community systems			1497.2302	(473)
Space and water heating			1497.2302	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			792.9052	(483)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	0.89	**TER**	14.03
Environmental	99 A	**% DER < TER**			93.66
CO_2 Emissions (t/year)	0.02	**DFEE**	12.51	**TFEE**	22.41
Compliance Check	See BREL	**% DFEE < TFEE**			44.16
% DPER < TPER	73.79	**DPER**	19.86	**TPER**	75.79

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
						(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross (m2)	Openings (m2)	NetArea (m2)	U-value (W/m2K)	A x U (W/K)	K-value (kJ/m2K)	A x K (kJ/K)	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
									Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)

12Total per year (kWh/year) 2188 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.5100	46.7521	0.6800	0.7000	0.7700	100.3973	(78)

Solar gains	100.3973	164.4249	209.4481	236.7219	246.6788	237.3948	231.9492	225.2548	218.7933	177.3477	119.0050	86.7525	(83)
Total gains	477.9882	549.1749	579.6096	594.2610	587.9455	567.4815	550.8658	545.3428	547.6173	516.5465	477.1624	457.6122	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761

alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451		
util living area	0.8823	0.8013	0.7146	0.5988	0.4712	0.3373	0.2390	0.2524	0.3766	0.5926	0.7980	0.9009	(86)
MIT	20.7448	20.8636	20.9355	20.9795	20.9958	20.9996	21.0000	20.9999	20.9991	20.9833	20.8850	20.7040	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house	0.8659	0.7796	0.6885	0.5690	0.4389	0.3031	0.2037	0.2167	0.3413	0.5581	0.7726	0.8862	(89)
MIT 2	20.0709	20.2061	20.2851	20.3307	20.3462	20.3493	20.3495	20.3495	20.3490	20.3351	20.2327	20.0233	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.3927	20.5201	20.5957	20.6406	20.6565	20.6599	20.6602	20.6602	20.6595	20.6447	20.5442	20.3484	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3927	20.5201	20.5957	20.6406	20.6565	20.6599	20.6602	20.6602	20.6595	20.6447	20.5442	20.3484	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8670	0.7855	0.6985	0.5824	0.4541	0.3194	0.2205	0.2337	0.3581	0.5739	0.7804	0.8862	(94)
Useful gains	414.4379	431.3573	404.8730	346.0996	267.0120	181.2470	121.4907	127.4719	196.0989	296.4530	372.3886	405.5371	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	481.5576	467.4146	421.7984	351.3246	268.0129	181.3356	121.4971	127.4815	196.2864	300.5777	402.3041	483.2241	(97)
Space heating kWh	49.9370	24.2305	12.5925	3.7620	0.7447	0.0000	0.0000	0.0000	0.0000	3.0688	21.5392	57.7991	(98a)
Space heating requirement - total per year (kWh/year)												173.6738	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	49.9370	24.2305	12.5925	3.7620	0.7447	0.0000	0.0000	0.0000	0.0000	3.0688	21.5392	57.7991	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												173.6738	
Space heating per m2											(98c) / (4) =	4.0054	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	49.9370	24.2305	12.5925	3.7620	0.7447	0.0000	0.0000	0.0000	0.0000	3.0688	21.5392	57.7991	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	74.9055	36.3458	18.8887	5.6430	1.1171	0.0000	0.0000	0.0000	0.0000	4.6032	32.3088	86.6987	
Space heating requirement	74.9055	36.3458	18.8887	5.6430	1.1171	0.0000	0.0000	0.0000	0.0000	4.6032	32.3088	86.6987	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												260.5107	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												2.6051	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2726.3735	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	944.5304	0.1593	11.0682	(367)
Electrical energy for heat distribution (space & water)	2.6051	0.0000	5.0329	(372)
Overall CO2 factor for heat network			0.0393	(386)
Total CO2 associated with community systems			139.2446	(373)
Space and water heating			139.2446	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			38.7168	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			0.8900	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	944.5304	1.5897	110.4359	(467)
Electrical energy for heat distribution (space & water)	2.6051	0.0000	54.0311	(472)
Overall CO2 factor for heat network			0.4220	(486)
Total CO2 associated with community systems			1494.8601	(473)
Space and water heating			1494.8601	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			861.2652	(483)
Dwelling Primary energy Rate (DPER)			19.8600	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)

Wall to Unheated Common area	16.5900	16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)		33.1800			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		13.7636	(33)
Main dwelling					
Party Wall		31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 199.1940 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	52.2400	0.0700	3.6568
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3858 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 20.1494 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	40.9650	40.8373	40.7122	40.1245	40.0146	39.5027	39.5027	39.4079	39.6999	40.0146	40.2370	40.4696	(39)

Average = Sum(39)m / 12 = 40.1240

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9448	0.9418	0.9389	0.9254	0.9228	0.9110	0.9110	0.9089	0.9156	0.9228	0.9280	0.9333	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)

Energy content (annual) Total = Sum(45)m = 1536.8125

Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)

Total per year (kWh/year) = Sum(64)m = 1875.8483 (64)

12Total per year (kWh/year) 1876 (64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
South					6.5100	46.7521		0.6300	0.7000	0.7700		93.0151	(78)
Solar gains	93.0151	152.3348	194.0475	219.3158	228.5407	219.9393	214.8941	208.6919	202.7056	164.3074	110.2547	80.3736	(83)
Total gains	462.2358	528.4965	555.8388	568.4169	561.4371	538.5879	522.4405	517.4097	520.0915	495.1360	459.9740	442.8631	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
tau	58.5666	58.7497	58.9302	59.7934	59.9577	60.7346	60.7346	60.8807	60.4330	59.9577	59.6262	59.2836	
alpha	4.9044	4.9166	4.9287	4.9862	4.9972	5.0490	5.0490	5.0587	5.0289	4.9972	4.9751	4.9522	
util living area	0.9474	0.9076	0.8553	0.7612	0.6315	0.4639	0.3318	0.3492	0.5166	0.7536	0.9026	0.9547	(86)
MIT	20.2410	20.4514	20.6453	20.8365	20.9456	20.9908	20.9986	20.9982	20.9836	20.8667	20.5540	20.2055	(87)
Th 2	20.1296	20.1321	20.1345	20.1460	20.1481	20.1581	20.1581	20.1600	20.1543	20.1481	20.1438	20.1393	(88)
util rest of house	0.9369	0.8909	0.8308	0.7247	0.5822	0.4050	0.2688	0.2860	0.4570	0.7105	0.8824	0.9455	(89)
MIT 2	19.2775	19.5336	19.7649	19.9899	20.1036	20.1525	20.1576	20.1592	20.1436	20.0277	19.6715	19.2417	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.7377	19.9720	20.1854	20.3942	20.5058	20.5529	20.5593	20.5599	20.5448	20.4284	20.0930	19.7020	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7377	19.9720	20.1854	20.3942	20.5058	20.5529	20.5593	20.5599	20.5448	20.4284	20.0930	19.7020	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9314	0.8875	0.8323	0.7358	0.6033	0.4328	0.2989	0.3162	0.4848	0.7253	0.8811	0.9400	(94)
Useful gains	430.5161	469.0583	462.6337	418.2233	338.7318	233.1229	156.1538	163.5998	252.1368	359.0975	405.2927	416.3091	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	632.4056	615.5000	557.1635	461.2006	352.3591	235.1549	156.4023	163.9343	255.8580	393.2807	522.7983	627.3589	(97)
Space heating kWh	150.2058	98.4089	70.3301	30.9437	10.1387	0.0000	0.0000	0.0000	0.0000	25.4323	84.6040	157.0210	(98a)
Space heating requirement - total per year (kWh/year)												627.0845	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	150.2058	98.4089	70.3301	30.9437	10.1387	0.0000	0.0000	0.0000	0.0000	25.4323	84.6040	157.0210	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												627.0845	
Space heating per m2											(98c) / (4) =	14.4623	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	150.2058	98.4089	70.3301	30.9437	10.1387	0.0000	0.0000	0.0000	0.0000	25.4323	84.6040	157.0210	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	162.7365	106.6185	76.1973	33.5251	10.9845	0.0000	0.0000	0.0000	0.0000	27.5540	91.6620	170.1203	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	83.6151	82.9730	82.2073	81.1795	80.3158	79.8000	79.8000	79.8000	79.8000	80.9514	82.6496	83.7348	(217)
Fuel for water heating, kWh/month	219.3985	195.7357	210.5449	189.2266	186.5770	170.5061	169.2907	175.3325	176.4869	192.4488	198.5437	216.9320	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												679.3981	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2301.0235	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2825.4957	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	679.3981	0.2100	142.6736	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2301.0235	0.2100	483.2149	(264)
Space and water heating			625.8886	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			608.1860	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.0300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	679.3981	1.1300	767.7199	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2301.0235	1.1300	2600.1566	(278)
Space and water heating			3367.8765	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3286.3741	(286)
Target Primary Energy Rate (TPER)			75.7900	(287)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	0.89	**TER**	14.03
Environmental	99 A	**% DER < TER**			93.66
CO_2 Emissions (t/year)	0.02	**DFEE**	12.51	**TFEE**	22.41
Compliance Check	See BREL	**% DFEE < TFEE**			44.16
% DPER < TPER	73.79	**DPER**	19.86	**TPER**	75.79

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area		Storey height		Volume	
Main dwelling		(m2)		(m)		(m3)	
Ground floor		43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2622	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		8637.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							199.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							0.9954	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		12.3956	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	31.8822	31.8062	31.7316	31.3815	31.3160	31.0111	31.0111	30.9546	31.1285	31.3160	31.4485	31.5871	(39)
Average = Sum(39)m / 12 =												31.3812	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7353	0.7335	0.7318	0.7237	0.7222	0.7152	0.7152	0.7139	0.7179	0.7222	0.7253	0.7285	(40)
HLP (average)												0.7237	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)											Total = Sum(45)m =	781.1490	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			449.4572	(64a)
Heat gains from water heating, kWh/month	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.4004	291.4783	279.0119	271.5070	258.2448	250.2442	241.2477	240.9702	247.9561	254.7841	268.8582	277.3654	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.5100	46.7521	0.6800	0.7000	0.7700	100.3973	(78)

Solar gains	100.3973	164.4249	209.4481	236.7219	246.6788	237.3948	231.9492	225.2548	218.7933	177.3477	119.0050	86.7525	(83)
Total gains	383.7977	455.9032	488.4600	508.2289	504.9237	487.6390	473.1968	466.2250	466.7494	432.1318	387.8632	364.1179	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.2514	75.4313	75.6085	76.4520	76.6119	77.3652	77.3652	77.5064	77.0733	76.6119	76.2891	75.9545	
alpha	6.0168	6.0288	6.0406	6.0968	6.1075	6.1577	6.1577	6.1671	6.1382	6.1075	6.0859	6.0636	
util living area	0.9567	0.9024	0.8311	0.7106	0.5682	0.4061	0.2883	0.3053	0.4580	0.7156	0.9047	0.9656	(86)
MIT	20.4651	20.6741	20.8246	20.9397	20.9858	20.9985	20.9999	20.9998	20.9968	20.9465	20.7203	20.4195	(87)
Th 2	20.3098	20.3113	20.3128	20.3199	20.3212	20.3274	20.3274	20.3286	20.3250	20.3212	20.3185	20.3157	(88)
util rest of house	0.9484	0.8869	0.8076	0.6782	0.5292	0.3638	0.2442	0.2608	0.4141	0.6778	0.8868	0.9588	(89)

MIT 2	19.8358	20.0333	20.1708	20.2754	20.3122	20.3267	20.3274	20.3285	20.3234	20.2837	20.0858	19.7972 (90)
Living area fraction										fLA = Living area / (4) =		0.4776 (91)
MIT	20.1364	20.3394	20.4831	20.5927	20.6340	20.6476	20.6486	20.6491	20.6450	20.6003	20.3888	20.0944 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1364	20.3394	20.4831	20.5927	20.6340	20.6476	20.6486	20.6491	20.6450	20.6003	20.3888	20.0944 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9461	0.8875	0.8136	0.6914	0.5473	0.3839	0.2653	0.2820	0.4350	0.6936	0.8888	0.9563	(94)
Useful gains	363.0977	404.6285	397.4297	351.3944	276.3356	187.2199	125.5245	131.4915	203.0265	299.7430	344.7397	348.2094	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	504.8986	491.0666	443.7053	366.9344	279.7758	187.5415	125.5506	131.5301	203.7365	313.1697	417.9146	502.0588	(97)
Space heating kWh	105.4999	58.0864	34.4291	11.1888	2.5595	0.0000	0.0000	0.0000	0.0000	9.9895	52.6860	114.4639	(98a)
Space heating requirement - total per year (kWh/year)												388.9031	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	105.4999	58.0864	34.4291	11.1888	2.5595	0.0000	0.0000	0.0000	0.0000	9.9895	52.6860	114.4639	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												388.9031	
Space heating per m2											(98c) / (4) =	8.9692	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	291.5043	229.4821	235.2551	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9896	0.9966	0.9958	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	288.4822	228.6944	234.2732	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	540.9452	525.6389	518.8953	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	181.7733	220.9267	211.7588	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	45.4433	55.2317	52.9397	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												153.6147	(107)
Energy for space heating												8.9692	(99)
Energy for space cooling												3.5428	(108)
Total												12.5119	(109)
Fabric Energy Efficiency (DFEE)												12.5	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	13.7636			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	199.1940	(35)
List of Thermal Bridges		

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	52.2400	0.0700	3.6568
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	6.3858	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	20.1494	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	40.9650	40.8373	40.7122	40.1245	40.0146	39.5027	39.5027	39.4079	39.6999	40.0146	40.2370	40.4696	(39)
Average = Sum(39)m / 12 =												40.1240	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9448	0.9418	0.9389	0.9254	0.9228	0.9110	0.9110	0.9089	0.9156	0.9228	0.9280	0.9333	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4982	(42)

Hot water usage for mixer showers

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												47.0349	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	

Distribution loss (46)m = 0.15 x (45)m

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)

Electric shower(s)

	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												449.4572	(64a)

Heat gains from water heating, kWh/month

	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													

	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931 (72)
Total internal gains	281.3655	289.2254	276.9770	269.4043	256.2100	248.1415	239.2128	238.9354	245.8534	252.7493	266.7555	275.3306 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.5100	46.7521	0.6300	0.7000	0.7700	93.0151	(78)

Solar gains	93.0151	152.3348	194.0475	219.3158	228.5407	219.9393	214.8941	208.6919	202.7056	164.3074	110.2547	80.3736 (83)
Total gains	374.3806	441.5603	471.0246	488.7202	484.7506	468.0808	454.1069	447.6273	448.5590	417.0567	377.0101	355.7042 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.5666	58.7497	58.9302	59.7934	59.9577	60.7346	60.7346	60.8807	60.4330	59.9577	59.6262	59.2836	
alpha	4.9044	4.9166	4.9287	4.9862	4.9972	5.0490	5.0490	5.0587	5.0289	4.9972	4.9751	4.9522	
util living area	0.9758	0.9488	0.9100	0.8302	0.7078	0.5288	0.3809	0.4025	0.5897	0.8323	0.9494	0.9803	(86)
MIT	20.0172	20.2641	20.5008	20.7530	20.9101	20.9835	20.9974	20.9965	20.9708	20.7862	20.3769	19.9764	(87)
Th 2	20.1296	20.1321	20.1345	20.1460	20.1481	20.1581	20.1581	20.1600	20.1543	20.1481	20.1438	20.1393	(88)
util rest of house	0.9703	0.9380	0.8917	0.7981	0.6580	0.4636	0.3089	0.3302	0.5248	0.7947	0.9369	0.9758	(89)
MIT 2	19.2504	19.4909	19.7175	19.9564	20.0890	20.1501	20.1573	20.1588	20.1389	19.9913	19.6127	19.2183	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.6166	19.8602	20.0917	20.3369	20.4812	20.5482	20.5586	20.5589	20.5362	20.3710	19.9777	19.5804	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6166	19.8602	20.0917	20.3369	20.4812	20.5482	20.5586	20.5589	20.5362	20.3710	19.9777	19.5804	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9664	0.9342	0.8907	0.8057	0.6781	0.4942	0.3433	0.3647	0.5547	0.8052	0.9342	0.9722	(94)
Useful gains	361.7862	412.4969	419.5269	393.7517	328.7229	231.3057	155.9017	163.2491	248.8025	335.8348	352.1900	345.8081	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	627.4458	610.9362	553.3462	458.8997	351.3752	234.9685	156.3736	163.8950	255.5176	390.9811	518.1607	622.4368	(97)
Space heating kWh	197.6508	133.3512	99.5616	46.9066	16.8533	0.0000	0.0000	0.0000	0.0000	41.0288	119.4990	205.8118	(98a)
Space heating requirement - total per year (kWh/year)												860.6630	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	197.6508	133.3512	99.5616	46.9066	16.8533	0.0000	0.0000	0.0000	0.0000	41.0288	119.4990	205.8118	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												860.6630	
Space heating per m2										(98c) / (4) =		19.8492	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	371.3254	292.3200	299.5001	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9401	0.9724	0.9684	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	349.0810	284.2664	290.0397	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	520.3646	505.5120	499.2860	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	123.3242	164.6067	155.6793	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	30.8310	41.1517	38.9198	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												110.9025	(107)
Energy for space heating												19.8492	(99)
Energy for space cooling												2.5577	(108)
Total												22.4070	(109)
Fabric Energy Efficiency (TFEE)												22.4	(109)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	0.89	**TER**	14.03
Environmental	99 A	**% DER < TER**			93.66
CO_2 Emissions (t/year)	0.02	**DFEE**	12.51	**TFEE**	22.41
Compliance Check	See BREL	**% DFEE < TFEE**			44.16
% DPER < TPER	73.79	**DPER**	19.86	**TPER**	75.79

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
						(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross (m2)	Openings (m2)	NetArea (m2)	U-value (W/m2K)	A x U (W/K)	K-value (kJ/m2K)	A x K (kJ/K)	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
									Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)

12Total per year (kWh/year) 2188 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.5100	46.7521	0.6800	0.7000	0.7700	100.3973	(78)

Solar gains	100.3973	164.4249	209.4481	236.7219	246.6788	237.3948	231.9492	225.2548	218.7933	177.3477	119.0050	86.7525	(83)
Total gains	477.9882	549.1749	579.6096	594.2610	587.9455	567.4815	550.8658	545.3428	547.6173	516.5465	477.1624	457.6122	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761

alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451		
util living area	0.8823	0.8013	0.7146	0.5988	0.4712	0.3373	0.2390	0.2524	0.3766	0.5926	0.7980	0.9009	(86)
MIT	20.7448	20.8636	20.9355	20.9795	20.9958	20.9996	21.0000	20.9999	20.9991	20.9833	20.8850	20.7040	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house	0.8659	0.7796	0.6885	0.5690	0.4389	0.3031	0.2037	0.2167	0.3413	0.5581	0.7726	0.8862	(89)
MIT 2	20.0709	20.2061	20.2851	20.3307	20.3462	20.3493	20.3495	20.3495	20.3490	20.3351	20.2327	20.0233	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.3927	20.5201	20.5957	20.6406	20.6565	20.6599	20.6602	20.6602	20.6595	20.6447	20.5442	20.3484	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3927	20.5201	20.5957	20.6406	20.6565	20.6599	20.6602	20.6602	20.6595	20.6447	20.5442	20.3484	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8670	0.7855	0.6985	0.5824	0.4541	0.3194	0.2205	0.2337	0.3581	0.5739	0.7804	0.8862	(94)
Useful gains	414.4379	431.3573	404.8730	346.0996	267.0120	181.2470	121.4907	127.4719	196.0989	296.4530	372.3886	405.5371	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	481.5576	467.4146	421.7984	351.3246	268.0129	181.3356	121.4971	127.4815	196.2864	300.5777	402.3041	483.2241	(97)
Space heating kWh	49.9370	24.2305	12.5925	3.7620	0.7447	0.0000	0.0000	0.0000	0.0000	3.0688	21.5392	57.7991	(98a)
Space heating requirement - total per year (kWh/year)												173.6738	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	49.9370	24.2305	12.5925	3.7620	0.7447	0.0000	0.0000	0.0000	0.0000	3.0688	21.5392	57.7991	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												173.6738	
Space heating per m2											(98c) / (4) =	4.0054	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	49.9370	24.2305	12.5925	3.7620	0.7447	0.0000	0.0000	0.0000	0.0000	3.0688	21.5392	57.7991	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	74.9055	36.3458	18.8887	5.6430	1.1171	0.0000	0.0000	0.0000	0.0000	4.6032	32.3088	86.6987	
Space heating requirement	74.9055	36.3458	18.8887	5.6430	1.1171	0.0000	0.0000	0.0000	0.0000	4.6032	32.3088	86.6987	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												260.5107	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												2.6051	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2726.3735	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	944.5304	0.1593	11.0682	(367)
Electrical energy for heat distribution (space & water)	2.6051	0.0000	5.0329	(372)
Overall CO2 factor for heat network			0.0393	(386)
Total CO2 associated with community systems			139.2446	(373)
Space and water heating			139.2446	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			38.7168	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			0.8900	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	944.5304	1.5897	110.4359	(467)
Electrical energy for heat distribution (space & water)	2.6051	0.0000	54.0311	(472)
Overall CO2 factor for heat network			0.4220	(486)
Total CO2 associated with community systems			1494.8601	(473)
Space and water heating			1494.8601	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			861.2652	(483)
Dwelling Primary energy Rate (DPER)			19.8600	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)

Wall to Unheated Common area	16.5900	16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)		33.1800			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		13.7636	(33)
Main dwelling					
Party Wall		31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 199.1940 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	52.2400	0.0700	3.6568
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3858 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 20.1494 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	40.9650	40.8373	40.7122	40.1245	40.0146	39.5027	39.5027	39.4079	39.6999	40.0146	40.2370	40.4696	(39)

Average = Sum(39)m / 12 = 40.1240

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9448	0.9418	0.9389	0.9254	0.9228	0.9110	0.9110	0.9089	0.9156	0.9228	0.9280	0.9333	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)

Energy content (annual) Total = Sum(45)m = 1536.8125

Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)

Total per year (kWh/year) = Sum(64)m = 1875.8483 (64)

12Total per year (kWh/year) 1876 (64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
South					6.5100	46.7521		0.6300	0.7000	0.7700		93.0151	(78)
Solar gains	93.0151	152.3348	194.0475	219.3158	228.5407	219.9393	214.8941	208.6919	202.7056	164.3074	110.2547	80.3736	(83)
Total gains	462.2358	528.4965	555.8388	568.4169	561.4371	538.5879	522.4405	517.4097	520.0915	495.1360	459.9740	442.8631	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
tau	58.5666	58.7497	58.9302	59.7934	59.9577	60.7346	60.7346	60.8807	60.4330	59.9577	59.6262	59.2836	
alpha	4.9044	4.9166	4.9287	4.9862	4.9972	5.0490	5.0490	5.0587	5.0289	4.9972	4.9751	4.9522	
util living area	0.9474	0.9076	0.8553	0.7612	0.6315	0.4639	0.3318	0.3492	0.5166	0.7536	0.9026	0.9547	(86)
MIT	20.2410	20.4514	20.6453	20.8365	20.9456	20.9908	20.9986	20.9982	20.9836	20.8667	20.5540	20.2055	(87)
Th 2	20.1296	20.1321	20.1345	20.1460	20.1481	20.1581	20.1581	20.1600	20.1543	20.1481	20.1438	20.1393	(88)
util rest of house	0.9369	0.8909	0.8308	0.7247	0.5822	0.4050	0.2688	0.2860	0.4570	0.7105	0.8824	0.9455	(89)
MIT 2	19.2775	19.5336	19.7649	19.9899	20.1036	20.1525	20.1576	20.1592	20.1436	20.0277	19.6715	19.2417	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.7377	19.9720	20.1854	20.3942	20.5058	20.5529	20.5593	20.5599	20.5448	20.4284	20.0930	19.7020	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7377	19.9720	20.1854	20.3942	20.5058	20.5529	20.5593	20.5599	20.5448	20.4284	20.0930	19.7020	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9314	0.8875	0.8323	0.7358	0.6033	0.4328	0.2989	0.3162	0.4848	0.7253	0.8811	0.9400	(94)
Useful gains	430.5161	469.0583	462.6337	418.2233	338.7318	233.1229	156.1538	163.5998	252.1368	359.0975	405.2927	416.3091	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	632.4056	615.5000	557.1635	461.2006	352.3591	235.1549	156.4023	163.9343	255.8580	393.2807	522.7983	627.3589	(97)
Space heating kWh	150.2058	98.4089	70.3301	30.9437	10.1387	0.0000	0.0000	0.0000	0.0000	25.4323	84.6040	157.0210	(98a)
Space heating requirement - total per year (kWh/year)												627.0845	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	150.2058	98.4089	70.3301	30.9437	10.1387	0.0000	0.0000	0.0000	0.0000	25.4323	84.6040	157.0210	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												627.0845	
Space heating per m2											(98c) / (4) =	14.4623	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	150.2058	98.4089	70.3301	30.9437	10.1387	0.0000	0.0000	0.0000	0.0000	25.4323	84.6040	157.0210	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	162.7365	106.6185	76.1973	33.5251	10.9845	0.0000	0.0000	0.0000	0.0000	27.5540	91.6620	170.1203	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	83.6151	82.9730	82.2073	81.1795	80.3158	79.8000	79.8000	79.8000	79.8000	80.9514	82.6496	83.7348	(217)
Fuel for water heating, kWh/month	219.3985	195.7357	210.5449	189.2266	186.5770	170.5061	169.2907	175.3325	176.4869	192.4488	198.5437	216.9320	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												679.3981	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2301.0235	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2825.4957	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	679.3981	0.2100	142.6736	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2301.0235	0.2100	483.2149	(264)
Space and water heating			625.8886	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			608.1860	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.0300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	679.3981	1.1300	767.7199	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2301.0235	1.1300	2600.1566	(278)
Space and water heating			3367.8765	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3286.3741	(286)
Target Primary Energy Rate (TPER)			75.7900	(287)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	0.89	**TER**	14.03
Environmental	99 A	**% DER < TER**			93.66
CO_2 Emissions (t/year)	0.02	**DFEE**	12.51	**TFEE**	22.41
Compliance Check	See BREL	**% DFEE < TFEE**			44.16
% DPER < TPER	73.79	**DPER**	19.86	**TPER**	75.79

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.5100	46.7521	0.6800	0.7000	0.7700	100.3973	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	100.3973	164.4249	209.4481	236.7219	246.6788	237.3948	231.9492	225.2548	218.7933	177.3477	119.0050	86.7525	(83)
Total gains	519.1581	581.2942	614.6323	620.0921	609.0995	580.8476	564.2984	560.1790	564.8181	542.9389	508.2319	496.4696	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451

util living area													
	0.8468	0.7712	0.6812	0.5758	0.4552	0.3295	0.2333	0.2457	0.3652	0.5659	0.7643	0.8692	(86)
MIT	20.8034	20.8904	20.9503	20.9835	20.9966	20.9996	21.0000	21.0000	20.9993	20.9871	20.9101	20.7671	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house													
	0.8280	0.7486	0.6552	0.5467	0.4239	0.2961	0.1988	0.2110	0.3309	0.5325	0.7378	0.8519	(89)
MIT 2	20.1380	20.2354	20.3003	20.3344	20.3468	20.3493	20.3495	20.3495	20.3491	20.3384	20.2593	20.0964	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.4558	20.5483	20.6108	20.6444	20.6572	20.6599	20.6602	20.6602	20.6596	20.6482	20.5701	20.4167	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4558	20.5483	20.6108	20.6444	20.6572	20.6599	20.6602	20.6602	20.6596	20.6482	20.5701	20.4167	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8312	0.7556	0.6658	0.5600	0.4387	0.3121	0.2153	0.2276	0.3473	0.5479	0.7470	0.8538	(94)
Useful gains	431.5291	439.2392	409.2168	347.2259	267.2099	181.2596	121.4916	127.4735	196.1332	297.4842	379.6502	423.8854	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	483.4442	468.2575	422.2500	351.4391	268.0329	181.3369	121.4972	127.4817	196.2899	300.6824	403.0779	485.2674	(97)
Space heating kWh													
	38.6249	19.5003	9.6967	3.0335	0.6123	0.0000	0.0000	0.0000	0.0000	2.3795	16.8679	45.6683	(98a)
Space heating requirement - total per year (kWh/year)												136.3833	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	38.6249	19.5003	9.6967	3.0335	0.6123	0.0000	0.0000	0.0000	0.0000	2.3795	16.8679	45.6683	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												136.3833	
Space heating per m2											(98c) / (4) =	3.1454	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	38.6249	19.5003	9.6967	3.0335	0.6123	0.0000	0.0000	0.0000	0.0000	2.3795	16.8679	45.6683	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	57.9373	29.2504	14.5450	4.5502	0.9184	0.0000	0.0000	0.0000	0.0000	3.5692	25.3019	68.5024	
Space heating requirement													
	57.9373	29.2504	14.5450	4.5502	0.9184	0.0000	0.0000	0.0000	0.0000	3.5692	25.3019	68.5024	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												204.5749	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												2.0457	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2670.4377	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	204.5749	4.4400	9.0831	(340a)
Space heating total			9.0831	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			172.4165	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7025	(357)
SAP value		88.6130	
SAP rating (Section 12)		89	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	929.6142	0.1593	8.6915	(367)
Electrical energy for heat distribution (space & water)	2.0457	0.0000	4.9438	(372)
Overall CO2 factor for heat network			0.0392	(386)
Total CO2 associated with community systems			136.7787	(373)
Space and water heating			136.7787	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			36.2509	(383)
CO2 emissions per m2			0.8400	(384)
EI value			99.4502	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	43.3600 (1b)	x 2.4500 (2b)	= 106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 43.3600				(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)

Adj infilt rate

	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104 (22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)

Heat transfer coeff

	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)

Average = Sum(39)m / 12 = 29.9239

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m													
	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Total per year (kWh/year) = Sum(64)m = 2187.6523 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.5100	54.0600	0.6800	0.7000	0.7700	116.0907	(78)

Solar gains	116.0907	168.5106	211.2321	242.6142	245.5697	254.7378	243.6962	239.4271	233.1629	191.5744	135.4309	100.9920	(83)
Total gains	534.8514	585.3799	616.4162	625.9844	607.9903	598.1906	576.0455	574.3513	579.1877	557.1656	524.6578	510.7091	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area													
	0.8240	0.7571	0.6597	0.5530	0.4319	0.2901	0.2026	0.2136	0.3407	0.5271	0.7305	0.8488	(86)
MIT	20.8363	20.9031	20.9598	20.9872	20.9976	20.9998	21.0000	21.0000	20.9995	20.9917	20.9322	20.8029	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house													
	0.8036	0.7337	0.6329	0.5238	0.4004	0.2576	0.1688	0.1797	0.3073	0.4938	0.7025	0.8299	(89)
MIT 2	20.1754	20.2495	20.3103	20.3380	20.3477	20.3495	20.3496	20.3496	20.3493	20.3426	20.2827	20.1378	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.4911	20.5617	20.6205	20.6481	20.6581	20.6601	20.6602	20.6602	20.6599	20.6526	20.5929	20.4554	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4911	20.5617	20.6205	20.6481	20.6581	20.6601	20.6602	20.6602	20.6599	20.6526	20.5929	20.4554	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8082	0.7415	0.6442	0.5373	0.4154	0.2731	0.1849	0.1959	0.3232	0.5094	0.7132	0.8331	(94)
Useful gains	432.2699	434.0450	397.0711	336.3367	252.5301	163.3562	106.5338	112.5175	187.2210	283.8204	374.1719	425.4724	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	475.5232	459.6804	407.5784	339.5790	253.0993	163.3877	106.5357	112.5204	187.3193	285.8517	391.7909	477.4491	(97)
Space heating kWh													
	32.1804	17.2270	7.8174	2.3344	0.4234	0.0000	0.0000	0.0000	0.0000	1.5113	12.6857	38.6707	(98a)
Space heating requirement - total per year (kWh/year)												112.8504	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	32.1804	17.2270	7.8174	2.3344	0.4234	0.0000	0.0000	0.0000	0.0000	1.5113	12.6857	38.6707	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												112.8504	
Space heating per m2											(98c) / (4) =	2.6026	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	32.1804	17.2270	7.8174	2.3344	0.4234	0.0000	0.0000	0.0000	0.0000	1.5113	12.6857	38.6707	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	48.2707	25.8405	11.7261	3.5017	0.6352	0.0000	0.0000	0.0000	0.0000	2.2670	19.0285	58.0060	
Space heating requirement													
	48.2707	25.8405	11.7261	3.5017	0.6352	0.0000	0.0000	0.0000	0.0000	2.2670	19.0285	58.0060	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year	
Space heating fuel - community heating	169.2756 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	3281.4784 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	1.6928 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)	
mechanical ventilation fans (SFP = 0.0920)	11.9235 (330a)
Total electricity for the above, kWh/year	11.9235 (331)
Electricity for lighting (calculated in Appendix L)	130.6818 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	2538.6124 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	169.2756	6.5500	11.0876	(340a)
Space heating total			11.0876	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			211.4886	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	920.2011	0.1596	7.2048	(367)
Electrical energy for heat distribution (space & water)	1.6928	0.0000	4.8881	(372)
Overall CO2 factor for heat network			0.0392	(386)
Total CO2 associated with community systems			135.2362	(373)
Space and water heating			135.2362	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			22.4763	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	920.2011	1.5908	71.8079	(467)
Electrical energy for heat distribution (space & water)	1.6928	0.0000	52.5825	(472)
Overall CO2 factor for heat network			0.4216	(486)
Total CO2 associated with community systems			1454.7835	(473)
Space and water heating			1454.7835	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			750.4585	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - North

Current energy efficiency rating:	B 89
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: B 89
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£41	£41	£0
Community scheme	£330	£330	£0
Space heating	£118	£118	£0
Water heating	£215	£215	£0
Lighting	£37	£37	£0
Generated (PV)	-£159	-£159	£0
Total cost of fuels	£212	£212	£0
Total cost of uses	£211	£211	£0
Delivered energy	59 kWh/m²	59 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.0 tonnes	0.0 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	17 kWh/m²	17 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)

Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	11.4002	(33)
Main dwelling					
Party Wall	31.3600	0.0000	0.0000	70.0000	2195.2000 (32)
Party Floor	43.3600			70.0000	3035.2000 (32d)
Party Ceiling 1	43.3600			30.0000	1300.8000 (32b)
Internal TF Wall	68.4500			9.0000	616.0500 (32c)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =		8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K					199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)					0.9954 (36)
Point Thermal bridges				(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =		12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.5100	46.7521	0.6800	0.7000	0.7700	100.3973	(78)

Solar gains	100.3973	164.4249	209.4481	236.7219	246.6788	237.3948	231.9492	225.2548	218.7933	177.3477	119.0050	86.7525	(83)
Total gains	519.1581	581.2942	614.6323	620.0921	609.0995	580.8476	564.2984	560.1790	564.8181	542.9389	508.2319	496.4696	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area	0.8468	0.7712	0.6812	0.5758	0.4552	0.3295	0.2333	0.2457	0.3652	0.5659	0.7643	0.8692	(86)
MIT	20.8034	20.8904	20.9503	20.9835	20.9966	20.9996	21.0000	21.0000	20.9993	20.9871	20.9101	20.7671	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house	0.8280	0.7486	0.6552	0.5467	0.4239	0.2961	0.1988	0.2110	0.3309	0.5325	0.7378	0.8519	(89)
MIT 2	20.1380	20.2354	20.3003	20.3344	20.3468	20.3493	20.3495	20.3495	20.3491	20.3384	20.2593	20.0964	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.4558	20.5483	20.6108	20.6444	20.6572	20.6599	20.6602	20.6602	20.6596	20.6482	20.5701	20.4167	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4558	20.5483	20.6108	20.6444	20.6572	20.6599	20.6602	20.6602	20.6596	20.6482	20.5701	20.4167	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8312	0.7556	0.6658	0.5600	0.4387	0.3121	0.2153	0.2276	0.3473	0.5479	0.7470	0.8538	(94)
Useful gains	431.5291	439.2392	409.2168	347.2259	267.2099	181.2596	121.4916	127.4735	196.1332	297.4842	379.6502	423.8854	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	483.4442	468.2575	422.2500	351.4391	268.0329	181.3369	121.4972	127.4817	196.2899	300.6824	403.0779	485.2674	(97)
Space heating kWh	38.6249	19.5003	9.6967	3.0335	0.6123	0.0000	0.0000	0.0000	0.0000	2.3795	16.8679	45.6683	(98a)
Space heating requirement - total per year (kWh/year)												136.3833	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	38.6249	19.5003	9.6967	3.0335	0.6123	0.0000	0.0000	0.0000	0.0000	2.3795	16.8679	45.6683	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												136.3833	
Space heating per m2										(98c) / (4) =		3.1454	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

Space heating:

Space heating requirement												
	38.6249	19.5003	9.6967	3.0335	0.6123	0.0000	0.0000	0.0000	0.0000	2.3795	16.8679	45.6683 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	57.9373	29.2504	14.5450	4.5502	0.9184	0.0000	0.0000	0.0000	0.0000	3.5692	25.3019	68.5024
Space heating requirement												
	57.9373	29.2504	14.5450	4.5502	0.9184	0.0000	0.0000	0.0000	0.0000	3.5692	25.3019	68.5024 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement												
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016
Water heating fuel												
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127 (331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year
Space heating fuel - community heating 204.5749 (307)
Space heating fuel - secondary 0.0000 (309)
Water heating fuel - community heating 3281.4784 (310)
Efficiency of water heater 0.0000 (311)
Electricity used for heat distribution 2.0457 (313)
Space cooling fuel 0.0000 (321)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)
mechanical ventilation fans (SFP = 0.0920) 11.9235 (330a)
Total electricity for the above, kWh/year 11.9235 (331)
Electricity for lighting (calculated in Appendix L) 130.6818 (332)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation -958.2209 (333)
Wind generation 0.0000 (334)
Hydro-electric generation (Appendix N) 0.0000 (335a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (335)

Appendix Q - special features

Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2670.4377	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	204.5749	4.4400	9.0831	(340a)
Space heating total			9.0831	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			172.4165	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7025	(357)
SAP value		88.6130	
SAP rating (Section 12)		89	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	929.6142	0.1593	8.6915	(367)
Electrical energy for heat distribution (space & water)	2.0457	0.0000	4.9438	(372)
Overall CO2 factor for heat network			0.0392	(386)
Total CO2 associated with community systems			136.7787	(373)
Space and water heating			136.7787	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			36.2509	(383)
CO2 emissions per m2			0.8400	(384)
EI value			99.4502	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

Measured/design AP50												3.0000	(17)
Infiltration rate												0.1500	(18)
Number of sides sheltered												3	(19)
Shelter factor									(20) = 1 - [0.075 x (19)] =			0.7750	(20)
Infiltration rate adjusted to include shelter factor									(21) = (18) x (20) =			0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4982	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)

Water heating gains (Table 5)

	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)

Total internal gains

	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.5100	54.0600	0.6800	0.7000	0.7700	116.0907	(78)

Solar gains	116.0907	168.5106	211.2321	242.6142	245.5697	254.7378	243.6962	239.4271	233.1629	191.5744	135.4309	100.9920	(83)
Total gains	534.8514	585.3799	616.4162	625.9844	607.9903	598.1906	576.0455	574.3513	579.1877	557.1656	524.6578	510.7091	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area	0.8240	0.7571	0.6597	0.5530	0.4319	0.2901	0.2026	0.2136	0.3407	0.5271	0.7305	0.8488	(86)
MIT	20.8363	20.9031	20.9598	20.9872	20.9976	20.9998	21.0000	21.0000	20.9995	20.9917	20.9322	20.8029	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house	0.8036	0.7337	0.6329	0.5238	0.4004	0.2576	0.1688	0.1797	0.3073	0.4938	0.7025	0.8299	(89)
MIT 2	20.1754	20.2495	20.3103	20.3380	20.3477	20.3495	20.3496	20.3496	20.3493	20.3426	20.2827	20.1378	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.4911	20.5617	20.6205	20.6481	20.6581	20.6601	20.6602	20.6602	20.6599	20.6526	20.5929	20.4554	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4911	20.5617	20.6205	20.6481	20.6581	20.6601	20.6602	20.6602	20.6599	20.6526	20.5929	20.4554	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8082	0.7415	0.6442	0.5373	0.4154	0.2731	0.1849	0.1959	0.3232	0.5094	0.7132	0.8331	(94)
Useful gains	432.2699	434.0450	397.0711	336.3367	252.5301	163.3562	106.5338	112.5175	187.2210	283.8204	374.1719	425.4724	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	475.5232	459.6804	407.5784	339.5790	253.0993	163.3877	106.5357	112.5204	187.3193	285.8517	391.7909	477.4491	(97)
Space heating kWh	32.1804	17.2270	7.8174	2.3344	0.4234	0.0000	0.0000	0.0000	0.0000	1.5113	12.6857	38.6707	(98a)
Space heating requirement - total per year (kWh/year)												112.8504	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	32.1804	17.2270	7.8174	2.3344	0.4234	0.0000	0.0000	0.0000	0.0000	1.5113	12.6857	38.6707	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												112.8504	
Space heating per m2										(98c) / (4) =		2.6026	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement

	32.1804	17.2270	7.8174	2.3344	0.4234	0.0000	0.0000	0.0000	0.0000	1.5113	12.6857	38.6707	(98)

Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50

307a	48.2707	25.8405	11.7261	3.5017	0.6352	0.0000	0.0000	0.0000	0.0000	2.2670	19.0285	58.0060	

Space heating requirement

	48.2707	25.8405	11.7261	3.5017	0.6352	0.0000	0.0000	0.0000	0.0000	2.2670	19.0285	58.0060	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)

Space heating fuel for secondary/supplementary system

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement

	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50

310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	

Water heating fuel

	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)

Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	169.2756	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	1.6928	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(330a)
Total electricity for the above, kWh/year	11.9235	(331)
Electricity for lighting (calculated in Appendix L)	130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2538.6124	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	169.2756	6.5500	11.0876	(340a)
Space heating total			11.0876	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			211.4886	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	920.2011	0.1596	7.2048	(367)
Electrical energy for heat distribution (space & water)	1.6928	0.0000	4.8881	(372)
Overall CO2 factor for heat network			0.0392	(386)
Total CO2 associated with community systems			135.2362	(373)
Space and water heating			135.2362	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			22.4763	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	920.2011	1.5908	71.8079	(467)
Electrical energy for heat distribution (space & water)	1.6928	0.0000	52.5825	(472)
Overall CO2 factor for heat network			0.4216	(486)
Total CO2 associated with community systems			1454.7835	(473)
Space and water heating			1454.7835	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			750.4585	(483)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	0.93	**TER**	14.27
Environmental	99 A	**% DER < TER**			93.48
CO_2 Emissions (t/year)	0.02	**DFEE**	13.81	**TFEE**	23.94
Compliance Check	See BREL	**% DFEE < TFEE**			42.32
% DPER < TPER	73.69	**DPER**	20.28	**TPER**	77.08

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523 (64)
12Total per year (kWh/year)												2188 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	6.5100	36.7938	0.6800	0.7000	0.7700	79.0126	(79)

Solar gains	79.0126	134.5876	184.1487	228.1691	255.5685	253.7203	244.6135	224.1724	199.3941	148.7480	94.6389	67.6183 (83)
Total gains	456.6035	519.3376	554.3102	585.7083	596.8351	583.8070	563.5301	544.2603	528.2181	487.9469	452.7963	438.4780 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761

alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451		
util living area	0.8996	0.8294	0.7397	0.6067	0.4643	0.3279	0.2336	0.2529	0.3903	0.6240	0.8246	0.9153	(86)
MIT	20.7088	20.8330	20.9219	20.9780	20.9961	20.9996	21.0000	20.9999	20.9989	20.9779	20.8607	20.6683	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house	0.8847	0.8088	0.7139	0.5767	0.4324	0.2946	0.1991	0.2171	0.3537	0.5885	0.8004	0.9021	(89)
MIT 2	20.0291	20.1722	20.2709	20.3293	20.3465	20.3493	20.3495	20.3495	20.3489	20.3303	20.2065	19.9812	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.3538	20.4878	20.5818	20.6391	20.6568	20.6599	20.6602	20.6602	20.6594	20.6396	20.5190	20.3094	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3538	20.4878	20.5818	20.6391	20.6568	20.6599	20.6602	20.6602	20.6594	20.6396	20.5190	20.3094	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8848	0.8134	0.7233	0.5902	0.4475	0.3105	0.2156	0.2342	0.3712	0.6045	0.8069	0.9012	(94)
Useful gains	403.9895	422.4101	400.9087	345.6634	267.1005	181.2621	121.4916	127.4718	196.0506	294.9491	365.3641	395.1431	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	480.3914	466.4473	421.3830	351.2801	268.0218	181.3372	121.4972	127.4815	196.2815	300.4244	401.5473	482.0555	(97)
Space heating kWh	56.8430	29.5931	15.2329	4.0440	0.6854	0.0000	0.0000	0.0000	0.0000	4.0736	26.0519	64.6628	(98a)
Space heating requirement - total per year (kWh/year)												201.1868	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	56.8430	29.5931	15.2329	4.0440	0.6854	0.0000	0.0000	0.0000	0.0000	4.0736	26.0519	64.6628	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												201.1868	
Space heating per m2											(98c) / (4) =	4.6399	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	56.8430	29.5931	15.2329	4.0440	0.6854	0.0000	0.0000	0.0000	0.0000	4.0736	26.0519	64.6628	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	85.2645	44.3896	22.8493	6.0660	1.0282	0.0000	0.0000	0.0000	0.0000	6.1104	39.0779	96.9942	
Space heating requirement	85.2645	44.3896	22.8493	6.0660	1.0282	0.0000	0.0000	0.0000	0.0000	6.1104	39.0779	96.9942	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												301.7802	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												3.0178	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2767.6430	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	955.5356	0.1592	12.8110	(367)
Electrical energy for heat distribution (space & water)	3.0178	0.0000	5.0983	(372)
Overall CO2 factor for heat network			0.0394	(386)
Total CO2 associated with community systems			141.0527	(373)
Space and water heating			141.0527	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			40.5250	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			0.9300	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	955.5356	1.5892	127.8923	(467)
Electrical energy for heat distribution (space & water)	3.0178	0.0000	54.6857	(472)
Overall CO2 factor for heat network			0.4222	(486)
Total CO2 associated with community systems			1512.9711	(473)
Space and water heating			1512.9711	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			879.3762	(483)
Dwelling Primary energy Rate (DPER)			20.2800	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)

Wall to Unheated Common area	16.5900	16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)		33.1800			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		13.7636	(33)
Main dwelling					
Party Wall		31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 199.1940 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	52.2400	0.0700	3.6568
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3858 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 20.1494 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	40.9650	40.8373	40.7122	40.1245	40.0146	39.5027	39.5027	39.4079	39.6999	40.0146	40.2370	40.4696	(39)

Average = Sum(39)m / 12 = 40.1240

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9448	0.9418	0.9389	0.9254	0.9228	0.9110	0.9110	0.9089	0.9156	0.9228	0.9280	0.9333	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)

Energy content (annual) Total = Sum(45)m = 1536.8125

Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)

Total per year (kWh/year) = Sum(64)m = 1875.8483 (64)

12Total per year (kWh/year) 1876 (64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
Southwest					6.5100	36.7938		0.6300	0.7000	0.7700		73.2028	(79)
Solar gains	73.2028	124.6915	170.6083	211.3920	236.7767	235.0644	226.6272	207.6891	184.7327	137.8107	87.6801	62.6464	(83)
Total gains	442.4235	500.8532	532.3996	560.4931	569.6731	553.7131	534.1736	516.4068	502.1187	468.6393	437.3995	425.1358	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.5666	58.7497	58.9302	59.7934	59.9577	60.7346	60.7346	60.8807	60.4330	59.9577	59.6262	59.2836	
alpha	4.9044	4.9166	4.9287	4.9862	4.9972	5.0490	5.0490	5.0587	5.0289	4.9972	4.9751	4.9522	
util living area	0.9549	0.9219	0.8712	0.7680	0.6240	0.4518	0.3246	0.3499	0.5335	0.7802	0.9167	0.9610	(86)
MIT	20.1934	20.3961	20.6095	20.8296	20.9484	20.9918	20.9987	20.9982	20.9812	20.8435	20.5100	20.1613	(87)
Th 2	20.1296	20.1321	20.1345	20.1460	20.1481	20.1581	20.1581	20.1600	20.1543	20.1481	20.1438	20.1393	(88)
util rest of house	0.9456	0.9071	0.8482	0.7318	0.5748	0.3943	0.2629	0.2866	0.4725	0.7384	0.8986	0.9528	(89)
MIT 2	19.2194	19.4682	19.7245	19.9829	20.1060	20.1532	20.1576	20.1592	20.1418	20.0049	19.6204	19.1875	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.6846	19.9114	20.1472	20.3873	20.5083	20.5537	20.5594	20.5599	20.5427	20.4054	20.0453	19.6526	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6846	19.9114	20.1472	20.3873	20.5083	20.5537	20.5594	20.5599	20.5427	20.4054	20.0453	19.6526	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9400	0.9029	0.8486	0.7425	0.5960	0.4215	0.2924	0.3168	0.5008	0.7517	0.8963	0.9473	(94)
Useful gains	415.8881	452.2079	451.7711	416.1649	339.5353	233.3839	156.1817	163.5963	251.4811	352.2568	392.0212	402.7523	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	630.2297	613.0254	555.6081	460.9226	352.4623	235.1875	156.4059	163.9339	255.7756	392.3605	520.8801	625.3608	(97)
Space heating kWh	159.4701	108.0694	77.2548	32.2255	9.6177	0.0000	0.0000	0.0000	0.0000	29.8372	92.7784	165.6207	(98a)
Space heating requirement - total per year (kWh/year)												674.8738	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	159.4701	108.0694	77.2548	32.2255	9.6177	0.0000	0.0000	0.0000	0.0000	29.8372	92.7784	165.6207	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												674.8738	
Space heating per m2											(98c) / (4) =	15.5644	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	159.4701	108.0694	77.2548	32.2255	9.6177	0.0000	0.0000	0.0000	0.0000	29.8372	92.7784	165.6207	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	172.7737	117.0849	83.6996	34.9139	10.4200	0.0000	0.0000	0.0000	0.0000	32.3263	100.5183	179.4374	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	83.7472	83.1679	82.3765	81.2276	80.2908	79.8000	79.8000	79.8000	79.8000	81.1215	82.8322	83.8532	(217)
Fuel for water heating, kWh/month	219.0524	195.2769	210.1126	189.1146	186.6352	170.5061	169.2907	175.3325	176.4869	192.0452	198.1061	216.6255	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												731.1742	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2298.5849	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2874.8331	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	731.1742	0.2100	153.5466	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2298.5849	0.2100	482.7028	(264)
Space and water heating			636.2494	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			618.5469	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.2700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	731.1742	1.1300	826.2269	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2298.5849	1.1300	2597.4009	(278)
Space and water heating			3423.6278	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3342.1254	(286)
Target Primary Energy Rate (TPER)			77.0800	(287)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	0.93	**TER**	14.27
Environmental	99 A	**% DER < TER**			93.48
CO_2 Emissions (t/year)	0.02	**DFEE**	13.81	**TFEE**	23.94
Compliance Check	See BREL	**% DFEE < TFEE**			42.32
% DPER < TPER	73.69	**DPER**	20.28	**TPER**	77.08

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2622	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	31.8822	31.8062	31.7316	31.3815	31.3160	31.0111	31.0111	30.9546	31.1285	31.3160	31.4485	31.5871	(39)
Average = Sum(39)m / 12 =												31.3812	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7353	0.7335	0.7318	0.7237	0.7222	0.7152	0.7152	0.7139	0.7179	0.7222	0.7253	0.7285	(40)
HLP (average)												0.7237	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		449.4572	(64a)
Heat gains from water heating, kWh/month	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.4004	291.4783	279.0119	271.5070	258.2448	250.2442	241.2477	240.9702	247.9561	254.7841	268.8582	277.3654	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	6.5100	36.7938	0.6800	0.7000	0.7700	79.0126	(79)

Solar gains	79.0126	134.5876	184.1487	228.1691	255.5685	253.7203	244.6135	224.1724	199.3941	148.7480	94.6389	67.6183	(83)
Total gains	362.4129	426.0660	463.1606	499.6762	513.8133	503.9646	485.8611	465.1426	447.3502	403.5322	363.4970	344.9837	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.2514	75.4313	75.6085	76.4520	76.6119	77.3652	77.3652	77.5064	77.0733	76.6119	76.2891	75.9545	
alpha	6.0168	6.0288	6.0406	6.0968	6.1075	6.1577	6.1577	6.1671	6.1382	6.1075	6.0859	6.0636	
util living area	0.9662	0.9236	0.8551	0.7200	0.5590	0.3930	0.2808	0.3060	0.4774	0.7533	0.9248	0.9730	(86)
MIT	20.4100	20.6161	20.7925	20.9353	20.9870	20.9987	20.9999	20.9998	20.9960	20.9295	20.6725	20.3678	(87)
Th 2	20.3098	20.3113	20.3128	20.3199	20.3212	20.3274	20.3274	20.3286	20.3250	20.3212	20.3185	20.3157	(88)
util rest of house	0.9594	0.9103	0.8332	0.6877	0.5205	0.3521	0.2379	0.2614	0.4317	0.7161	0.9096	0.9675	(89)

MIT 2	19.7830	19.9800	20.1431	20.2720	20.3130	20.3268	20.3274	20.3285	20.3229	20.2710	20.0425	19.7474	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.0825	20.2838	20.4533	20.5888	20.6349	20.6477	20.6486	20.6491	20.6444	20.5856	20.3434	20.0438	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0825	20.2838	20.4533	20.5888	20.6349	20.6477	20.6486	20.6491	20.6444	20.5856	20.3434	20.0438	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9568	0.9098	0.8379	0.7007	0.5384	0.3716	0.2584	0.2827	0.4534	0.7310	0.9102	0.9649	(94)
Useful gains	346.7733	387.6246	388.0975	350.1387	276.6504	187.2794	125.5286	131.4910	202.8266	294.9847	330.8453	332.8790	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	503.1808	489.3000	442.7608	366.8130	279.8057	187.5472	125.5510	131.5300	203.7174	312.7081	416.4851	500.4580	(97)
Space heating kWh	116.3672	68.3259	40.6695	12.0055	2.3475	0.0000	0.0000	0.0000	0.0000	13.1862	61.6607	124.6787	(98a)
Space heating requirement - total per year (kWh/year)												439.2412	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	116.3672	68.3259	40.6695	12.0055	2.3475	0.0000	0.0000	0.0000	0.0000	13.1862	61.6607	124.6787	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												439.2412	
Space heating per m2											(98c) / (4) =	10.1301	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	291.5043	229.4821	235.2551	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9913	0.9970	0.9958	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	288.9727	228.8045	234.2603	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	560.0270	540.4413	517.6301	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	195.1591	231.8578	210.8271	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	48.7898	57.9645	52.7068	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												159.4610	(107)
Energy for space heating												10.1301	(99)
Energy for space cooling												3.6776	(108)
Total												13.8077	(109)
Fabric Energy Efficiency (DFEE)												13.8	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	13.7636			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	199.1940	(35)
List of Thermal Bridges		

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	52.2400	0.0700	3.6568
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	6.3858	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	20.1494	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	40.9650	40.8373	40.7122	40.1245	40.0146	39.5027	39.5027	39.4079	39.6999	40.0146	40.2370	40.4696	(39)
Average = Sum(39)m / 12 =												40.1240	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9448	0.9418	0.9389	0.9254	0.9228	0.9110	0.9110	0.9089	0.9156	0.9228	0.9280	0.9333	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4982	(42)

Hot water usage for mixer showers

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												47.0349	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	

Distribution loss (46)m = 0.15 x (45)m

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)

Electric shower(s)

	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												449.4572	(64a)

Heat gains from water heating, kWh/month

	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													

	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931 (72)
Total internal gains	281.3655	289.2254	276.9770	269.4043	256.2100	248.1415	239.2128	238.9354	245.8534	252.7493	266.7555	275.3306 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	6.5100	36.7938	0.6300	0.7000	0.7700	73.2028	(79)

Solar gains	73.2028	124.6915	170.6083	211.3920	236.7767	235.0644	226.6272	207.6891	184.7327	137.8107	87.6801	62.6464 (83)
Total gains	354.5683	413.9169	447.5854	480.7963	492.9866	483.2059	465.8400	446.6244	430.5862	390.5599	354.4356	337.9769 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.5666	58.7497	58.9302	59.7934	59.9577	60.7346	60.7346	60.8807	60.4330	59.9577	59.6262	59.2836	
alpha	4.9044	4.9166	4.9287	4.9862	4.9972	5.0490	5.0490	5.0587	5.0289	4.9972	4.9751	4.9522	
util living area	0.9804	0.9593	0.9234	0.8370	0.6992	0.5135	0.3715	0.4034	0.6107	0.8585	0.9595	0.9840	(86)
MIT	19.9627	20.1967	20.4535	20.7427	20.9149	20.9855	20.9977	20.9965	20.9660	20.7495	20.3216	19.9265	(87)
Th 2	20.1296	20.1321	20.1345	20.1460	20.1481	20.1581	20.1581	20.1600	20.1543	20.1481	20.1438	20.1393	(88)
util rest of house	0.9759	0.9504	0.9070	0.8055	0.6492	0.4497	0.3012	0.3309	0.5447	0.8240	0.9491	0.9802	(89)
MIT 2	19.1972	19.4267	19.6742	19.9479	20.0924	20.1511	20.1574	20.1588	20.1362	19.9614	19.5606	19.1695	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.5628	19.7945	20.0464	20.3275	20.4852	20.5496	20.5587	20.5589	20.5325	20.3379	19.9241	19.5310	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5628	19.7945	20.0464	20.3275	20.4852	20.5496	20.5587	20.5589	20.5325	20.3379	19.9241	19.5310	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9722	0.9464	0.9052	0.8126	0.6696	0.4797	0.3348	0.3655	0.5748	0.8323	0.9459	0.9769	(94)
Useful gains	344.7187	391.7118	405.1354	390.6917	330.1032	231.8138	155.9604	163.2417	247.5225	325.0584	335.2753	330.1692	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	625.2415	608.2508	551.5045	458.5239	351.5376	235.0270	156.3808	163.8941	255.3695	389.6561	516.0024	620.4399	(97)
Space heating kWh	208.7090	145.5142	108.8985	48.8392	15.9472	0.0000	0.0000	0.0000	0.0000	48.0607	130.1235	215.9614	(98a)
Space heating requirement - total per year (kWh/year)												922.0537	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	208.7090	145.5142	108.8985	48.8392	15.9472	0.0000	0.0000	0.0000	0.0000	48.0607	130.1235	215.9614	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												922.0537	
Space heating per m2											(98c) / (4) =	21.2651	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	371.3254	292.3200	299.5001	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9467	0.9752	0.9681	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	351.5360	285.0707	289.9538	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	538.0433	519.2260	498.1139	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	134.2853	174.2116	154.8711	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	33.5713	43.5529	38.7178	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												115.8420	(107)
Energy for space heating												21.2651	(99)
Energy for space cooling												2.6716	(108)
Total												23.9367	(109)
Fabric Energy Efficiency (TFEE)												23.9	(109)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	0.93	**TER**	14.27
Environmental	99 A	**% DER < TER**			93.48
CO_2 Emissions (t/year)	0.02	**DFEE**	13.81	**TFEE**	23.94
Compliance Check	See BREL	**% DFEE < TFEE**			42.32
% DPER < TPER	73.69	**DPER**	20.28	**TPER**	77.08

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523 (64)
12Total per year (kWh/year)												2188 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	6.5100	36.7938	0.6800	0.7000	0.7700	79.0126	(79)

Solar gains	79.0126	134.5876	184.1487	228.1691	255.5685	253.7203	244.6135	224.1724	199.3941	148.7480	94.6389	67.6183 (83)
Total gains	456.6035	519.3376	554.3102	585.7083	596.8351	583.8070	563.5301	544.2603	528.2181	487.9469	452.7963	438.4780 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761

alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451		
util living area	0.8996	0.8294	0.7397	0.6067	0.4643	0.3279	0.2336	0.2529	0.3903	0.6240	0.8246	0.9153	(86)
MIT	20.7088	20.8330	20.9219	20.9780	20.9961	20.9996	21.0000	20.9999	20.9989	20.9779	20.8607	20.6683	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house	0.8847	0.8088	0.7139	0.5767	0.4324	0.2946	0.1991	0.2171	0.3537	0.5885	0.8004	0.9021	(89)
MIT 2	20.0291	20.1722	20.2709	20.3293	20.3465	20.3493	20.3495	20.3495	20.3489	20.3303	20.2065	19.9812	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.3538	20.4878	20.5818	20.6391	20.6568	20.6599	20.6602	20.6602	20.6594	20.6396	20.5190	20.3094	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3538	20.4878	20.5818	20.6391	20.6568	20.6599	20.6602	20.6602	20.6594	20.6396	20.5190	20.3094	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8848	0.8134	0.7233	0.5902	0.4475	0.3105	0.2156	0.2342	0.3712	0.6045	0.8069	0.9012	(94)
Useful gains	403.9895	422.4101	400.9087	345.6634	267.1005	181.2621	121.4916	127.4718	196.0506	294.9491	365.3641	395.1431	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	480.3914	466.4473	421.3830	351.2801	268.0218	181.3372	121.4972	127.4815	196.2815	300.4244	401.5473	482.0555	(97)
Space heating kWh	56.8430	29.5931	15.2329	4.0440	0.6854	0.0000	0.0000	0.0000	0.0000	4.0736	26.0519	64.6628	(98a)
Space heating requirement - total per year (kWh/year)												201.1868	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	56.8430	29.5931	15.2329	4.0440	0.6854	0.0000	0.0000	0.0000	0.0000	4.0736	26.0519	64.6628	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												201.1868	
Space heating per m2											(98c) / (4) =	4.6399	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	56.8430	29.5931	15.2329	4.0440	0.6854	0.0000	0.0000	0.0000	0.0000	4.0736	26.0519	64.6628	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	85.2645	44.3896	22.8493	6.0660	1.0282	0.0000	0.0000	0.0000	0.0000	6.1104	39.0779	96.9942	
Space heating requirement	85.2645	44.3896	22.8493	6.0660	1.0282	0.0000	0.0000	0.0000	0.0000	6.1104	39.0779	96.9942	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												301.7802	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												3.0178	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2767.6430	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	955.5356	0.1592	12.8110	(367)
Electrical energy for heat distribution (space & water)	3.0178	0.0000	5.0983	(372)
Overall CO2 factor for heat network			0.0394	(386)
Total CO2 associated with community systems			141.0527	(373)
Space and water heating			141.0527	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			40.5250	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			0.9300	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	955.5356	1.5892	127.8923	(467)
Electrical energy for heat distribution (space & water)	3.0178	0.0000	54.6857	(472)
Overall CO2 factor for heat network			0.4222	(486)
Total CO2 associated with community systems			1512.9711	(473)
Space and water heating			1512.9711	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			879.3762	(483)
Dwelling Primary energy Rate (DPER)			20.2800	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)

Wall to Unheated Common area	16.5900	16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)		33.1800			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		13.7636	(33)
Main dwelling					
Party Wall		31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 199.1940 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	52.2400	0.0700	3.6568
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3858 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 20.1494 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	40.9650	40.8373	40.7122	40.1245	40.0146	39.5027	39.5027	39.4079	39.6999	40.0146	40.2370	40.4696	(39)

Average = Sum(39)m / 12 = 40.1240

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9448	0.9418	0.9389	0.9254	0.9228	0.9110	0.9110	0.9089	0.9156	0.9228	0.9280	0.9333	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)

Energy content (annual) Total = Sum(45)m = 1536.8125

Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)

Total per year (kWh/year) = Sum(64)m = 1875.8483 (64)

12Total per year (kWh/year) 1876 (64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
Southwest					6.5100	36.7938		0.6300	0.7000	0.7700		73.2028	(79)
Solar gains	73.2028	124.6915	170.6083	211.3920	236.7767	235.0644	226.6272	207.6891	184.7327	137.8107	87.6801	62.6464	(83)
Total gains	442.4235	500.8532	532.3996	560.4931	569.6731	553.7131	534.1736	516.4068	502.1187	468.6393	437.3995	425.1358	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.5666	58.7497	58.9302	59.7934	59.9577	60.7346	60.7346	60.8807	60.4330	59.9577	59.6262	59.2836	
alpha	4.9044	4.9166	4.9287	4.9862	4.9972	5.0490	5.0490	5.0587	5.0289	4.9972	4.9751	4.9522	
util living area	0.9549	0.9219	0.8712	0.7680	0.6240	0.4518	0.3246	0.3499	0.5335	0.7802	0.9167	0.9610	(86)
MIT	20.1934	20.3961	20.6095	20.8296	20.9484	20.9918	20.9987	20.9982	20.9812	20.8435	20.5100	20.1613	(87)
Th 2	20.1296	20.1321	20.1345	20.1460	20.1481	20.1581	20.1581	20.1600	20.1543	20.1481	20.1438	20.1393	(88)
util rest of house	0.9456	0.9071	0.8482	0.7318	0.5748	0.3943	0.2629	0.2866	0.4725	0.7384	0.8986	0.9528	(89)
MIT 2	19.2194	19.4682	19.7245	19.9829	20.1060	20.1532	20.1576	20.1592	20.1418	20.0049	19.6204	19.1875	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.6846	19.9114	20.1472	20.3873	20.5083	20.5537	20.5594	20.5599	20.5427	20.4054	20.0453	19.6526	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6846	19.9114	20.1472	20.3873	20.5083	20.5537	20.5594	20.5599	20.5427	20.4054	20.0453	19.6526	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9400	0.9029	0.8486	0.7425	0.5960	0.4215	0.2924	0.3168	0.5008	0.7517	0.8963	0.9473	(94)
Useful gains	415.8881	452.2079	451.7711	416.1649	339.5353	233.3839	156.1817	163.5963	251.4811	352.2568	392.0212	402.7523	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	630.2297	613.0254	555.6081	460.9226	352.4623	235.1875	156.4059	163.9339	255.7756	392.3605	520.8801	625.3608	(97)
Space heating kWh	159.4701	108.0694	77.2548	32.2255	9.6177	0.0000	0.0000	0.0000	0.0000	29.8372	92.7784	165.6207	(98a)
Space heating requirement - total per year (kWh/year)												674.8738	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	159.4701	108.0694	77.2548	32.2255	9.6177	0.0000	0.0000	0.0000	0.0000	29.8372	92.7784	165.6207	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												674.8738	
Space heating per m2											(98c) / (4) =	15.5644	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	159.4701	108.0694	77.2548	32.2255	9.6177	0.0000	0.0000	0.0000	0.0000	29.8372	92.7784	165.6207	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	172.7737	117.0849	83.6996	34.9139	10.4200	0.0000	0.0000	0.0000	0.0000	32.3263	100.5183	179.4374	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	83.7472	83.1679	82.3765	81.2276	80.2908	79.8000	79.8000	79.8000	79.8000	81.1215	82.8322	83.8532	(217)
Fuel for water heating, kWh/month	219.0524	195.2769	210.1126	189.1146	186.6352	170.5061	169.2907	175.3325	176.4869	192.0452	198.1061	216.6255	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												731.1742	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2298.5849	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2874.8331	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	731.1742	0.2100	153.5466	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2298.5849	0.2100	482.7028	(264)
Space and water heating			636.2494	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			618.5469	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.2700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	731.1742	1.1300	826.2269	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2298.5849	1.1300	2597.4009	(278)
Space and water heating			3423.6278	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3342.1254	(286)
Target Primary Energy Rate (TPER)			77.0800	(287)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	0.93	**TER**	14.27
Environmental	99 A	**% DER < TER**			93.48
CO_2 Emissions (t/year)	0.02	**DFEE**	13.81	**TFEE**	23.94
Compliance Check	See BREL	**% DFEE < TFEE**			42.32
% DPER < TPER	73.69	**DPER**	20.28	**TPER**	77.08

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	6.5100	36.7938	0.6800	0.7000	0.7700	79.0126	(79)

Solar gains	79.0126	134.5876	184.1487	228.1691	255.5685	253.7203	244.6135	224.1724	199.3941	148.7480	94.6389	67.6183	(83)
Total gains	497.7734	551.4570	589.3328	611.5393	617.9891	597.1731	576.9627	559.0966	545.4189	514.3393	483.8657	477.3354	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451

util living area													
	0.8655	0.7992	0.7051	0.5832	0.4487	0.3205	0.2282	0.2462	0.3781	0.5950	0.7907	0.8852	(86)
MIT	20.7746	20.8657	20.9400	20.9822	20.9968	20.9997	21.0000	21.0000	20.9991	20.9830	20.8909	20.7376	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house													
	0.8479	0.7774	0.6791	0.5539	0.4178	0.2880	0.1945	0.2114	0.3426	0.5604	0.7650	0.8691	(89)
MIT 2	20.1052	20.2084	20.2898	20.3333	20.3470	20.3494	20.3496	20.3495	20.3490	20.3348	20.2390	20.0624	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.4249	20.5223	20.6003	20.6433	20.6574	20.6600	20.6602	20.6602	20.6595	20.6444	20.5504	20.3849	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4249	20.5223	20.6003	20.6433	20.6574	20.6600	20.6602	20.6602	20.6595	20.6444	20.5504	20.3849	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8500	0.7833	0.6893	0.5672	0.4325	0.3036	0.2106	0.2280	0.3595	0.5762	0.7732	0.8700	(94)
Useful gains	423.1307	431.9739	406.2007	346.8822	267.2809	181.2726	121.4924	127.4734	196.0940	296.3528	374.1059	415.3021	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	482.5207	467.4809	421.9369	351.4042	268.0400	181.3382	121.4973	127.4817	196.2859	300.5675	402.4879	484.3150	(97)
Space heating kWh													
	44.1862	23.8607	11.7077	3.2558	0.5648	0.0000	0.0000	0.0000	0.0000	3.1357	20.4350	51.3456	(98a)
Space heating requirement - total per year (kWh/year)												158.4916	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	44.1862	23.8607	11.7077	3.2558	0.5648	0.0000	0.0000	0.0000	0.0000	3.1357	20.4350	51.3456	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												158.4916	
Space heating per m2											(98c) / (4) =	3.6552	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	44.1862	23.8607	11.7077	3.2558	0.5648	0.0000	0.0000	0.0000	0.0000	3.1357	20.4350	51.3456	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	66.2792	35.7910	17.5615	4.8838	0.8471	0.0000	0.0000	0.0000	0.0000	4.7036	30.6526	77.0185	
Space heating requirement													
	66.2792	35.7910	17.5615	4.8838	0.8471	0.0000	0.0000	0.0000	0.0000	4.7036	30.6526	77.0185	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												237.7374	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												2.3774	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2703.6001	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	237.7374	4.4400	10.5555	(340a)
Space heating total			10.5555	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			173.8889	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7085 (357)
SAP value		88.5158
SAP rating (Section 12)		89 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	938.4575	0.1592	10.0932	(367)
Electrical energy for heat distribution (space & water)	2.3774	0.0000	4.9964	(372)
Overall CO2 factor for heat network			0.0393	(386)
Total CO2 associated with community systems			138.2329	(373)
Space and water heating			138.2329	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			37.7052	(383)
CO2 emissions per m2			0.8700	(384)
EI value			99.4282	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	43.3600 (1b)	x 2.4500 (2b)	= 106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)

Adj infilt rate

	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104 (22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)

Heat transfer coeff

	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)

Average = Sum(39)m / 12 = 29.9239

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m													
	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Total per year (kWh/year) = Sum(64)m = 2187.6523 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)												
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874 (72)
Total internal gains												
	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	6.5100	42.9509	0.6800	0.7000	0.7700	92.2346	(79)

Solar gains	92.2346	139.6167	188.6581	237.9251	258.4168	276.0712	260.8108	242.3337	216.0832	162.8736	108.8094	79.4115 (83)
Total gains	510.9954	556.4860	593.8423	621.2953	620.8375	619.5239	593.1600	577.2579	562.1080	528.4649	498.0363	489.1286 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area													
	0.8458	0.7845	0.6809	0.5570	0.4231	0.2801	0.1967	0.2125	0.3511	0.5542	0.7594	0.8679	(86)
MIT	20.8084	20.8815	20.9522	20.9867	20.9978	20.9999	21.0000	21.0000	20.9995	20.9890	20.9157	20.7734	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house													
	0.8265	0.7618	0.6539	0.5276	0.3922	0.2487	0.1639	0.1788	0.3166	0.5196	0.7320	0.8502	(89)
MIT 2	20.1441	20.2261	20.3027	20.3376	20.3479	20.3495	20.3496	20.3496	20.3492	20.3403	20.2658	20.1042	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.4614	20.5391	20.6129	20.6476	20.6583	20.6601	20.6602	20.6602	20.6598	20.6502	20.5762	20.4239	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4614	20.5391	20.6129	20.6476	20.6583	20.6601	20.6602	20.6602	20.6598	20.6502	20.5762	20.4239	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8300	0.7686	0.6649	0.5411	0.4069	0.2637	0.1796	0.1949	0.3330	0.5357	0.7418	0.8523	(94)
Useful gains	424.1160	427.7070	394.8655	336.1928	252.6006	163.3629	106.5341	112.5176	187.2001	283.0942	369.4231	416.8848	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	474.6347	459.0064	407.3507	339.5644	253.1064	163.3884	106.5358	112.5204	187.3172	285.7783	391.2911	476.5040	(97)
Space heating kWh													
	37.5859	21.0332	9.2890	2.4275	0.3763	0.0000	0.0000	0.0000	0.0000	1.9969	15.7449	44.3567	(98a)
Space heating requirement - total per year (kWh/year)												132.8105	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	37.5859	21.0332	9.2890	2.4275	0.3763	0.0000	0.0000	0.0000	0.0000	1.9969	15.7449	44.3567	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												132.8105	
Space heating per m2											(98c) / (4) =	3.0630	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	37.5859	21.0332	9.2890	2.4275	0.3763	0.0000	0.0000	0.0000	0.0000	1.9969	15.7449	44.3567	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	56.3789	31.5498	13.9334	3.6413	0.5644	0.0000	0.0000	0.0000	0.0000	2.9954	23.6174	66.5351	
Space heating requirement													
	56.3789	31.5498	13.9334	3.6413	0.5644	0.0000	0.0000	0.0000	0.0000	2.9954	23.6174	66.5351	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	199.2157	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	1.9922	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(330a)
Total electricity for the above, kWh/year	11.9235	(331)
Electricity for lighting (calculated in Appendix L)	130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2568.5524	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	199.2157	6.5500	13.0486	(340a)
Space heating total			13.0486	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			213.4497	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	928.1851	0.1595	8.4756	(367)
Electrical energy for heat distribution (space & water)	1.9922	0.0000	4.9357	(372)
Overall CO2 factor for heat network			0.0392	(386)
Total CO2 associated with community systems			136.5547	(373)
Space and water heating			136.5547	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			23.7948	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	928.1851	1.5905	84.4958	(467)
Electrical energy for heat distribution (space & water)	1.9922	0.0000	53.0583	(472)
Overall CO2 factor for heat network			0.4217	(486)
Total CO2 associated with community systems			1467.9471	(473)
Space and water heating			1467.9471	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			763.6221	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Northeast

Current energy efficiency rating:	B 89
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 89
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£41	£41	£0
Community scheme	£332	£332	£0
Space heating	£120	£120	£0
Water heating	£215	£215	£0
Lighting	£37	£37	£0
Generated (PV)	-£159	-£159	£0
Total cost of fuels	£214	£214	£0
Total cost of uses	£213	£213	£0
Delivered energy	59 kWh/m²	59 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.0 tonnes	0.0 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	18 kWh/m²	18 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)

Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	11.4002	(33)
Main dwelling					
Party Wall	31.3600	0.0000	0.0000	70.0000	2195.2000 (32)
Party Floor	43.3600			70.0000	3035.2000 (32d)
Party Ceiling 1	43.3600			30.0000	1300.8000 (32b)
Internal TF Wall	68.4500			9.0000	616.0500 (32c)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =		8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K					199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)					0.9954 (36)
Point Thermal bridges				(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =		12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	6.5100	36.7938	0.6800	0.7000	0.7700	79.0126	(79)

Solar gains	79.0126	134.5876	184.1487	228.1691	255.5685	253.7203	244.6135	224.1724	199.3941	148.7480	94.6389	67.6183	(83)
Total gains	497.7734	551.4570	589.3328	611.5393	617.9891	597.1731	576.9627	559.0966	545.4189	514.3393	483.8657	477.3354	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area													
	0.8655	0.7992	0.7051	0.5832	0.4487	0.3205	0.2282	0.2462	0.3781	0.5950	0.7907	0.8852	(86)
MIT	20.7746	20.8657	20.9400	20.9822	20.9968	20.9997	21.0000	21.0000	20.9991	20.9830	20.8909	20.7376	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house													
	0.8479	0.7774	0.6791	0.5539	0.4178	0.2880	0.1945	0.2114	0.3426	0.5604	0.7650	0.8691	(89)
MIT 2	20.1052	20.2084	20.2898	20.3333	20.3470	20.3494	20.3496	20.3495	20.3490	20.3348	20.2390	20.0624	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.4249	20.5223	20.6003	20.6433	20.6574	20.6600	20.6602	20.6602	20.6595	20.6444	20.5504	20.3849	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4249	20.5223	20.6003	20.6433	20.6574	20.6600	20.6602	20.6602	20.6595	20.6444	20.5504	20.3849	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8500	0.7833	0.6893	0.5672	0.4325	0.3036	0.2106	0.2280	0.3595	0.5762	0.7732	0.8700	(94)
Useful gains	423.1307	431.9739	406.2007	346.8822	267.2809	181.2726	121.4924	127.4734	196.0940	296.3528	374.1059	415.3021	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	482.5207	467.4809	421.9369	351.4042	268.0400	181.3382	121.4973	127.4817	196.2859	300.5675	402.4879	484.3150	(97)
Space heating kWh													
	44.1862	23.8607	11.7077	3.2558	0.5648	0.0000	0.0000	0.0000	0.0000	3.1357	20.4350	51.3456	(98a)
Space heating requirement - total per year (kWh/year)												158.4916	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	44.1862	23.8607	11.7077	3.2558	0.5648	0.0000	0.0000	0.0000	0.0000	3.1357	20.4350	51.3456	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												158.4916	
Space heating per m2											(98c) / (4) =	3.6552	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	44.1862	23.8607	11.7077	3.2558	0.5648	0.0000	0.0000	0.0000	0.0000	3.1357	20.4350	51.3456	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	66.2792	35.7910	17.5615	4.8838	0.8471	0.0000	0.0000	0.0000	0.0000	4.7036	30.6526	77.0185	
Space heating requirement													
	66.2792	35.7910	17.5615	4.8838	0.8471	0.0000	0.0000	0.0000	0.0000	4.7036	30.6526	77.0185	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												237.7374	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												2.3774	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)

Appendix Q - special features
Energy saved or generated -0.0000 (336)
Energy used 0.0000 (337)
Total delivered energy for all uses 2703.6001 (338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	237.7374	4.4400	10.5555	(340a)
Space heating total			10.5555	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			173.8889	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12): 0.3600 (356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] = 0.7085 (357)
SAP value 88.5158
SAP rating (Section 12) 89 (358)
SAP band B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	938.4575	0.1592	10.0932	(367)
Electrical energy for heat distribution (space & water)	2.3774	0.0000	4.9964	(372)
Overall CO2 factor for heat network			0.0393	(386)
Total CO2 associated with community systems			138.2329	(373)
Space and water heating			138.2329	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			37.7052	(383)
CO2 emissions per m2			0.8700	(384)
EI value			99.4282	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate
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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

Measured/design AP50												3.0000	(17)
Infiltration rate												0.1500	(18)
Number of sides sheltered												3	(19)
Shelter factor									(20) = 1 - [0.075 x (19)] =			0.7750	(20)
Infiltration rate adjusted to include shelter factor									(21) = (18) x (20) =			0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4982	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)

Water heating gains (Table 5)

	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)

Total internal gains

	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	6.5100	42.9509	0.6800	0.7000	0.7700	92.2346	(79)

Solar gains	92.2346	139.6167	188.6581	237.9251	258.4168	276.0712	260.8108	242.3337	216.0832	162.8736	108.8094	79.4115	(83)
Total gains	510.9954	556.4860	593.8423	621.2953	620.8375	619.5239	593.1600	577.2579	562.1080	528.4649	498.0363	489.1286	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area	0.8458	0.7845	0.6809	0.5570	0.4231	0.2801	0.1967	0.2125	0.3511	0.5542	0.7594	0.8679	(86)
MIT	20.8084	20.8815	20.9522	20.9867	20.9978	20.9999	21.0000	21.0000	20.9995	20.9890	20.9157	20.7734	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house	0.8265	0.7618	0.6539	0.5276	0.3922	0.2487	0.1639	0.1788	0.3166	0.5196	0.7320	0.8502	(89)
MIT 2	20.1441	20.2261	20.3027	20.3376	20.3479	20.3495	20.3496	20.3496	20.3492	20.3403	20.2658	20.1042	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.4614	20.5391	20.6129	20.6476	20.6583	20.6601	20.6602	20.6602	20.6598	20.6502	20.5762	20.4239	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4614	20.5391	20.6129	20.6476	20.6583	20.6601	20.6602	20.6602	20.6598	20.6502	20.5762	20.4239	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8300	0.7686	0.6649	0.5411	0.4069	0.2637	0.1796	0.1949	0.3330	0.5357	0.7418	0.8523	(94)
Useful gains	424.1160	427.7070	394.8655	336.1928	252.6006	163.3629	106.5341	112.5176	187.2001	283.0942	369.4231	416.8848	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	474.6347	459.0064	407.3507	339.5644	253.1064	163.3884	106.5358	112.5204	187.3172	285.7783	391.2911	476.5040	(97)
Space heating kWh	37.5859	21.0332	9.2890	2.4275	0.3763	0.0000	0.0000	0.0000	0.0000	1.9969	15.7449	44.3567	(98a)
Space heating requirement - total per year (kWh/year)												132.8105	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	37.5859	21.0332	9.2890	2.4275	0.3763	0.0000	0.0000	0.0000	0.0000	1.9969	15.7449	44.3567	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												132.8105	
Space heating per m2										(98c) / (4) =		3.0630	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement

	37.5859	21.0332	9.2890	2.4275	0.3763	0.0000	0.0000	0.0000	0.0000	1.9969	15.7449	44.3567	(98)

Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50

307a	56.3789	31.5498	13.9334	3.6413	0.5644	0.0000	0.0000	0.0000	0.0000	2.9954	23.6174	66.5351	

Space heating requirement

	56.3789	31.5498	13.9334	3.6413	0.5644	0.0000	0.0000	0.0000	0.0000	2.9954	23.6174	66.5351	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)

Space heating fuel for secondary/supplementary system

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement

	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50

310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	

Water heating fuel

	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)

Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	199.2157	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	1.9922	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(330a)
Total electricity for the above, kWh/year	11.9235	(331)
Electricity for lighting (calculated in Appendix L)	130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2568.5524	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	199.2157	6.5500	13.0486	(340a)
Space heating total			13.0486	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			213.4497	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	928.1851	0.1595	8.4756	(367)
Electrical energy for heat distribution (space & water)	1.9922	0.0000	4.9357	(372)
Overall CO2 factor for heat network			0.0392	(386)
Total CO2 associated with community systems			136.5547	(373)
Space and water heating			136.5547	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			23.7948	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	928.1851	1.5905	84.4958	(467)
Electrical energy for heat distribution (space & water)	1.9922	0.0000	53.0583	(472)
Overall CO2 factor for heat network			0.4217	(486)
Total CO2 associated with community systems			1467.9471	(473)
Space and water heating			1467.9471	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			763.6221	(483)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	0.93	**TER**	14.27
Environmental	99 A	**% DER < TER**			93.48
CO_2 Emissions (t/year)	0.02	**DFEE**	13.81	**TFEE**	23.94
Compliance Check	See BREL	**% DFEE < TFEE**			42.32
% DPER < TPER	73.69	**DPER**	20.28	**TPER**	77.08

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523 (64)
12Total per year (kWh/year)												2188 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.5100	36.7938	0.6800	0.7000	0.7700	79.0126	(77)

Solar gains	79.0126	134.5876	184.1487	228.1691	255.5685	253.7203	244.6135	224.1724	199.3941	148.7480	94.6389	67.6183 (83)
Total gains	456.6035	519.3376	554.3102	585.7083	596.8351	583.8070	563.5301	544.2603	528.2181	487.9469	452.7963	438.4780 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761

alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451		
util living area	0.8996	0.8294	0.7397	0.6067	0.4643	0.3279	0.2336	0.2529	0.3903	0.6240	0.8246	0.9153	(86)
MIT	20.7088	20.8330	20.9219	20.9780	20.9961	20.9996	21.0000	20.9999	20.9989	20.9779	20.8607	20.6683	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house	0.8847	0.8088	0.7139	0.5767	0.4324	0.2946	0.1991	0.2171	0.3537	0.5885	0.8004	0.9021	(89)
MIT 2	20.0291	20.1722	20.2709	20.3293	20.3465	20.3493	20.3495	20.3495	20.3489	20.3303	20.2065	19.9812	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.3538	20.4878	20.5818	20.6391	20.6568	20.6599	20.6602	20.6602	20.6594	20.6396	20.5190	20.3094	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3538	20.4878	20.5818	20.6391	20.6568	20.6599	20.6602	20.6602	20.6594	20.6396	20.5190	20.3094	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8848	0.8134	0.7233	0.5902	0.4475	0.3105	0.2156	0.2342	0.3712	0.6045	0.8069	0.9012	(94)
Useful gains	403.9895	422.4101	400.9087	345.6634	267.1005	181.2621	121.4916	127.4718	196.0506	294.9491	365.3641	395.1431	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	480.3914	466.4473	421.3830	351.2801	268.0218	181.3372	121.4972	127.4815	196.2815	300.4244	401.5473	482.0555	(97)
Space heating kWh	56.8430	29.5931	15.2329	4.0440	0.6854	0.0000	0.0000	0.0000	0.0000	4.0736	26.0519	64.6628	(98a)
Space heating requirement - total per year (kWh/year)												201.1868	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	56.8430	29.5931	15.2329	4.0440	0.6854	0.0000	0.0000	0.0000	0.0000	4.0736	26.0519	64.6628	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												201.1868	
Space heating per m2											(98c) / (4) =	4.6399	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	56.8430	29.5931	15.2329	4.0440	0.6854	0.0000	0.0000	0.0000	0.0000	4.0736	26.0519	64.6628	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	85.2645	44.3896	22.8493	6.0660	1.0282	0.0000	0.0000	0.0000	0.0000	6.1104	39.0779	96.9942	
Space heating requirement	85.2645	44.3896	22.8493	6.0660	1.0282	0.0000	0.0000	0.0000	0.0000	6.1104	39.0779	96.9942	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												301.7802	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												3.0178	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2767.6430	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	955.5356	0.1592	12.8110	(367)
Electrical energy for heat distribution (space & water)	3.0178	0.0000	5.0983	(372)
Overall CO2 factor for heat network			0.0394	(386)
Total CO2 associated with community systems			141.0527	(373)
Space and water heating			141.0527	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			40.5250	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			0.9300	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	955.5356	1.5892	127.8923	(467)
Electrical energy for heat distribution (space & water)	3.0178	0.0000	54.6857	(472)
Overall CO2 factor for heat network			0.4222	(486)
Total CO2 associated with community systems			1512.9711	(473)
Space and water heating			1512.9711	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			879.3762	(483)
Dwelling Primary energy Rate (DPER)			20.2800	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)

Wall to Unheated Common area	16.5900	16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)		33.1800			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		13.7636	(33)
Main dwelling					
Party Wall		31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 199.1940 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	52.2400	0.0700	3.6568
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3858 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 20.1494 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	40.9650	40.8373	40.7122	40.1245	40.0146	39.5027	39.5027	39.4079	39.6999	40.0146	40.2370	40.4696	(39)

Average = Sum(39)m / 12 = 40.1240

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9448	0.9418	0.9389	0.9254	0.9228	0.9110	0.9110	0.9089	0.9156	0.9228	0.9280	0.9333	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)

Energy content (annual) Total = Sum(45)m = 1536.8125

Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)

Total per year (kWh/year) = Sum(64)m = 1875.8483 (64)

12Total per year (kWh/year) 1876 (64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
Southeast					6.5100	36.7938		0.6300	0.7000	0.7700		73.2028	(77)
Solar gains	73.2028	124.6915	170.6083	211.3920	236.7767	235.0644	226.6272	207.6891	184.7327	137.8107	87.6801	62.6464	(83)
Total gains	442.4235	500.8532	532.3996	560.4931	569.6731	553.7131	534.1736	516.4068	502.1187	468.6393	437.3995	425.1358	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.5666	58.7497	58.9302	59.7934	59.9577	60.7346	60.7346	60.8807	60.4330	59.9577	59.6262	59.2836	
alpha	4.9044	4.9166	4.9287	4.9862	4.9972	5.0490	5.0490	5.0587	5.0289	4.9972	4.9751	4.9522	
util living area	0.9549	0.9219	0.8712	0.7680	0.6240	0.4518	0.3246	0.3499	0.5335	0.7802	0.9167	0.9610	(86)
MIT	20.1934	20.3961	20.6095	20.8296	20.9484	20.9918	20.9987	20.9982	20.9812	20.8435	20.5100	20.1613	(87)
Th 2	20.1296	20.1321	20.1345	20.1460	20.1481	20.1581	20.1581	20.1600	20.1543	20.1481	20.1438	20.1393	(88)
util rest of house	0.9456	0.9071	0.8482	0.7318	0.5748	0.3943	0.2629	0.2866	0.4725	0.7384	0.8986	0.9528	(89)
MIT 2	19.2194	19.4682	19.7245	19.9829	20.1060	20.1532	20.1576	20.1592	20.1418	20.0049	19.6204	19.1875	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.6846	19.9114	20.1472	20.3873	20.5083	20.5537	20.5594	20.5599	20.5427	20.4054	20.0453	19.6526	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6846	19.9114	20.1472	20.3873	20.5083	20.5537	20.5594	20.5599	20.5427	20.4054	20.0453	19.6526	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9400	0.9029	0.8486	0.7425	0.5960	0.4215	0.2924	0.3168	0.5008	0.7517	0.8963	0.9473	(94)
Useful gains	415.8881	452.2079	451.7711	416.1649	339.5353	233.3839	156.1817	163.5963	251.4811	352.2568	392.0212	402.7523	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	630.2297	613.0254	555.6081	460.9226	352.4623	235.1875	156.4059	163.9339	255.7756	392.3605	520.8801	625.3608	(97)
Space heating kWh	159.4701	108.0694	77.2548	32.2255	9.6177	0.0000	0.0000	0.0000	0.0000	29.8372	92.7784	165.6207	(98a)
Space heating requirement - total per year (kWh/year)												674.8738	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	159.4701	108.0694	77.2548	32.2255	9.6177	0.0000	0.0000	0.0000	0.0000	29.8372	92.7784	165.6207	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												674.8738	
Space heating per m2											(98c) / (4) =	15.5644	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	159.4701	108.0694	77.2548	32.2255	9.6177	0.0000	0.0000	0.0000	0.0000	29.8372	92.7784	165.6207	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	172.7737	117.0849	83.6996	34.9139	10.4200	0.0000	0.0000	0.0000	0.0000	32.3263	100.5183	179.4374	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	83.7472	83.1679	82.3765	81.2276	80.2908	79.8000	79.8000	79.8000	79.8000	81.1215	82.8322	83.8532	(217)
Fuel for water heating, kWh/month	219.0524	195.2769	210.1126	189.1146	186.6352	170.5061	169.2907	175.3325	176.4869	192.0452	198.1061	216.6255	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												731.1742	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2298.5849	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2874.8331	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	731.1742	0.2100	153.5466	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2298.5849	0.2100	482.7028	(264)
Space and water heating			636.2494	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			618.5469	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.2700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	731.1742	1.1300	826.2269	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2298.5849	1.1300	2597.4009	(278)
Space and water heating			3423.6278	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3342.1254	(286)
Target Primary Energy Rate (TPER)			77.0800	(287)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	0.93	**TER**	14.27
Environmental	99 A	**% DER < TER**			93.48
CO_2 Emissions (t/year)	0.02	**DFEE**	13.81	**TFEE**	23.94
Compliance Check	See BREL	**% DFEE < TFEE**			42.32
% DPER < TPER	73.69	**DPER**	20.28	**TPER**	77.08

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area		Storey height		Volume	
Main dwelling		(m2)		(m)		(m3)	
Ground floor		43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2622	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		8637.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							199.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							0.9954	(36)
Point Thermal bridges					(36a) =		0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		12.3956	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	31.8822	31.8062	31.7316	31.3815	31.3160	31.0111	31.0111	30.9546	31.1285	31.3160	31.4485	31.5871	(39)
Average = Sum(39)m / 12 =												31.3812	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7353	0.7335	0.7318	0.7237	0.7222	0.7152	0.7152	0.7139	0.7179	0.7222	0.7253	0.7285	(40)
HLP (average)												0.7237	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		449.4572	(64a)
Heat gains from water heating, kWh/month	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.4004	291.4783	279.0119	271.5070	258.2448	250.2442	241.2477	240.9702	247.9561	254.7841	268.8582	277.3654	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.5100	36.7938	0.6800	0.7000	0.7700	79.0126	(77)

Solar gains	79.0126	134.5876	184.1487	228.1691	255.5685	253.7203	244.6135	224.1724	199.3941	148.7480	94.6389	67.6183	(83)
Total gains	362.4129	426.0660	463.1606	499.6762	513.8133	503.9646	485.8611	465.1426	447.3502	403.5322	363.4970	344.9837	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.2514	75.4313	75.6085	76.4520	76.6119	77.3652	77.3652	77.5064	77.0733	76.6119	76.2891	75.9545	
alpha	6.0168	6.0288	6.0406	6.0968	6.1075	6.1577	6.1577	6.1671	6.1382	6.1075	6.0859	6.0636	
util living area	0.9662	0.9236	0.8551	0.7200	0.5590	0.3930	0.2808	0.3060	0.4774	0.7533	0.9248	0.9730	(86)
MIT	20.4100	20.6161	20.7925	20.9353	20.9870	20.9987	20.9999	20.9998	20.9960	20.9295	20.6725	20.3678	(87)
Th 2	20.3098	20.3113	20.3128	20.3199	20.3212	20.3274	20.3274	20.3286	20.3250	20.3212	20.3185	20.3157	(88)
util rest of house	0.9594	0.9103	0.8332	0.6877	0.5205	0.3521	0.2379	0.2614	0.4317	0.7161	0.9096	0.9675	(89)

MIT 2	19.7830	19.9800	20.1431	20.2720	20.3130	20.3268	20.3274	20.3285	20.3229	20.2710	20.0425	19.7474	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.0825	20.2838	20.4533	20.5888	20.6349	20.6477	20.6486	20.6491	20.6444	20.5856	20.3434	20.0438	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0825	20.2838	20.4533	20.5888	20.6349	20.6477	20.6486	20.6491	20.6444	20.5856	20.3434	20.0438	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9568	0.9098	0.8379	0.7007	0.5384	0.3716	0.2584	0.2827	0.4534	0.7310	0.9102	0.9649	(94)
Useful gains	346.7733	387.6246	388.0975	350.1387	276.6504	187.2794	125.5286	131.4910	202.8266	294.9847	330.8453	332.8790	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	503.1808	489.3000	442.7608	366.8130	279.8057	187.5472	125.5510	131.5300	203.7174	312.7081	416.4851	500.4580	(97)
Space heating kWh	116.3672	68.3259	40.6695	12.0055	2.3475	0.0000	0.0000	0.0000	0.0000	13.1862	61.6607	124.6787	(98a)
Space heating requirement - total per year (kWh/year)												439.2412	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	116.3672	68.3259	40.6695	12.0055	2.3475	0.0000	0.0000	0.0000	0.0000	13.1862	61.6607	124.6787	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												439.2412	
Space heating per m2											(98c) / (4) =	10.1301	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	291.5043	229.4821	235.2551	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9913	0.9970	0.9958	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	288.9727	228.8045	234.2603	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	560.0270	540.4413	517.6301	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	195.1591	231.8578	210.8271	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	48.7898	57.9645	52.7068	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												159.4610	(107)
Energy for space heating												10.1301	(99)
Energy for space cooling												3.6776	(108)
Total												13.8077	(109)
Fabric Energy Efficiency (DFEE)												13.8	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

---

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	13.7636			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	199.1940	(35)
List of Thermal Bridges		

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	52.2400	0.0700	3.6568
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	6.3858	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	20.1494	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	40.9650	40.8373	40.7122	40.1245	40.0146	39.5027	39.5027	39.4079	39.6999	40.0146	40.2370	40.4696	(39)
Average = Sum(39)m / 12 =												40.1240	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9448	0.9418	0.9389	0.9254	0.9228	0.9110	0.9110	0.9089	0.9156	0.9228	0.9280	0.9333	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4982	(42)

Hot water usage for mixer showers

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												47.0349	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	

Distribution loss (46)m = 0.15 x (45)m

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)

Electric shower(s)

	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												449.4572	(64a)

Heat gains from water heating, kWh/month

	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													

	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931 (72)
Total internal gains	281.3655	289.2254	276.9770	269.4043	256.2100	248.1415	239.2128	238.9354	245.8534	252.7493	266.7555	275.3306 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.5100	36.7938	0.6300	0.7000	0.7700	73.2028	(77)

Solar gains	73.2028	124.6915	170.6083	211.3920	236.7767	235.0644	226.6272	207.6891	184.7327	137.8107	87.6801	62.6464 (83)
Total gains	354.5683	413.9169	447.5854	480.7963	492.9866	483.2059	465.8400	446.6244	430.5862	390.5599	354.4356	337.9769 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.5666	58.7497	58.9302	59.7934	59.9577	60.7346	60.7346	60.8807	60.4330	59.9577	59.6262	59.2836	
alpha	4.9044	4.9166	4.9287	4.9862	4.9972	5.0490	5.0490	5.0587	5.0289	4.9972	4.9751	4.9522	
util living area	0.9804	0.9593	0.9234	0.8370	0.6992	0.5135	0.3715	0.4034	0.6107	0.8585	0.9595	0.9840	(86)
MIT	19.9627	20.1967	20.4535	20.7427	20.9149	20.9855	20.9977	20.9965	20.9660	20.7495	20.3216	19.9265	(87)
Th 2	20.1296	20.1321	20.1345	20.1460	20.1481	20.1581	20.1581	20.1600	20.1543	20.1481	20.1438	20.1393	(88)
util rest of house	0.9759	0.9504	0.9070	0.8055	0.6492	0.4497	0.3012	0.3309	0.5447	0.8240	0.9491	0.9802	(89)
MIT 2	19.1972	19.4267	19.6742	19.9479	20.0924	20.1511	20.1574	20.1588	20.1362	19.9614	19.5606	19.1695	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.5628	19.7945	20.0464	20.3275	20.4852	20.5496	20.5587	20.5589	20.5325	20.3379	19.9241	19.5310	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5628	19.7945	20.0464	20.3275	20.4852	20.5496	20.5587	20.5589	20.5325	20.3379	19.9241	19.5310	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9722	0.9464	0.9052	0.8126	0.6696	0.4797	0.3348	0.3655	0.5748	0.8323	0.9459	0.9769	(94)
Useful gains	344.7187	391.7118	405.1354	390.6917	330.1032	231.8138	155.9604	163.2417	247.5225	325.0584	335.2753	330.1692	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	625.2415	608.2508	551.5045	458.5239	351.5376	235.0270	156.3808	163.8941	255.3695	389.6561	516.0024	620.4399	(97)
Space heating kWh	208.7090	145.5142	108.8985	48.8392	15.9472	0.0000	0.0000	0.0000	0.0000	48.0607	130.1235	215.9614	(98a)
Space heating requirement - total per year (kWh/year)												922.0537	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	208.7090	145.5142	108.8985	48.8392	15.9472	0.0000	0.0000	0.0000	0.0000	48.0607	130.1235	215.9614	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												922.0537	
Space heating per m2										(98c) / (4) =		21.2651	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	371.3254	292.3200	299.5001	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9467	0.9752	0.9681	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	351.5360	285.0707	289.9538	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	538.0433	519.2260	498.1139	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	134.2853	174.2116	154.8711	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	33.5713	43.5529	38.7178	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												115.8420	(107)
Energy for space heating												21.2651	(99)
Energy for space cooling												2.6716	(108)
Total												23.9367	(109)
Fabric Energy Efficiency (TFEE)												23.9	(109)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	0.93	**TER**	14.27
Environmental	99 A	**% DER < TER**			93.48
CO_2 Emissions (t/year)	0.02	**DFEE**	13.81	**TFEE**	23.94
Compliance Check	See BREL	**% DFEE < TFEE**			42.32
% DPER < TPER	73.69	**DPER**	20.28	**TPER**	77.08

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523 (64)
12Total per year (kWh/year)												2188 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.5100	36.7938	0.6800	0.7000	0.7700	79.0126	(77)

Solar gains	79.0126	134.5876	184.1487	228.1691	255.5685	253.7203	244.6135	224.1724	199.3941	148.7480	94.6389	67.6183 (83)
Total gains	456.6035	519.3376	554.3102	585.7083	596.8351	583.8070	563.5301	544.2603	528.2181	487.9469	452.7963	438.4780 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761

alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451		
util living area	0.8996	0.8294	0.7397	0.6067	0.4643	0.3279	0.2336	0.2529	0.3903	0.6240	0.8246	0.9153	(86)
MIT	20.7088	20.8330	20.9219	20.9780	20.9961	20.9996	21.0000	20.9999	20.9989	20.9779	20.8607	20.6683	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house	0.8847	0.8088	0.7139	0.5767	0.4324	0.2946	0.1991	0.2171	0.3537	0.5885	0.8004	0.9021	(89)
MIT 2	20.0291	20.1722	20.2709	20.3293	20.3465	20.3493	20.3495	20.3495	20.3489	20.3303	20.2065	19.9812	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.3538	20.4878	20.5818	20.6391	20.6568	20.6599	20.6602	20.6602	20.6594	20.6396	20.5190	20.3094	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3538	20.4878	20.5818	20.6391	20.6568	20.6599	20.6602	20.6602	20.6594	20.6396	20.5190	20.3094	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8848	0.8134	0.7233	0.5902	0.4475	0.3105	0.2156	0.2342	0.3712	0.6045	0.8069	0.9012	(94)
Useful gains	403.9895	422.4101	400.9087	345.6634	267.1005	181.2621	121.4916	127.4718	196.0506	294.9491	365.3641	395.1431	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	480.3914	466.4473	421.3830	351.2801	268.0218	181.3372	121.4972	127.4815	196.2815	300.4244	401.5473	482.0555	(97)
Space heating kWh	56.8430	29.5931	15.2329	4.0440	0.6854	0.0000	0.0000	0.0000	0.0000	4.0736	26.0519	64.6628	(98a)
Space heating requirement - total per year (kWh/year)												201.1868	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	56.8430	29.5931	15.2329	4.0440	0.6854	0.0000	0.0000	0.0000	0.0000	4.0736	26.0519	64.6628	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												201.1868	
Space heating per m2											(98c) / (4) =	4.6399	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	56.8430	29.5931	15.2329	4.0440	0.6854	0.0000	0.0000	0.0000	0.0000	4.0736	26.0519	64.6628	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	85.2645	44.3896	22.8493	6.0660	1.0282	0.0000	0.0000	0.0000	0.0000	6.1104	39.0779	96.9942	
Space heating requirement	85.2645	44.3896	22.8493	6.0660	1.0282	0.0000	0.0000	0.0000	0.0000	6.1104	39.0779	96.9942	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												301.7802	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												3.0178	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2767.6430	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	955.5356	0.1592	12.8110	(367)
Electrical energy for heat distribution (space & water)	3.0178	0.0000	5.0983	(372)
Overall CO2 factor for heat network			0.0394	(386)
Total CO2 associated with community systems			141.0527	(373)
Space and water heating			141.0527	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			40.5250	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			0.9300	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	955.5356	1.5892	127.8923	(467)
Electrical energy for heat distribution (space & water)	3.0178	0.0000	54.6857	(472)
Overall CO2 factor for heat network			0.4222	(486)
Total CO2 associated with community systems			1512.9711	(473)
Space and water heating			1512.9711	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			879.3762	(483)
Dwelling Primary energy Rate (DPER)			20.2800	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)

Wall to Unheated Common area	16.5900	16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)		33.1800			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		13.7636	(33)
Main dwelling					
Party Wall		31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 199.1940 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	52.2400	0.0700	3.6568
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3858 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 20.1494 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	40.9650	40.8373	40.7122	40.1245	40.0146	39.5027	39.5027	39.4079	39.6999	40.0146	40.2370	40.4696	(39)

Average = Sum(39)m / 12 = 40.1240

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9448	0.9418	0.9389	0.9254	0.9228	0.9110	0.9110	0.9089	0.9156	0.9228	0.9280	0.9333	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)

Energy content (annual) Total = Sum(45)m = 1536.8125

Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)

Total per year (kWh/year) = Sum(64)m = 1875.8483 (64)

12Total per year (kWh/year) 1876 (64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
Southeast					6.5100	36.7938		0.6300	0.7000	0.7700		73.2028	(77)
Solar gains	73.2028	124.6915	170.6083	211.3920	236.7767	235.0644	226.6272	207.6891	184.7327	137.8107	87.6801	62.6464	(83)
Total gains	442.4235	500.8532	532.3996	560.4931	569.6731	553.7131	534.1736	516.4068	502.1187	468.6393	437.3995	425.1358	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.5666	58.7497	58.9302	59.7934	59.9577	60.7346	60.7346	60.8807	60.4330	59.9577	59.6262	59.2836	
alpha	4.9044	4.9166	4.9287	4.9862	4.9972	5.0490	5.0490	5.0587	5.0289	4.9972	4.9751	4.9522	
util living area	0.9549	0.9219	0.8712	0.7680	0.6240	0.4518	0.3246	0.3499	0.5335	0.7802	0.9167	0.9610	(86)
MIT	20.1934	20.3961	20.6095	20.8296	20.9484	20.9918	20.9987	20.9982	20.9812	20.8435	20.5100	20.1613	(87)
Th 2	20.1296	20.1321	20.1345	20.1460	20.1481	20.1581	20.1581	20.1600	20.1543	20.1481	20.1438	20.1393	(88)
util rest of house	0.9456	0.9071	0.8482	0.7318	0.5748	0.3943	0.2629	0.2866	0.4725	0.7384	0.8986	0.9528	(89)
MIT 2	19.2194	19.4682	19.7245	19.9829	20.1060	20.1532	20.1576	20.1592	20.1418	20.0049	19.6204	19.1875	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.6846	19.9114	20.1472	20.3873	20.5083	20.5537	20.5594	20.5599	20.5427	20.4054	20.0453	19.6526	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6846	19.9114	20.1472	20.3873	20.5083	20.5537	20.5594	20.5599	20.5427	20.4054	20.0453	19.6526	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9400	0.9029	0.8486	0.7425	0.5960	0.4215	0.2924	0.3168	0.5008	0.7517	0.8963	0.9473	(94)
Useful gains	415.8881	452.2079	451.7711	416.1649	339.5353	233.3839	156.1817	163.5963	251.4811	352.2568	392.0212	402.7523	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	630.2297	613.0254	555.6081	460.9226	352.4623	235.1875	156.4059	163.9339	255.7756	392.3605	520.8801	625.3608	(97)
Space heating kWh	159.4701	108.0694	77.2548	32.2255	9.6177	0.0000	0.0000	0.0000	0.0000	29.8372	92.7784	165.6207	(98a)
Space heating requirement - total per year (kWh/year)												674.8738	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	159.4701	108.0694	77.2548	32.2255	9.6177	0.0000	0.0000	0.0000	0.0000	29.8372	92.7784	165.6207	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												674.8738	
Space heating per m2											(98c) / (4) =	15.5644	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	159.4701	108.0694	77.2548	32.2255	9.6177	0.0000	0.0000	0.0000	0.0000	29.8372	92.7784	165.6207	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	172.7737	117.0849	83.6996	34.9139	10.4200	0.0000	0.0000	0.0000	0.0000	32.3263	100.5183	179.4374	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	83.7472	83.1679	82.3765	81.2276	80.2908	79.8000	79.8000	79.8000	79.8000	81.1215	82.8322	83.8532	(217)
Fuel for water heating, kWh/month	219.0524	195.2769	210.1126	189.1146	186.6352	170.5061	169.2907	175.3325	176.4869	192.0452	198.1061	216.6255	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												731.1742	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2298.5849	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2874.8331	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	731.1742	0.2100	153.5466	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2298.5849	0.2100	482.7028	(264)
Space and water heating			636.2494	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			618.5469	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.2700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	731.1742	1.1300	826.2269	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2298.5849	1.1300	2597.4009	(278)
Space and water heating			3423.6278	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3342.1254	(286)
Target Primary Energy Rate (TPER)			77.0800	(287)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	0.93	**TER**	14.27
Environmental	99 A	**% DER < TER**			93.48
CO_2 Emissions (t/year)	0.02	**DFEE**	13.81	**TFEE**	23.94
Compliance Check	See BREL	**% DFEE < TFEE**			42.32
% DPER < TPER	73.69	**DPER**	20.28	**TPER**	77.08

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		8637.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							199.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							0.9954	(36)
Point Thermal bridges					(36a) =		0.0000	

Total fabric heat loss (33) + (36) + (36a) = 12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.5100	36.7938	0.6800	0.7000	0.7700	79.0126	(77)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	79.0126	134.5876	184.1487	228.1691	255.5685	253.7203	244.6135	224.1724	199.3941	148.7480	94.6389	67.6183	(83)
Total gains	497.7734	551.4570	589.3328	611.5393	617.9891	597.1731	576.9627	559.0966	545.4189	514.3393	483.8657	477.3354	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451

util living area													
	0.8655	0.7992	0.7051	0.5832	0.4487	0.3205	0.2282	0.2462	0.3781	0.5950	0.7907	0.8852	(86)
MIT	20.7746	20.8657	20.9400	20.9822	20.9968	20.9997	21.0000	21.0000	20.9991	20.9830	20.8909	20.7376	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house													
	0.8479	0.7774	0.6791	0.5539	0.4178	0.2880	0.1945	0.2114	0.3426	0.5604	0.7650	0.8691	(89)
MIT 2	20.1052	20.2084	20.2898	20.3333	20.3470	20.3494	20.3496	20.3495	20.3490	20.3348	20.2390	20.0624	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.4249	20.5223	20.6003	20.6433	20.6574	20.6600	20.6602	20.6602	20.6595	20.6444	20.5504	20.3849	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4249	20.5223	20.6003	20.6433	20.6574	20.6600	20.6602	20.6602	20.6595	20.6444	20.5504	20.3849	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8500	0.7833	0.6893	0.5672	0.4325	0.3036	0.2106	0.2280	0.3595	0.5762	0.7732	0.8700	(94)
Useful gains	423.1307	431.9739	406.2007	346.8822	267.2809	181.2726	121.4924	127.4734	196.0940	296.3528	374.1059	415.3021	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	482.5207	467.4809	421.9369	351.4042	268.0400	181.3382	121.4973	127.4817	196.2859	300.5675	402.4879	484.3150	(97)
Space heating kWh													
	44.1862	23.8607	11.7077	3.2558	0.5648	0.0000	0.0000	0.0000	0.0000	3.1357	20.4350	51.3456	(98a)
Space heating requirement - total per year (kWh/year)												158.4916	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	44.1862	23.8607	11.7077	3.2558	0.5648	0.0000	0.0000	0.0000	0.0000	3.1357	20.4350	51.3456	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												158.4916	
Space heating per m2											(98c) / (4) =	3.6552	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	44.1862	23.8607	11.7077	3.2558	0.5648	0.0000	0.0000	0.0000	0.0000	3.1357	20.4350	51.3456	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	66.2792	35.7910	17.5615	4.8838	0.8471	0.0000	0.0000	0.0000	0.0000	4.7036	30.6526	77.0185	
Space heating requirement													
	66.2792	35.7910	17.5615	4.8838	0.8471	0.0000	0.0000	0.0000	0.0000	4.7036	30.6526	77.0185	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												237.7374	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												2.3774	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2703.6001	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	237.7374	4.4400	10.5555	(340a)
Space heating total			10.5555	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			173.8889	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7085 (357)
SAP value		88.5158
SAP rating (Section 12)		89 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	938.4575	0.1592	10.0932	(367)
Electrical energy for heat distribution (space & water)	2.3774	0.0000	4.9964	(372)
Overall CO2 factor for heat network			0.0393	(386)
Total CO2 associated with community systems			138.2329	(373)
Space and water heating			138.2329	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			37.7052	(383)
CO2 emissions per m2			0.8700	(384)
EI value			99.4282	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	43.3600 (1b)	x 2.4500 (2b)	= 106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)

Adj infilt rate

	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104 (22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)

Heat transfer coeff

	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)

Average = Sum(39)m / 12 = 29.9239

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m													
	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Total per year (kWh/year) = Sum(64)m = 2187.6523 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.5100	42.9509	0.6800	0.7000	0.7700	92.2346	(77)

Solar gains	92.2346	139.6167	188.6581	237.9251	258.4168	276.0712	260.8108	242.3337	216.0832	162.8736	108.8094	79.4115	(83)
Total gains	510.9954	556.4860	593.8423	621.2953	620.8375	619.5239	593.1600	577.2579	562.1080	528.4649	498.0363	489.1286	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area													
	0.8458	0.7845	0.6809	0.5570	0.4231	0.2801	0.1967	0.2125	0.3511	0.5542	0.7594	0.8679	(86)
MIT	20.8084	20.8815	20.9522	20.9867	20.9978	20.9999	21.0000	21.0000	20.9995	20.9890	20.9157	20.7734	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house													
	0.8265	0.7618	0.6539	0.5276	0.3922	0.2487	0.1639	0.1788	0.3166	0.5196	0.7320	0.8502	(89)
MIT 2	20.1441	20.2261	20.3027	20.3376	20.3479	20.3495	20.3496	20.3496	20.3492	20.3403	20.2658	20.1042	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.4614	20.5391	20.6129	20.6476	20.6583	20.6601	20.6602	20.6602	20.6598	20.6502	20.5762	20.4239	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4614	20.5391	20.6129	20.6476	20.6583	20.6601	20.6602	20.6602	20.6598	20.6502	20.5762	20.4239	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8300	0.7686	0.6649	0.5411	0.4069	0.2637	0.1796	0.1949	0.3330	0.5357	0.7418	0.8523	(94)
Useful gains	424.1160	427.7070	394.8655	336.1928	252.6006	163.3629	106.5341	112.5176	187.2001	283.0942	369.4231	416.8848	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	474.6347	459.0064	407.3507	339.5644	253.1064	163.3884	106.5358	112.5204	187.3172	285.7783	391.2911	476.5040	(97)
Space heating kWh													
	37.5859	21.0332	9.2890	2.4275	0.3763	0.0000	0.0000	0.0000	0.0000	1.9969	15.7449	44.3567	(98a)
Space heating requirement - total per year (kWh/year)												132.8105	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	37.5859	21.0332	9.2890	2.4275	0.3763	0.0000	0.0000	0.0000	0.0000	1.9969	15.7449	44.3567	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												132.8105	
Space heating per m2											(98c) / (4) =	3.0630	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	37.5859	21.0332	9.2890	2.4275	0.3763	0.0000	0.0000	0.0000	0.0000	1.9969	15.7449	44.3567	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	56.3789	31.5498	13.9334	3.6413	0.5644	0.0000	0.0000	0.0000	0.0000	2.9954	23.6174	66.5351	
Space heating requirement													
	56.3789	31.5498	13.9334	3.6413	0.5644	0.0000	0.0000	0.0000	0.0000	2.9954	23.6174	66.5351	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	199.2157	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	1.9922	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(330a)
Total electricity for the above, kWh/year	11.9235	(331)
Electricity for lighting (calculated in Appendix L)	130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2568.5524	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	199.2157	6.5500	13.0486	(340a)
Space heating total			13.0486	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			213.4497	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	928.1851	0.1595	8.4756	(367)
Electrical energy for heat distribution (space & water)	1.9922	0.0000	4.9357	(372)
Overall CO2 factor for heat network			0.0392	(386)
Total CO2 associated with community systems			136.5547	(373)
Space and water heating			136.5547	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			23.7948	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	928.1851	1.5905	84.4958	(467)
Electrical energy for heat distribution (space & water)	1.9922	0.0000	53.0583	(472)
Overall CO2 factor for heat network			0.4217	(486)
Total CO2 associated with community systems			1467.9471	(473)
Space and water heating			1467.9471	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			763.6221	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Northwest

Current energy efficiency rating:	B 89
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 89
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£41	£41	£0
Community scheme	£332	£332	£0
Space heating	£120	£120	£0
Water heating	£215	£215	£0
Lighting	£37	£37	£0
Generated (PV)	-£159	-£159	£0
Total cost of fuels	£214	£214	£0
Total cost of uses	£213	£213	£0
Delivered energy	59 kWh/m²	59 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.0 tonnes	0.0 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	18 kWh/m²	18 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)

Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	11.4002	(33)
Main dwelling					
Party Wall	31.3600	0.0000	0.0000	70.0000	2195.2000 (32)
Party Floor	43.3600			70.0000	3035.2000 (32d)
Party Ceiling 1	43.3600			30.0000	1300.8000 (32b)
Internal TF Wall	68.4500			9.0000	616.0500 (32c)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =		8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K					199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)					0.9954 (36)
Point Thermal bridges				(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =		12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.5100	36.7938	0.6800	0.7000	0.7700	79.0126	(77)

Solar gains	79.0126	134.5876	184.1487	228.1691	255.5685	253.7203	244.6135	224.1724	199.3941	148.7480	94.6389	67.6183	(83)
Total gains	497.7734	551.4570	589.3328	611.5393	617.9891	597.1731	576.9627	559.0966	545.4189	514.3393	483.8657	477.3354	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area													
	0.8655	0.7992	0.7051	0.5832	0.4487	0.3205	0.2282	0.2462	0.3781	0.5950	0.7907	0.8852	(86)
MIT	20.7746	20.8657	20.9400	20.9822	20.9968	20.9997	21.0000	21.0000	20.9991	20.9830	20.8909	20.7376	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house													
	0.8479	0.7774	0.6791	0.5539	0.4178	0.2880	0.1945	0.2114	0.3426	0.5604	0.7650	0.8691	(89)
MIT 2	20.1052	20.2084	20.2898	20.3333	20.3470	20.3494	20.3496	20.3495	20.3490	20.3348	20.2390	20.0624	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.4249	20.5223	20.6003	20.6433	20.6574	20.6600	20.6602	20.6602	20.6595	20.6444	20.5504	20.3849	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4249	20.5223	20.6003	20.6433	20.6574	20.6600	20.6602	20.6602	20.6595	20.6444	20.5504	20.3849	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8500	0.7833	0.6893	0.5672	0.4325	0.3036	0.2106	0.2280	0.3595	0.5762	0.7732	0.8700	(94)
Useful gains	423.1307	431.9739	406.2007	346.8822	267.2809	181.2726	121.4924	127.4734	196.0940	296.3528	374.1059	415.3021	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	482.5207	467.4809	421.9369	351.4042	268.0400	181.3382	121.4973	127.4817	196.2859	300.5675	402.4879	484.3150	(97)
Space heating kWh													
	44.1862	23.8607	11.7077	3.2558	0.5648	0.0000	0.0000	0.0000	0.0000	3.1357	20.4350	51.3456	(98a)
Space heating requirement - total per year (kWh/year)												158.4916	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	44.1862	23.8607	11.7077	3.2558	0.5648	0.0000	0.0000	0.0000	0.0000	3.1357	20.4350	51.3456	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												158.4916	
Space heating per m2											(98c) / (4) =	3.6552	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	44.1862	23.8607	11.7077	3.2558	0.5648	0.0000	0.0000	0.0000	0.0000	3.1357	20.4350	51.3456	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	66.2792	35.7910	17.5615	4.8838	0.8471	0.0000	0.0000	0.0000	0.0000	4.7036	30.6526	77.0185	
Space heating requirement													
	66.2792	35.7910	17.5615	4.8838	0.8471	0.0000	0.0000	0.0000	0.0000	4.7036	30.6526	77.0185	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												237.7374	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												2.3774	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)

Appendix Q - special features
Energy saved or generated -0.0000 (336)
Energy used 0.0000 (337)
Total delivered energy for all uses 2703.6001 (338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	237.7374	4.4400	10.5555	(340a)
Space heating total			10.5555	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			173.8889	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12): 0.3600 (356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] = 0.7085 (357)
SAP value 88.5158
SAP rating (Section 12) 89 (358)
SAP band B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	938.4575	0.1592	10.0932	(367)
Electrical energy for heat distribution (space & water)	2.3774	0.0000	4.9964	(372)
Overall CO2 factor for heat network			0.0393	(386)
Total CO2 associated with community systems			138.2329	(373)
Space and water heating			138.2329	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			37.7052	(383)
CO2 emissions per m2			0.8700	(384)
EI value			99.4282	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate
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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

Measured/design AP50												3.0000	(17)
Infiltration rate												0.1500	(18)
Number of sides sheltered												3	(19)
Shelter factor									(20) = 1 - [0.075 x (19)] =			0.7750	(20)
Infiltration rate adjusted to include shelter factor									(21) = (18) x (20) =			0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4982	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)

Water heating gains (Table 5)

	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)

Total internal gains

	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.5100	42.9509	0.6800	0.7000	0.7700	92.2346	(77)

Solar gains	92.2346	139.6167	188.6581	237.9251	258.4168	276.0712	260.8108	242.3337	216.0832	162.8736	108.8094	79.4115	(83)
Total gains	510.9954	556.4860	593.8423	621.2953	620.8375	619.5239	593.1600	577.2579	562.1080	528.4649	498.0363	489.1286	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area	0.8458	0.7845	0.6809	0.5570	0.4231	0.2801	0.1967	0.2125	0.3511	0.5542	0.7594	0.8679	(86)
MIT	20.8084	20.8815	20.9522	20.9867	20.9978	20.9999	21.0000	21.0000	20.9995	20.9890	20.9157	20.7734	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house	0.8265	0.7618	0.6539	0.5276	0.3922	0.2487	0.1639	0.1788	0.3166	0.5196	0.7320	0.8502	(89)
MIT 2	20.1441	20.2261	20.3027	20.3376	20.3479	20.3495	20.3496	20.3496	20.3492	20.3403	20.2658	20.1042	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.4614	20.5391	20.6129	20.6476	20.6583	20.6601	20.6602	20.6602	20.6598	20.6502	20.5762	20.4239	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4614	20.5391	20.6129	20.6476	20.6583	20.6601	20.6602	20.6602	20.6598	20.6502	20.5762	20.4239	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8300	0.7686	0.6649	0.5411	0.4069	0.2637	0.1796	0.1949	0.3330	0.5357	0.7418	0.8523	(94)
Useful gains	424.1160	427.7070	394.8655	336.1928	252.6006	163.3629	106.5341	112.5176	187.2001	283.0942	369.4231	416.8848	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	474.6347	459.0064	407.3507	339.5644	253.1064	163.3884	106.5358	112.5204	187.3172	285.7783	391.2911	476.5040	(97)
Space heating kWh	37.5859	21.0332	9.2890	2.4275	0.3763	0.0000	0.0000	0.0000	0.0000	1.9969	15.7449	44.3567	(98a)
Space heating requirement - total per year (kWh/year)												132.8105	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	37.5859	21.0332	9.2890	2.4275	0.3763	0.0000	0.0000	0.0000	0.0000	1.9969	15.7449	44.3567	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												132.8105	
Space heating per m2										(98c) / (4) =		3.0630	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement

	37.5859	21.0332	9.2890	2.4275	0.3763	0.0000	0.0000	0.0000	0.0000	1.9969	15.7449	44.3567	(98)

Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50

307a	56.3789	31.5498	13.9334	3.6413	0.5644	0.0000	0.0000	0.0000	0.0000	2.9954	23.6174	66.5351	

Space heating requirement

	56.3789	31.5498	13.9334	3.6413	0.5644	0.0000	0.0000	0.0000	0.0000	2.9954	23.6174	66.5351	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)

Space heating fuel for secondary/supplementary system

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement

	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50

310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	

Water heating fuel

	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)

Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	199.2157	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	1.9922	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(330a)
Total electricity for the above, kWh/year	11.9235	(331)
Electricity for lighting (calculated in Appendix L)	130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2568.5524	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	199.2157	6.5500	13.0486	(340a)
Space heating total			13.0486	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			213.4497	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	928.1851	0.1595	8.4756	(367)
Electrical energy for heat distribution (space & water)	1.9922	0.0000	4.9357	(372)
Overall CO2 factor for heat network			0.0392	(386)
Total CO2 associated with community systems			136.5547	(373)
Space and water heating			136.5547	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			23.7948	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	928.1851	1.5905	84.4958	(467)
Electrical energy for heat distribution (space & water)	1.9922	0.0000	53.0583	(472)
Overall CO2 factor for heat network			0.4217	(486)
Total CO2 associated with community systems			1467.9471	(473)
Space and water heating			1467.9471	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			763.6221	(483)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.11	**TER**	15.24
Environmental	99 A	**% DER < TER**			92.72
CO_2 Emissions (t/year)	0.03	**DFEE**	17.36	**TFEE**	28.76
Compliance Check	See BREL	**% DFEE < TFEE**			39.64
% DPER < TPER	73.23	**DPER**	22.04	**TPER**	82.33

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
12Total per year (kWh/year)												2188	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.5100	10.6334	0.6800	0.7000	0.7700	22.8346	(74)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	22.8346	43.6381	74.1517	119.1067	160.4476	171.7639	160.3635	127.2280	89.1544	51.9454	28.1694	19.0360	(83)
Total gains	400.4255	428.3880	444.3132	476.6458	501.7142	501.8506	479.2802	447.3160	417.9784	391.1442	386.3268	389.8957	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761

alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451		
util living area	0.9394	0.9090	0.8534	0.7228	0.5487	0.3811	0.2747	0.3076	0.4911	0.7488	0.8936	0.9471	(86)
MIT	20.5956	20.6978	20.8209	20.9426	20.9902	20.9991	20.9999	20.9998	20.9961	20.9400	20.7686	20.5633	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house	0.9288	0.8945	0.8320	0.6915	0.5121	0.3426	0.2341	0.2642	0.4459	0.7125	0.8748	0.9376	(89)
MIT 2	19.8947	20.0173	20.1616	20.2949	20.3416	20.3490	20.3495	20.3495	20.3469	20.2948	20.1039	19.8555	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.2295	20.3423	20.4765	20.6043	20.6514	20.6595	20.6602	20.6601	20.6570	20.6030	20.4213	20.1936	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2295	20.3423	20.4765	20.6043	20.6514	20.6595	20.6602	20.6601	20.6570	20.6030	20.4213	20.1936	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9267	0.8943	0.8364	0.7040	0.5292	0.3610	0.2535	0.2849	0.4674	0.7270	0.8770	0.9351	(94)
Useful gains	371.0723	383.0977	371.6123	335.5673	265.5092	181.1436	121.4811	127.4473	195.3489	284.3627	338.8113	364.6002	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	476.6722	462.0939	418.2325	350.2380	267.8611	181.3251	121.4961	127.4789	196.2103	299.3275	398.6265	478.5896	(97)
Space heating kWh	78.5663	53.0854	34.6854	10.5629	1.7498	0.0000	0.0000	0.0000	0.0000	11.1338	43.0670	84.8082	(98a)
Space heating requirement - total per year (kWh/year)												317.6588	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	78.5663	53.0854	34.6854	10.5629	1.7498	0.0000	0.0000	0.0000	0.0000	11.1338	43.0670	84.8082	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												317.6588	
Space heating per m2											(98c) / (4) =	7.3261	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	78.5663	53.0854	34.6854	10.5629	1.7498	0.0000	0.0000	0.0000	0.0000	11.1338	43.0670	84.8082	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	117.8495	79.6281	52.0281	15.8444	2.6247	0.0000	0.0000	0.0000	0.0000	16.7007	64.6005	127.2122	
Space heating requirement	117.8495	79.6281	52.0281	15.8444	2.6247	0.0000	0.0000	0.0000	0.0000	16.7007	64.6005	127.2122	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												476.4882	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												4.7649	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2942.3510	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1002.1244	0.1580	20.0757	(367)
Electrical energy for heat distribution (space & water)	4.7649	0.0000	5.3707	(372)
Overall CO2 factor for heat network			0.0395	(386)
Total CO2 associated with community systems			148.5898	(373)
Space and water heating			148.5898	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			48.0621	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.1100	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1002.1244	1.5849	201.3816	(467)
Electrical energy for heat distribution (space & water)	4.7649	0.0000	57.4416	(472)
Overall CO2 factor for heat network			0.4229	(486)
Total CO2 associated with community systems			1589.2162	(473)
Space and water heating			1589.2162	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			955.6214	(483)
Dwelling Primary energy Rate (DPER)			22.0400	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)

Wall to Unheated Common area	16.5900	16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)		33.1800			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		13.7636	(33)
Main dwelling					
Party Wall		31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 199.1940 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	52.2400	0.0700	3.6568
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3858 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 20.1494 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	40.9650	40.8373	40.7122	40.1245	40.0146	39.5027	39.5027	39.4079	39.6999	40.0146	40.2370	40.4696	(39)

Average = Sum(39)m / 12 = 40.1240

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9448	0.9418	0.9389	0.9254	0.9228	0.9110	0.9110	0.9089	0.9156	0.9228	0.9280	0.9333	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)

Energy content (annual) Total = Sum(45)m = 1536.8125

Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)

Total per year (kWh/year) = Sum(64)m = 1875.8483 (64)

12Total per year (kWh/year) 1876 (64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
North					6.5100	10.6334		0.6300	0.7000	0.7700		21.1556	(74)
Solar gains	21.1556	40.4294	68.6994	110.3488	148.6500	159.1342	148.5721	117.8730	82.5989	48.1259	26.0981	17.6363	(83)
Total gains	390.3763	416.5911	430.4906	459.4499	481.5464	477.7828	456.1185	426.5907	399.9848	378.9545	375.8175	380.1258	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.5666	58.7497	58.9302	59.7934	59.9577	60.7346	60.7346	60.8807	60.4330	59.9577	59.6262	59.2836	
alpha	4.9044	4.9166	4.9287	4.9862	4.9972	5.0490	5.0490	5.0587	5.0289	4.9972	4.9751	4.9522	
util living area	0.9716	0.9583	0.9325	0.8551	0.7112	0.5189	0.3793	0.4217	0.6490	0.8697	0.9500	0.9744	(86)
MIT	20.0602	20.2033	20.4169	20.7131	20.9082	20.9848	20.9974	20.9957	20.9555	20.7318	20.3740	20.0435	(87)
Th 2	20.1296	20.1321	20.1345	20.1460	20.1481	20.1581	20.1581	20.1600	20.1543	20.1481	20.1438	20.1393	(88)
util rest of house	0.9652	0.9493	0.9176	0.8254	0.6614	0.4546	0.3076	0.3463	0.5815	0.8366	0.9376	0.9687	(89)
MIT 2	19.0550	19.2352	19.5005	19.8598	20.0705	20.1487	20.1571	20.1581	20.1233	19.8897	19.4589	19.0414	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.5351	19.6976	19.9382	20.2674	20.4706	20.5481	20.5585	20.5582	20.5208	20.2919	19.8960	19.5200	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5351	19.6976	19.9382	20.2674	20.4706	20.5481	20.5585	20.5582	20.5208	20.2919	19.8960	19.5200	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9600	0.9439	0.9138	0.8299	0.6809	0.4847	0.3418	0.3823	0.6116	0.8427	0.9335	0.9637	(94)
Useful gains	374.7583	393.2207	393.3756	381.2958	327.9082	231.6007	155.9078	163.0652	244.6332	319.3583	350.8094	366.3334	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	624.1072	604.2947	547.0998	456.1097	350.9511	234.9642	156.3703	163.8655	254.9059	387.8164	514.8730	619.9937	(97)
Space heating kWh	185.5156	141.8418	114.3708	53.8660	17.1439	0.0000	0.0000	0.0000	0.0000	50.9328	118.1258	188.7233	(98a)
Space heating requirement - total per year (kWh/year)												870.5201	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	185.5156	141.8418	114.3708	53.8660	17.1439	0.0000	0.0000	0.0000	0.0000	50.9328	118.1258	188.7233	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												870.5201	
Space heating per m2											(98c) / (4) =	20.0766	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	185.5156	141.8418	114.3708	53.8660	17.1439	0.0000	0.0000	0.0000	0.0000	50.9328	118.1258	188.7233	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	200.9920	153.6747	123.9120	58.3597	18.5742	0.0000	0.0000	0.0000	0.0000	55.1818	127.9803	204.4673	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.0849	83.7576	83.1532	81.9565	80.6390	79.8000	79.8000	79.8000	79.8000	81.8437	83.3352	84.1456	(217)
Fuel for water heating, kWh/month	218.1726	193.9021	208.1501	187.4326	185.8292	170.5061	169.2907	175.3325	176.4869	190.3506	196.9104	215.8728	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												943.1421	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2288.2366	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3076.4526	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	943.1421	0.2100	198.0598	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2288.2366	0.2100	480.5297	(264)
Space and water heating			678.5895	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			660.8870	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.2400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	943.1421	1.1300	1065.7505	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2288.2366	1.1300	2585.7073	(278)
Space and water heating			3651.4579	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3569.9554	(286)
Target Primary Energy Rate (TPER)			82.3300	(287)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.11	**TER**	15.24
Environmental	99 A	**% DER < TER**			92.72
CO_2 Emissions (t/year)	0.03	**DFEE**	17.36	**TFEE**	28.76
Compliance Check	See BREL	**% DFEE < TFEE**			39.64
% DPER < TPER	73.23	**DPER**	22.04	**TPER**	82.33

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2622	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	31.8822	31.8062	31.7316	31.3815	31.3160	31.0111	31.0111	30.9546	31.1285	31.3160	31.4485	31.5871	(39)
Average = Sum(39)m / 12 =												31.3812	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7353	0.7335	0.7318	0.7237	0.7222	0.7152	0.7152	0.7139	0.7179	0.7222	0.7253	0.7285	(40)
HLP (average)												0.7237	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		449.4572	(64a)
Heat gains from water heating, kWh/month	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.4004	291.4783	279.0119	271.5070	258.2448	250.2442	241.2477	240.9702	247.9561	254.7841	268.8582	277.3654	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.5100	10.6334	0.6800	0.7000	0.7700	22.8346	(74)

Solar gains	22.8346	43.6381	74.1517	119.1067	160.4476	171.7639	160.3635	127.2280	89.1544	51.9454	28.1694	19.0360	(83)
Total gains	306.2350	335.1164	353.1636	390.6137	418.6924	422.0081	401.6112	368.1982	337.1105	306.7295	297.0275	296.4015	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.2514	75.4313	75.6085	76.4520	76.6119	77.3652	77.3652	77.5064	77.0733	76.6119	76.2891	75.9545	
alpha	6.0168	6.0288	6.0406	6.0968	6.1075	6.1577	6.1577	6.1671	6.1382	6.1075	6.0859	6.0636	
util living area	0.9844	0.9717	0.9443	0.8467	0.6706	0.4679	0.3395	0.3860	0.6220	0.8837	0.9674	0.9869	(86)
MIT	20.2524	20.3963	20.5899	20.8410	20.9661	20.9967	20.9996	20.9992	20.9834	20.8226	20.5140	20.2279	(87)
Th 2	20.3098	20.3113	20.3128	20.3199	20.3212	20.3274	20.3274	20.3286	20.3250	20.3212	20.3185	20.3157	(88)
util rest of house	0.9810	0.9657	0.9326	0.8195	0.6284	0.4197	0.2877	0.3300	0.5665	0.8560	0.9593	0.9839	(89)

MIT 2	19.6300	19.7720	19.9599	20.1958	20.2989	20.3258	20.3273	20.3283	20.3159	20.1853	19.8943	19.6109	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.9273	20.0702	20.2608	20.5039	20.6176	20.6462	20.6484	20.6487	20.6347	20.4897	20.1903	19.9056	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9273	20.0702	20.2608	20.5039	20.6176	20.6462	20.6484	20.6487	20.6347	20.4897	20.1903	19.9056	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9787	0.9632	0.9316	0.8272	0.6471	0.4426	0.3124	0.3568	0.5923	0.8634	0.9576	0.9818	(94)
Useful gains	299.7092	322.7957	328.9996	323.1333	270.9561	186.7931	125.4789	131.3699	199.6838	264.8361	284.4336	291.0074	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	498.2324	482.5051	436.6517	364.1488	279.2624	187.5006	125.5459	131.5178	203.4167	309.7070	411.6703	496.0935	(97)
Space heating kWh													
	147.7012	107.3247	80.0932	29.5312	6.1799	0.0000	0.0000	0.0000	0.0000	33.3839	91.6104	152.5841	(98a)
Space heating requirement - total per year (kWh/year)												648.4086	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	147.7012	107.3247	80.0932	29.5312	6.1799	0.0000	0.0000	0.0000	0.0000	33.3839	91.6104	152.5841	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												648.4086	
Space heating per m2											(98c) / (4) =	14.9541	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	291.5043	229.4821	235.2551	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9780	0.9914	0.9849	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	285.0970	227.5144	231.6946	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	464.2337	441.9674	404.3185	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	128.9785	159.5530	128.4322	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	32.2446	39.8883	32.1080	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												104.2409	(107)
Energy for space heating												14.9541	(99)
Energy for space cooling												2.4041	(108)
Total												17.3582	(109)
Fabric Energy Efficiency (DFEE)												17.4	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	13.7636			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	199.1940	(35)
List of Thermal Bridges		

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	52.2400	0.0700	3.6568
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	6.3858	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	20.1494	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	40.9650	40.8373	40.7122	40.1245	40.0146	39.5027	39.5027	39.4079	39.6999	40.0146	40.2370	40.4696	(39)
Average = Sum(39)m / 12 =												40.1240	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9448	0.9418	0.9389	0.9254	0.9228	0.9110	0.9110	0.9089	0.9156	0.9228	0.9280	0.9333	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4982	(42)

Hot water usage for mixer showers

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												47.0349	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	

Distribution loss (46)m = 0.15 x (45)m

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)

Electric shower(s)

	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												449.4572	(64a)

Heat gains from water heating, kWh/month

	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													

	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931 (72)
Total internal gains	281.3655	289.2254	276.9770	269.4043	256.2100	248.1415	239.2128	238.9354	245.8534	252.7493	266.7555	275.3306 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.5100	10.6334	0.6300	0.7000	0.7700	21.1556	(74)

Solar gains	21.1556	40.4294	68.6994	110.3488	148.6500	159.1342	148.5721	117.8730	82.5989	48.1259	26.0981	17.6363	(83)
Total gains	302.5211	329.6548	345.6764	379.7531	404.8599	407.2757	387.7849	356.8084	328.4523	300.8752	292.8536	292.9669	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.5666	58.7497	58.9302	59.7934	59.9577	60.7346	60.7346	60.8807	60.4330	59.9577	59.6262	59.2836	
alpha	4.9044	4.9166	4.9287	4.9862	4.9972	5.0490	5.0490	5.0587	5.0289	4.9972	4.9751	4.9522	
util living area	0.9897	0.9830	0.9691	0.9169	0.7963	0.5983	0.4439	0.4998	0.7505	0.9361	0.9805	0.9911	(86)
MIT	19.8140	19.9714	20.2118	20.5749	20.8459	20.9716	20.9948	20.9908	20.9149	20.5833	20.1578	19.7961	(87)
Th 2	20.1296	20.1321	20.1345	20.1460	20.1481	20.1581	20.1581	20.1600	20.1543	20.1481	20.1438	20.1393	(88)
util rest of house	0.9872	0.9788	0.9611	0.8959	0.7503	0.5279	0.3611	0.4124	0.6836	0.9154	0.9750	0.9889	(89)
MIT 2	19.0512	19.2086	19.4466	19.8022	20.0419	20.1439	20.1565	20.1568	20.1052	19.8177	19.4032	19.0410	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.4156	19.5729	19.8121	20.1712	20.4259	20.5392	20.5569	20.5552	20.4919	20.1834	19.7636	19.4017	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4156	19.5729	19.8121	20.1712	20.4259	20.5392	20.5569	20.5552	20.4919	20.1834	19.7636	19.4017	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9845	0.9755	0.9576	0.8966	0.7662	0.5604	0.4006	0.4540	0.7117	0.9164	0.9719	0.9865	(94)
Useful gains	297.8411	321.5634	331.0104	340.4792	310.1950	228.2476	155.3535	162.0078	233.7730	275.7197	284.6348	289.0256	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	619.2090	599.2032	541.9641	452.2533	349.1637	234.6156	156.3070	163.7462	253.7581	383.4748	509.5470	615.2045	(97)
Space heating kWh	239.0977	186.5740	156.9495	80.4774	28.9928	0.0000	0.0000	0.0000	0.0000	80.1698	161.9368	242.6771	(98a)
Space heating requirement - total per year (kWh/year)												1176.8749	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	239.0977	186.5740	156.9495	80.4774	28.9928	0.0000	0.0000	0.0000	0.0000	80.1698	161.9368	242.6771	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1176.8749	
Space heating per m2										(98c) / (4) =		27.1419	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	371.3254	292.3200	299.5001	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9031	0.9486	0.9255	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	335.3528	277.3059	277.1933	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	449.2937	427.9928	393.1341	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	82.0375	112.1111	86.2599	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	20.5094	28.0278	21.5650	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												70.1021	(107)
Energy for space heating												27.1419	(99)
Energy for space cooling												1.6167	(108)
Total												28.7587	(109)
Fabric Energy Efficiency (TFEE)												28.8	(109)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.11	**TER**	15.24
Environmental	99 A	**% DER < TER**			92.72
CO_2 Emissions (t/year)	0.03	**DFEE**	17.36	**TFEE**	28.76
Compliance Check	See BREL	**% DFEE < TFEE**			39.64
% DPER < TPER	73.23	**DPER**	22.04	**TPER**	82.33

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
12Total per year (kWh/year)												2188	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.5100	10.6334	0.6800	0.7000	0.7700	22.8346	(74)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	22.8346	43.6381	74.1517	119.1067	160.4476	171.7639	160.3635	127.2280	89.1544	51.9454	28.1694	19.0360	(83)
Total gains	400.4255	428.3880	444.3132	476.6458	501.7142	501.8506	479.2802	447.3160	417.9784	391.1442	386.3268	389.8957	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761

alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451		
util living area	0.9394	0.9090	0.8534	0.7228	0.5487	0.3811	0.2747	0.3076	0.4911	0.7488	0.8936	0.9471	(86)
MIT	20.5956	20.6978	20.8209	20.9426	20.9902	20.9991	20.9999	20.9998	20.9961	20.9400	20.7686	20.5633	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house	0.9288	0.8945	0.8320	0.6915	0.5121	0.3426	0.2341	0.2642	0.4459	0.7125	0.8748	0.9376	(89)
MIT 2	19.8947	20.0173	20.1616	20.2949	20.3416	20.3490	20.3495	20.3495	20.3469	20.2948	20.1039	19.8555	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.2295	20.3423	20.4765	20.6043	20.6514	20.6595	20.6602	20.6601	20.6570	20.6030	20.4213	20.1936	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2295	20.3423	20.4765	20.6043	20.6514	20.6595	20.6602	20.6601	20.6570	20.6030	20.4213	20.1936	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9267	0.8943	0.8364	0.7040	0.5292	0.3610	0.2535	0.2849	0.4674	0.7270	0.8770	0.9351	(94)
Useful gains	371.0723	383.0977	371.6123	335.5673	265.5092	181.1436	121.4811	127.4473	195.3489	284.3627	338.8113	364.6002	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	476.6722	462.0939	418.2325	350.2380	267.8611	181.3251	121.4961	127.4789	196.2103	299.3275	398.6265	478.5896	(97)
Space heating kWh	78.5663	53.0854	34.6854	10.5629	1.7498	0.0000	0.0000	0.0000	0.0000	11.1338	43.0670	84.8082	(98a)
Space heating requirement - total per year (kWh/year)												317.6588	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	78.5663	53.0854	34.6854	10.5629	1.7498	0.0000	0.0000	0.0000	0.0000	11.1338	43.0670	84.8082	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												317.6588	
Space heating per m2											(98c) / (4) =	7.3261	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	78.5663	53.0854	34.6854	10.5629	1.7498	0.0000	0.0000	0.0000	0.0000	11.1338	43.0670	84.8082	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	117.8495	79.6281	52.0281	15.8444	2.6247	0.0000	0.0000	0.0000	0.0000	16.7007	64.6005	127.2122	
Space heating requirement	117.8495	79.6281	52.0281	15.8444	2.6247	0.0000	0.0000	0.0000	0.0000	16.7007	64.6005	127.2122	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												476.4882	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												4.7649	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2942.3510	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1002.1244	0.1580	20.0757	(367)
Electrical energy for heat distribution (space & water)	4.7649	0.0000	5.3707	(372)
Overall CO2 factor for heat network			0.0395	(386)
Total CO2 associated with community systems			148.5898	(373)
Space and water heating			148.5898	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			48.0621	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.1100	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1002.1244	1.5849	201.3816	(467)
Electrical energy for heat distribution (space & water)	4.7649	0.0000	57.4416	(472)
Overall CO2 factor for heat network			0.4229	(486)
Total CO2 associated with community systems			1589.2162	(473)
Space and water heating			1589.2162	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			955.6214	(483)
Dwelling Primary energy Rate (DPER)			22.0400	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)

Wall to Unheated Common area	16.5900	16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)		33.1800			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		13.7636	(33)
Main dwelling					
Party Wall		31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 199.1940 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	52.2400	0.0700	3.6568
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3858 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 20.1494 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	40.9650	40.8373	40.7122	40.1245	40.0146	39.5027	39.5027	39.4079	39.6999	40.0146	40.2370	40.4696	(39)

Average = Sum(39)m / 12 = 40.1240

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9448	0.9418	0.9389	0.9254	0.9228	0.9110	0.9110	0.9089	0.9156	0.9228	0.9280	0.9333	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)

Energy content (annual) Total = Sum(45)m = 1536.8125

Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)

Total per year (kWh/year) = Sum(64)m = 1875.8483 (64)

12Total per year (kWh/year) 1876 (64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
North					6.5100	10.6334		0.6300	0.7000	0.7700		21.1556	(74)
Solar gains	21.1556	40.4294	68.6994	110.3488	148.6500	159.1342	148.5721	117.8730	82.5989	48.1259	26.0981	17.6363	(83)
Total gains	390.3763	416.5911	430.4906	459.4499	481.5464	477.7828	456.1185	426.5907	399.9848	378.9545	375.8175	380.1258	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.5666	58.7497	58.9302	59.7934	59.9577	60.7346	60.7346	60.8807	60.4330	59.9577	59.6262	59.2836	
alpha	4.9044	4.9166	4.9287	4.9862	4.9972	5.0490	5.0490	5.0587	5.0289	4.9972	4.9751	4.9522	
util living area	0.9716	0.9583	0.9325	0.8551	0.7112	0.5189	0.3793	0.4217	0.6490	0.8697	0.9500	0.9744	(86)
MIT	20.0602	20.2033	20.4169	20.7131	20.9082	20.9848	20.9974	20.9957	20.9555	20.7318	20.3740	20.0435	(87)
Th 2	20.1296	20.1321	20.1345	20.1460	20.1481	20.1581	20.1581	20.1600	20.1543	20.1481	20.1438	20.1393	(88)
util rest of house	0.9652	0.9493	0.9176	0.8254	0.6614	0.4546	0.3076	0.3463	0.5815	0.8366	0.9376	0.9687	(89)
MIT 2	19.0550	19.2352	19.5005	19.8598	20.0705	20.1487	20.1571	20.1581	20.1233	19.8897	19.4589	19.0414	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.5351	19.6976	19.9382	20.2674	20.4706	20.5481	20.5585	20.5582	20.5208	20.2919	19.8960	19.5200	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5351	19.6976	19.9382	20.2674	20.4706	20.5481	20.5585	20.5582	20.5208	20.2919	19.8960	19.5200	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9600	0.9439	0.9138	0.8299	0.6809	0.4847	0.3418	0.3823	0.6116	0.8427	0.9335	0.9637	(94)
Useful gains	374.7583	393.2207	393.3756	381.2958	327.9082	231.6007	155.9078	163.0652	244.6332	319.3583	350.8094	366.3334	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	624.1072	604.2947	547.0998	456.1097	350.9511	234.9642	156.3703	163.8655	254.9059	387.8164	514.8730	619.9937	(97)
Space heating kWh	185.5156	141.8418	114.3708	53.8660	17.1439	0.0000	0.0000	0.0000	0.0000	50.9328	118.1258	188.7233	(98a)
Space heating requirement - total per year (kWh/year)												870.5201	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	185.5156	141.8418	114.3708	53.8660	17.1439	0.0000	0.0000	0.0000	0.0000	50.9328	118.1258	188.7233	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												870.5201	
Space heating per m2											(98c) / (4) =	20.0766	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	185.5156	141.8418	114.3708	53.8660	17.1439	0.0000	0.0000	0.0000	0.0000	50.9328	118.1258	188.7233	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	200.9920	153.6747	123.9120	58.3597	18.5742	0.0000	0.0000	0.0000	0.0000	55.1818	127.9803	204.4673	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.0849	83.7576	83.1532	81.9565	80.6390	79.8000	79.8000	79.8000	79.8000	81.8437	83.3352	84.1456	(217)
Fuel for water heating, kWh/month	218.1726	193.9021	208.1501	187.4326	185.8292	170.5061	169.2907	175.3325	176.4869	190.3506	196.9104	215.8728	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												943.1421	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2288.2366	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3076.4526	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	943.1421	0.2100	198.0598	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2288.2366	0.2100	480.5297	(264)
Space and water heating			678.5895	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			660.8870	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.2400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	943.1421	1.1300	1065.7505	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2288.2366	1.1300	2585.7073	(278)
Space and water heating			3651.4579	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3569.9554	(286)
Target Primary Energy Rate (TPER)			82.3300	(287)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.11	**TER**	15.24
Environmental	99 A	**% DER < TER**			92.72
CO_2 Emissions (t/year)	0.03	**DFEE**	17.36	**TFEE**	28.76
Compliance Check	See BREL	**% DFEE < TFEE**			39.64
% DPER < TPER	73.23	**DPER**	22.04	**TPER**	82.33

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.5100	10.6334	0.6800	0.7000	0.7700	22.8346	(74)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	22.8346	43.6381	74.1517	119.1067	160.4476	171.7639	160.3635	127.2280	89.1544	51.9454	28.1694	19.0360	(83)
Total gains	441.5954	460.5074	479.3358	502.4769	522.8682	515.2166	492.7128	462.1522	435.1792	417.5366	417.3962	428.7531	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451

util living area													
	0.9111	0.8826	0.8173	0.6929	0.5276	0.3713	0.2672	0.2977	0.4723	0.7121	0.8623	0.9222	(86)
MIT	20.6813	20.7534	20.8621	20.9545	20.9921	20.9993	20.9999	20.9999	20.9969	20.9546	20.8168	20.6489	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house													
	0.8973	0.8655	0.7938	0.6615	0.4921	0.3337	0.2277	0.2557	0.4286	0.6754	0.8407	0.9097	(89)
MIT 2	19.9968	20.0820	20.2070	20.3067	20.3432	20.3491	20.3495	20.3495	20.3475	20.3087	20.1582	19.9582	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.3237	20.4027	20.5199	20.6161	20.6531	20.6596	20.6602	20.6601	20.6576	20.6172	20.4727	20.2881	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3237	20.4027	20.5199	20.6161	20.6531	20.6596	20.6602	20.6601	20.6576	20.6172	20.4727	20.2881	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8967	0.8670	0.8001	0.6746	0.5088	0.3516	0.2466	0.2758	0.4493	0.6908	0.8450	0.9085	(94)
Useful gains	395.9798	399.2622	383.5327	338.9663	266.0220	181.1722	121.4837	127.4535	195.5396	288.4357	352.6907	389.5068	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	479.4920	463.9013	419.5300	350.5916	267.9130	181.3280	121.4964	127.4796	196.2297	299.7531	400.1639	481.4191	(97)
Space heating kWh	62.1331	43.4375	26.7820	8.3702	1.4068	0.0000	0.0000	0.0000	0.0000	8.4201	34.1807	68.3828	(98a)
Space heating requirement - total per year (kWh/year)												253.1133	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	62.1331	43.4375	26.7820	8.3702	1.4068	0.0000	0.0000	0.0000	0.0000	8.4201	34.1807	68.3828	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												253.1133	
Space heating per m2											(98c) / (4) =	5.8375	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	62.1331	43.4375	26.7820	8.3702	1.4068	0.0000	0.0000	0.0000	0.0000	8.4201	34.1807	68.3828	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	93.1997	65.1562	40.1730	12.5553	2.1103	0.0000	0.0000	0.0000	0.0000	12.6302	51.2711	102.5741	
Space heating requirement	93.1997	65.1562	40.1730	12.5553	2.1103	0.0000	0.0000	0.0000	0.0000	12.6302	51.2711	102.5741	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												379.6699	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												3.7967	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2845.5327	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	379.6699	4.4400	16.8573	(340a)
Space heating total			16.8573	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			180.1907	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7341 (357)
SAP value		88.0996
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	976.3062	0.1581	16.0043	(367)
Electrical energy for heat distribution (space & water)	3.7967	0.0000	5.2180	(372)
Overall CO2 factor for heat network			0.0394	(386)
Total CO2 associated with community systems			144.3658	(373)
Space and water heating			144.3658	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			43.8380	(383)
CO2 emissions per m2			1.0100	(384)
EI value			99.3352	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume					(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)

Adj infilt rate

	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104 (22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)

Heat transfer coeff

	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)

Average = Sum(39)m / 12 = 29.9239

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m													
	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Total per year (kWh/year) = Sum(64)m = 2187.6523 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)												
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874 (72)
Total internal gains												
	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.5100	12.7500	0.6800	0.7000	0.7700	27.3798	(74)

Solar gains	27.3798	46.9693	79.5710	129.9934	168.5258	193.2019	177.1418	143.5631	101.3139	59.2783	33.3677	22.8947 (83)
Total gains	446.1406	463.8387	484.7551	513.3636	530.9465	536.6546	509.4910	478.4873	447.3387	424.8696	422.5946	432.6117 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area													
	0.9014	0.8720	0.7935	0.6616	0.4930	0.3232	0.2290	0.2564	0.4401	0.6742	0.8436	0.9138	(86)
MIT	20.7101	20.7764	20.8879	20.9658	20.9949	20.9997	21.0000	20.9999	20.9980	20.9680	20.8447	20.6780	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house													
	0.8863	0.8538	0.7681	0.6294	0.4575	0.2871	0.1909	0.2157	0.3973	0.6358	0.8199	0.9002	(89)
MIT 2	20.0311	20.1089	20.2356	20.3180	20.3456	20.3494	20.3496	20.3495	20.3483	20.3217	20.1898	19.9933	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.3554	20.4277	20.5472	20.6274	20.6557	20.6600	20.6602	20.6602	20.6586	20.6304	20.5026	20.3203	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3554	20.4277	20.5472	20.6274	20.6557	20.6600	20.6602	20.6602	20.6586	20.6304	20.5026	20.3203	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8865	0.8561	0.7760	0.6434	0.4743	0.3043	0.2091	0.2351	0.4177	0.6526	0.8257	0.8995	(94)
Useful gains	395.5002	397.0745	376.1889	330.2809	251.8212	163.3244	106.5313	112.5108	186.8464	277.2896	348.9359	389.1416	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	471.4624	455.6720	405.3836	338.9607	253.0278	163.3845	106.5355	112.5197	187.2812	285.1852	389.0892	473.4062	(97)
Space heating kWh													
	56.5159	39.3775	21.7209	6.2494	0.8977	0.0000	0.0000	0.0000	0.0000	5.8743	28.9104	62.6929	(98a)
Space heating requirement - total per year (kWh/year)												222.2390	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	56.5159	39.3775	21.7209	6.2494	0.8977	0.0000	0.0000	0.0000	0.0000	5.8743	28.9104	62.6929	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												222.2390	
Space heating per m2											(98c) / (4) =	5.1254	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	56.5159	39.3775	21.7209	6.2494	0.8977	0.0000	0.0000	0.0000	0.0000	5.8743	28.9104	62.6929	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	84.7738	59.0663	32.5813	9.3742	1.3465	0.0000	0.0000	0.0000	0.0000	8.8115	43.3656	94.0393	
Space heating requirement													
	84.7738	59.0663	32.5813	9.3742	1.3465	0.0000	0.0000	0.0000	0.0000	8.8115	43.3656	94.0393	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	333.3584	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	3.3336	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(330a)
Total electricity for the above, kWh/year	11.9235	(331)
Electricity for lighting (calculated in Appendix L)	130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2702.6952	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	333.3584	6.5500	21.8350	(340a)
Space heating total			21.8350	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			222.2361	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	963.9565	0.1585	14.0925	(367)
Electrical energy for heat distribution (space & water)	3.3336	0.0000	5.1463	(372)
Overall CO2 factor for heat network			0.0394	(386)
Total CO2 associated with community systems			142.3822	(373)
Space and water heating			142.3822	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			29.6224	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	963.9565	1.5868	141.0633	(467)
Electrical energy for heat distribution (space & water)	3.3336	0.0000	55.1796	(472)
Overall CO2 factor for heat network			0.4223	(486)
Total CO2 associated with community systems			1526.6360	(473)
Space and water heating			1526.6360	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			822.3110	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - South

Current energy efficiency rating:	B 88
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£41	£41	£0
Community scheme	£341	£341	£0
Space heating	£129	£129	£0
Water heating	£215	£215	£0
Lighting	£37	£37	£0
Generated (PV)	-£159	-£159	£0
Total cost of fuels	£223	£223	£0
Total cost of uses	£222	£222	£0
Delivered energy	62 kWh/m²	62 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.0 tonnes	0.0 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	19 kWh/m²	19 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)

Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	11.4002	(33)
Main dwelling					
Party Wall	31.3600	0.0000	0.0000	70.0000	2195.2000 (32)
Party Floor	43.3600			70.0000	3035.2000 (32d)
Party Ceiling 1	43.3600			30.0000	1300.8000 (32b)
Internal TF Wall	68.4500			9.0000	616.0500 (32c)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =		8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K					199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)					0.9954 (36)
Point Thermal bridges				(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =		12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.5100	10.6334	0.6800	0.7000	0.7700	22.8346	(74)

Solar gains	22.8346	43.6381	74.1517	119.1067	160.4476	171.7639	160.3635	127.2280	89.1544	51.9454	28.1694	19.0360	(83)
Total gains	441.5954	460.5074	479.3358	502.4769	522.8682	515.2166	492.7128	462.1522	435.1792	417.5366	417.3962	428.7531	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area													
	0.9111	0.8826	0.8173	0.6929	0.5276	0.3713	0.2672	0.2977	0.4723	0.7121	0.8623	0.9222	(86)
MIT	20.6813	20.7534	20.8621	20.9545	20.9921	20.9993	20.9999	20.9999	20.9969	20.9546	20.8168	20.6489	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house													
	0.8973	0.8655	0.7938	0.6615	0.4921	0.3337	0.2277	0.2557	0.4286	0.6754	0.8407	0.9097	(89)
MIT 2	19.9968	20.0820	20.2070	20.3067	20.3432	20.3491	20.3495	20.3495	20.3475	20.3087	20.1582	19.9582	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.3237	20.4027	20.5199	20.6161	20.6531	20.6596	20.6602	20.6601	20.6576	20.6172	20.4727	20.2881	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3237	20.4027	20.5199	20.6161	20.6531	20.6596	20.6602	20.6601	20.6576	20.6172	20.4727	20.2881	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8967	0.8670	0.8001	0.6746	0.5088	0.3516	0.2466	0.2758	0.4493	0.6908	0.8450	0.9085	(94)
Useful gains	395.9798	399.2622	383.5327	338.9663	266.0220	181.1722	121.4837	127.4535	195.5396	288.4357	352.6907	389.5068	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	479.4920	463.9013	419.5300	350.5916	267.9130	181.3280	121.4964	127.4796	196.2297	299.7531	400.1639	481.4191	(97)
Space heating kWh													
	62.1331	43.4375	26.7820	8.3702	1.4068	0.0000	0.0000	0.0000	0.0000	8.4201	34.1807	68.3828	(98a)
Space heating requirement - total per year (kWh/year)												253.1133	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	62.1331	43.4375	26.7820	8.3702	1.4068	0.0000	0.0000	0.0000	0.0000	8.4201	34.1807	68.3828	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												253.1133	
Space heating per m2											(98c) / (4) =	5.8375	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	62.1331	43.4375	26.7820	8.3702	1.4068	0.0000	0.0000	0.0000	0.0000	8.4201	34.1807	68.3828	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	93.1997	65.1562	40.1730	12.5553	2.1103	0.0000	0.0000	0.0000	0.0000	12.6302	51.2711	102.5741	
Space heating requirement													
	93.1997	65.1562	40.1730	12.5553	2.1103	0.0000	0.0000	0.0000	0.0000	12.6302	51.2711	102.5741	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												379.6699	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												3.7967	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)

Appendix Q - special features
Energy saved or generated -0.0000 (336)
Energy used 0.0000 (337)
Total delivered energy for all uses 2845.5327 (338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	379.6699	4.4400	16.8573	(340a)
Space heating total			16.8573	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			180.1907	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12): 0.3600 (356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] = 0.7341 (357)
SAP value 88.0996
SAP rating (Section 12) 88 (358)
SAP band B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	976.3062	0.1581	16.0043	(367)
Electrical energy for heat distribution (space & water)	3.7967	0.0000	5.2180	(372)
Overall CO2 factor for heat network			0.0394	(386)
Total CO2 associated with community systems			144.3658	(373)
Space and water heating			144.3658	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			43.8380	(383)
CO2 emissions per m2			1.0100	(384)
EI value			99.3352	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate
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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

Measured/design AP50												3.0000	(17)
Infiltration rate												0.1500	(18)
Number of sides sheltered												3	(19)
Shelter factor									(20) = 1 - [0.075 x (19)] =			0.7750	(20)
Infiltration rate adjusted to include shelter factor									(21) = (18) x (20) =			0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4982	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)

Water heating gains (Table 5)

	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)

Total internal gains

	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.5100	12.7500	0.6800	0.7000	0.7700	27.3798	(74)

Solar gains	27.3798	46.9693	79.5710	129.9934	168.5258	193.2019	177.1418	143.5631	101.3139	59.2783	33.3677	22.8947	(83)
Total gains	446.1406	463.8387	484.7551	513.3636	530.9465	536.6546	509.4910	478.4873	447.3387	424.8696	422.5946	432.6117	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area	0.9014	0.8720	0.7935	0.6616	0.4930	0.3232	0.2290	0.2564	0.4401	0.6742	0.8436	0.9138	(86)
MIT	20.7101	20.7764	20.8879	20.9658	20.9949	20.9997	21.0000	20.9999	20.9980	20.9680	20.8447	20.6780	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house	0.8863	0.8538	0.7681	0.6294	0.4575	0.2871	0.1909	0.2157	0.3973	0.6358	0.8199	0.9002	(89)
MIT 2	20.0311	20.1089	20.2356	20.3180	20.3456	20.3494	20.3496	20.3495	20.3483	20.3217	20.1898	19.9933	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.3554	20.4277	20.5472	20.6274	20.6557	20.6600	20.6602	20.6602	20.6586	20.6304	20.5026	20.3203	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3554	20.4277	20.5472	20.6274	20.6557	20.6600	20.6602	20.6602	20.6586	20.6304	20.5026	20.3203	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8865	0.8561	0.7760	0.6434	0.4743	0.3043	0.2091	0.2351	0.4177	0.6526	0.8257	0.8995	(94)
Useful gains	395.5002	397.0745	376.1889	330.2809	251.8212	163.3244	106.5313	112.5108	186.8464	277.2896	348.9359	389.1416	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	471.4624	455.6720	405.3836	338.9607	253.0278	163.3845	106.5355	112.5197	187.2812	285.1852	389.0892	473.4062	(97)
Space heating kWh	56.5159	39.3775	21.7209	6.2494	0.8977	0.0000	0.0000	0.0000	0.0000	5.8743	28.9104	62.6929	(98a)
Space heating requirement - total per year (kWh/year)												222.2390	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	56.5159	39.3775	21.7209	6.2494	0.8977	0.0000	0.0000	0.0000	0.0000	5.8743	28.9104	62.6929	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												222.2390	
Space heating per m2										(98c) / (4) =		5.1254	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement

	56.5159	39.3775	21.7209	6.2494	0.8977	0.0000	0.0000	0.0000	0.0000	5.8743	28.9104	62.6929	(98)

Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50

307a	84.7738	59.0663	32.5813	9.3742	1.3465	0.0000	0.0000	0.0000	0.0000	8.8115	43.3656	94.0393	

Space heating requirement

	84.7738	59.0663	32.5813	9.3742	1.3465	0.0000	0.0000	0.0000	0.0000	8.8115	43.3656	94.0393	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)

Space heating fuel for secondary/supplementary system

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement

	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50

310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	

Water heating fuel

	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)

Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	333.3584	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	3.3336	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(330a)
Total electricity for the above, kWh/year	11.9235	(331)
Electricity for lighting (calculated in Appendix L)	130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2702.6952	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	333.3584	6.5500	21.8350	(340a)
Space heating total			21.8350	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			222.2361	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	963.9565	0.1585	14.0925	(367)
Electrical energy for heat distribution (space & water)	3.3336	0.0000	5.1463	(372)
Overall CO2 factor for heat network			0.0394	(386)
Total CO2 associated with community systems			142.3822	(373)
Space and water heating			142.3822	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			29.6224	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	963.9565	1.5868	141.0633	(467)
Electrical energy for heat distribution (space & water)	3.3336	0.0000	55.1796	(472)
Overall CO2 factor for heat network			0.4223	(486)
Total CO2 associated with community systems			1526.6360	(473)
Space and water heating			1526.6360	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			822.3110	(483)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.09	**TER**	15.13
Environmental	99 A	**% DER < TER**			92.80
CO_2 Emissions (t/year)	0.03	**DFEE**	17.34	**TFEE**	28.45
Compliance Check	See BREL	**% DFEE < TFEE**			39.06
% DPER < TPER	73.24	**DPER**	21.88	**TPER**	81.75

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		8637.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							199.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							0.9954	(36)
Point Thermal bridges					(36a) =		0.0000	

Total fabric heat loss (33) + (36) + (36a) = 12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
									Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
12Total per year (kWh/year)												2188	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)	
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)	
Heat gains from water heating, kWh/month													
97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)	

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)	
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)													
-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)	
Water heating gains (Table 5)													
130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)	
Total internal gains													
377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)	

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	6.5100	11.2829	0.6800	0.7000	0.7700	24.2294	(81)

Solar gains	24.2294	49.3197	88.8585	145.9312	196.1601	209.1274	195.6344	155.9620	108.2755	60.2726	30.4869	19.7870	(83)
Total gains	401.8204	434.0697	459.0200	503.4703	537.4268	539.2142	514.5511	476.0500	437.0995	399.4715	388.6443	390.6467	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761

alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451		
util living area	0.9385	0.9045	0.8384	0.6918	0.5140	0.3548	0.2559	0.2891	0.4702	0.7370	0.8913	0.9466	(86)
MIT	20.5988	20.7083	20.8394	20.9549	20.9932	20.9994	20.9999	20.9999	20.9969	20.9451	20.7725	20.5651	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house	0.9278	0.8895	0.8160	0.6604	0.4792	0.3189	0.2180	0.2482	0.4267	0.7006	0.8723	0.9371	(89)
MIT 2	19.8985	20.0296	20.1821	20.3071	20.3441	20.3492	20.3495	20.3495	20.3475	20.2996	20.1083	19.8576	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.2330	20.3538	20.4961	20.6165	20.6541	20.6598	20.6602	20.6601	20.6577	20.6079	20.4256	20.1955	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2330	20.3538	20.4961	20.6165	20.6541	20.6598	20.6602	20.6601	20.6577	20.6079	20.4256	20.1955	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9258	0.8896	0.8212	0.6735	0.4955	0.3361	0.2361	0.2677	0.4474	0.7154	0.8747	0.9346	(94)
Useful gains	371.9867	386.1506	376.9650	339.0812	266.3093	181.2125	121.4870	127.4582	195.5581	285.7765	339.9423	365.1173	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	476.7762	462.4368	418.8175	350.6035	267.9420	181.3321	121.4967	127.4801	196.2316	299.4757	398.7526	478.6486	(97)
Space heating kWh	77.9634	51.2643	31.1382	8.2961	1.2147	0.0000	0.0000	0.0000	0.0000	10.1922	42.3434	84.4673	(98a)
Space heating requirement - total per year (kWh/year)												306.8795	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	77.9634	51.2643	31.1382	8.2961	1.2147	0.0000	0.0000	0.0000	0.0000	10.1922	42.3434	84.4673	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												306.8795	
Space heating per m2											(98c) / (4) =	7.0775	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	77.9634	51.2643	31.1382	8.2961	1.2147	0.0000	0.0000	0.0000	0.0000	10.1922	42.3434	84.4673	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	116.9450	76.8964	46.7074	12.4441	1.8221	0.0000	0.0000	0.0000	0.0000	15.2883	63.5151	126.7009	
Space heating requirement	116.9450	76.8964	46.7074	12.4441	1.8221	0.0000	0.0000	0.0000	0.0000	15.2883	63.5151	126.7009	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												460.3193	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												4.6032	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2926.1821	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	997.8127	0.1583	19.4277	(367)
Electrical energy for heat distribution (space & water)	4.6032	0.0000	5.3464	(372)
Overall CO2 factor for heat network			0.0395	(386)
Total CO2 associated with community systems			147.9175	(373)
Space and water heating			147.9175	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			47.3898	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.0900	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	997.8127	1.5859	194.6684	(467)
Electrical energy for heat distribution (space & water)	4.6032	0.0000	57.1898	(472)
Overall CO2 factor for heat network			0.4229	(486)
Total CO2 associated with community systems			1582.2512	(473)
Space and water heating			1582.2512	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			948.6564	(483)
Dwelling Primary energy Rate (DPER)			21.8800	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)

Wall to Unheated Common area	16.5900	16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)		33.1800			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		13.7636	(33)
Main dwelling					
Party Wall		31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 199.1940 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	52.2400	0.0700	3.6568
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3858 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 20.1494 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	40.9650	40.8373	40.7122	40.1245	40.0146	39.5027	39.5027	39.4079	39.6999	40.0146	40.2370	40.4696	(39)

Average = Sum(39)m / 12 = 40.1240

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9448	0.9418	0.9389	0.9254	0.9228	0.9110	0.9110	0.9089	0.9156	0.9228	0.9280	0.9333	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)

Energy content (annual) Total = Sum(45)m = 1536.8125

Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)

Total per year (kWh/year) = Sum(64)m = 1875.8483 (64)

12Total per year (kWh/year) 1876 (64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
Northwest					6.5100	11.2829		0.6300	0.7000	0.7700		22.4479	(81)
Solar gains	22.4479	45.6933	82.3248	135.2009	181.7366	193.7504	181.2495	144.4942	100.3140	55.8408	28.2452	18.3321	(83)
Total gains	391.6686	421.8550	444.1160	484.3020	514.6330	512.3991	488.7959	453.2120	417.7000	386.6694	377.9646	380.8215	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.5666	58.7497	58.9302	59.7934	59.9577	60.7346	60.7346	60.8807	60.4330	59.9577	59.6262	59.2836	
alpha	4.9044	4.9166	4.9287	4.9862	4.9972	5.0490	5.0490	5.0587	5.0289	4.9972	4.9751	4.9522	
util living area	0.9712	0.9564	0.9253	0.8340	0.6769	0.4862	0.3544	0.3976	0.6264	0.8623	0.9489	0.9742	(86)
MIT	20.0637	20.2164	20.4462	20.7473	20.9263	20.9886	20.9981	20.9967	20.9619	20.7437	20.3791	20.0453	(87)
Th 2	20.1296	20.1321	20.1345	20.1460	20.1481	20.1581	20.1581	20.1600	20.1543	20.1481	20.1438	20.1393	(88)
util rest of house	0.9648	0.9470	0.9092	0.8022	0.6269	0.4251	0.2872	0.3262	0.5597	0.8282	0.9364	0.9685	(89)
MIT 2	19.0593	19.2512	19.5352	19.8967	20.0867	20.1512	20.1574	20.1586	20.1281	19.9024	19.4651	19.0437	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.5390	19.7122	19.9703	20.3030	20.4877	20.5511	20.5589	20.5589	20.5264	20.3042	19.9017	19.5221	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5390	19.7122	19.9703	20.3030	20.4877	20.5511	20.5589	20.5589	20.5264	20.3042	19.9017	19.5221	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9595	0.9416	0.9058	0.8084	0.6474	0.4539	0.3193	0.3603	0.5898	0.8350	0.9323	0.9635	(94)
Useful gains	375.8246	397.2337	402.2702	391.5168	333.1490	232.5742	156.0514	163.2827	246.3554	322.8744	352.3683	366.9170	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	624.2659	604.8904	548.4076	457.5389	351.6368	235.0862	156.3890	163.8935	255.1261	388.3102	515.1012	620.0797	(97)
Space heating kWh	184.8403	139.5453	108.7263	47.5359	13.7549	0.0000	0.0000	0.0000	0.0000	48.6842	117.1677	188.3530	(98a)
Space heating requirement - total per year (kWh/year)												848.6077	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	184.8403	139.5453	108.7263	47.5359	13.7549	0.0000	0.0000	0.0000	0.0000	48.6842	117.1677	188.3530	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												848.6077	
Space heating per m2											(98c) / (4) =	19.5712	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	184.8403	139.5453	108.7263	47.5359	13.7549	0.0000	0.0000	0.0000	0.0000	48.6842	117.1677	188.3530	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	200.2604	151.1867	117.7966	51.5016	14.9024	0.0000	0.0000	0.0000	0.0000	52.7456	126.9422	204.0661	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.0767	83.7214	83.0474	81.7582	80.4858	79.8000	79.8000	79.8000	79.8000	81.7733	83.3177	84.1412	(217)
Fuel for water heating, kWh/month	218.1938	193.9859	208.4152	187.8871	186.1830	170.5061	169.2907	175.3325	176.4869	190.5146	196.9517	215.8841	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												919.4016	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2289.6316	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3054.1072	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	919.4016	0.2100	193.0743	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2289.6316	0.2100	480.8226	(264)
Space and water heating			673.8970	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			656.1944	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.1300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	919.4016	1.1300	1038.9238	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2289.6316	1.1300	2587.2837	(278)
Space and water heating			3626.2075	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3544.7051	(286)
Target Primary Energy Rate (TPER)			81.7500	(287)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.09	**TER**	15.13
Environmental	99 A	**% DER < TER**			92.80
CO_2 Emissions (t/year)	0.03	**DFEE**	17.34	**TFEE**	28.45
Compliance Check	See BREL	**% DFEE < TFEE**			39.06
% DPER < TPER	73.24	**DPER**	21.88	**TPER**	81.75

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area		Storey height		Volume	
Main dwelling		(m2)		(m)		(m3)	
Ground floor		43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		2 * 10 =	20.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		20.0000 / (5) =	0.1883 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			3.0000 (17)
Infiltration rate			0.3383 (18)
Number of sides sheltered			3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.2622 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)

Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	31.8822	31.8062	31.7316	31.3815	31.3160	31.0111	31.0111	30.9546	31.1285	31.3160	31.4485	31.5871	(39)
Average = Sum(39)m / 12 =												31.3812	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7353	0.7335	0.7318	0.7237	0.7222	0.7152	0.7152	0.7139	0.7179	0.7222	0.7253	0.7285	(40)
HLP (average)												0.7237	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		449.4572	(64a)
Heat gains from water heating, kWh/month	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.4004	291.4783	279.0119	271.5070	258.2448	250.2442	241.2477	240.9702	247.9561	254.7841	268.8582	277.3654	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	6.5100	11.2829	0.6800	0.7000	0.7700	24.2294	(81)

Solar gains	24.2294	49.3197	88.8585	145.9312	196.1601	209.1274	195.6344	155.9620	108.2755	60.2726	30.4869	19.7870	(83)
Total gains	307.6298	340.7981	367.8704	417.4382	454.4050	459.3717	436.8821	396.9323	356.2316	315.0568	299.3451	297.1524	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.2514	75.4313	75.6085	76.4520	76.6119	77.3652	77.3652	77.5064	77.0733	76.6119	76.2891	75.9545	
alpha	6.0168	6.0288	6.0406	6.0968	6.1075	6.1577	6.1577	6.1671	6.1382	6.1075	6.0859	6.0636	
util living area	0.9841	0.9695	0.9346	0.8154	0.6250	0.4306	0.3122	0.3583	0.5919	0.8731	0.9662	0.9867	(86)
MIT	20.2565	20.4118	20.6232	20.8723	20.9766	20.9979	20.9998	20.9995	20.9872	20.8357	20.5201	20.2301	(87)
Th 2	20.3098	20.3113	20.3128	20.3199	20.3212	20.3274	20.3274	20.3286	20.3250	20.3212	20.3185	20.3157	(88)
util rest of house	0.9806	0.9631	0.9213	0.7860	0.5839	0.3860	0.2645	0.3062	0.5380	0.8441	0.9580	0.9837	(89)

MIT 2	19.6340	19.7869	19.9909	20.2217	20.3061	20.3264	20.3273	20.3284	20.3181	20.1963	19.9002	19.6131	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.9313	20.0853	20.2929	20.5324	20.6263	20.6471	20.6485	20.6489	20.6377	20.5017	20.1963	19.9078	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9313	20.0853	20.2929	20.5324	20.6263	20.6471	20.6485	20.6489	20.6377	20.5017	20.1963	19.9078	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9783	0.9606	0.9209	0.7956	0.6026	0.4073	0.2873	0.3311	0.5633	0.8524	0.9563	0.9816	(94)
Useful gains	300.9423	327.3828	338.7633	332.0998	273.8223	187.0815	125.5074	131.4267	200.6496	268.5458	286.2511	291.6827	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	498.3618	482.9869	437.6710	365.0437	279.5367	187.5282	125.5488	131.5235	203.5092	310.0821	411.8594	496.1638	(97)
Space heating kWh													
	146.8801	104.5659	73.5873	23.7196	4.2515	0.0000	0.0000	0.0000	0.0000	30.9030	90.4379	152.1339	(98a)
Space heating requirement - total per year (kWh/year)												626.4793	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	146.8801	104.5659	73.5873	23.7196	4.2515	0.0000	0.0000	0.0000	0.0000	30.9030	90.4379	152.1339	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												626.4793	
Space heating per m2											(98c) / (4) =	14.4483	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	291.5043	229.4821	235.2551	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9858	0.9946	0.9899	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	287.3594	228.2466	232.8681	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	507.9054	483.1931	437.9038	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	158.7931	189.6802	152.5465	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	39.6983	47.4201	38.1366	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												125.2550	(107)
Energy for space heating												14.4483	(99)
Energy for space cooling												2.8887	(108)
Total												17.3370	(109)
Fabric Energy Efficiency (DFEE)												17.3	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	13.7636			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	199.1940	(35)
List of Thermal Bridges		

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	52.2400	0.0700	3.6568
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	6.3858	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	20.1494	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	40.9650	40.8373	40.7122	40.1245	40.0146	39.5027	39.5027	39.4079	39.6999	40.0146	40.2370	40.4696	(39)
Average = Sum(39)m / 12 =												40.1240	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9448	0.9418	0.9389	0.9254	0.9228	0.9110	0.9110	0.9089	0.9156	0.9228	0.9280	0.9333	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4982	(42)

Hot water usage for mixer showers

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												47.0349	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	

Distribution loss (46)m = 0.15 x (45)m

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)

Electric shower(s)

	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												449.4572	(64a)

Heat gains from water heating, kWh/month

	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													

	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931 (72)
Total internal gains	281.3655	289.2254	276.9770	269.4043	256.2100	248.1415	239.2128	238.9354	245.8534	252.7493	266.7555	275.3306 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	6.5100	11.2829	0.6300	0.7000	0.7700	22.4479	(81)

Solar gains	22.4479	45.6933	82.3248	135.2009	181.7366	193.7504	181.2495	144.4942	100.3140	55.8408	28.2452	18.3321 (83)
Total gains	303.8134	334.9187	359.3018	404.6052	437.9465	441.8920	420.4623	383.4296	346.1675	308.5901	295.0007	293.6626 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.5666	58.7497	58.9302	59.7934	59.9577	60.7346	60.7346	60.8807	60.4330	59.9577	59.6262	59.2836	
alpha	4.9044	4.9166	4.9287	4.9862	4.9972	5.0490	5.0490	5.0587	5.0289	4.9972	4.9751	4.9522	
util living area	0.9895	0.9819	0.9642	0.8989	0.7589	0.5570	0.4106	0.4671	0.7240	0.9304	0.9800	0.9911	(86)
MIT	19.8178	19.9862	20.2472	20.6228	20.8768	20.9792	20.9963	20.9932	20.9277	20.6002	20.1638	19.7981	(87)
Th 2	20.1296	20.1321	20.1345	20.1460	20.1481	20.1581	20.1581	20.1600	20.1543	20.1481	20.1438	20.1393	(88)
util rest of house	0.9870	0.9774	0.9553	0.8749	0.7106	0.4894	0.3334	0.3845	0.6562	0.9084	0.9743	0.9888	(89)
MIT 2	19.0549	19.2231	19.4805	19.8449	20.0650	20.1479	20.1570	20.1577	20.1133	19.8329	19.4090	19.0430	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.4193	19.5876	19.8467	20.2164	20.4528	20.5450	20.5579	20.5567	20.5023	20.1994	19.7695	19.4037	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4193	19.5876	19.8467	20.2164	20.4528	20.5450	20.5579	20.5567	20.5023	20.1994	19.7695	19.4037	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9843	0.9740	0.9517	0.8771	0.7287	0.5210	0.3703	0.4239	0.6854	0.9099	0.9712	0.9864	(94)
Useful gains	299.0367	326.2134	341.9614	354.8714	319.1366	230.2196	155.6797	162.5312	237.2568	280.7946	286.5012	289.6754	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	619.3624	599.8012	543.3748	454.0668	350.2380	234.8433	156.3466	163.8088	254.1701	384.1164	509.7844	615.2870	(97)
Space heating kWh	238.3223	183.8510	149.8516	71.4207	23.1394	0.0000	0.0000	0.0000	0.0000	76.8715	160.7639	242.2550	(98a)
Space heating requirement - total per year (kWh/year)												1146.4753	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	238.3223	183.8510	149.8516	71.4207	23.1394	0.0000	0.0000	0.0000	0.0000	76.8715	160.7639	242.2550	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1146.4753	
Space heating per m2											(98c) / (4) =	26.4409	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	371.3254	292.3200	299.5001	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9264	0.9624	0.9425	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	344.0135	281.3380	282.2830	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	489.7542	466.1872	424.2498	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	104.9333	137.5278	105.6233	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	26.2333	34.3820	26.4058	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												87.0211	(107)
Energy for space heating												26.4409	(99)
Energy for space cooling												2.0069	(108)
Total												28.4478	(109)
Fabric Energy Efficiency (TFEE)												28.4	(109)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.09	**TER**	15.13
Environmental	99 A	**% DER < TER**			92.80
CO_2 Emissions (t/year)	0.03	**DFEE**	17.34	**TFEE**	28.45
Compliance Check	See BREL	**% DFEE < TFEE**			39.06
% DPER < TPER	73.24	**DPER**	21.88	**TPER**	81.75

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		8637.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							199.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							0.9954	(36)
Point Thermal bridges					(36a) =		0.0000	

Total fabric heat loss (33) + (36) + (36a) = 12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
									Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
12Total per year (kWh/year)												2188	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)	
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)	
Heat gains from water heating, kWh/month													
97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)	

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)	
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)													
-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)	
Water heating gains (Table 5)													
130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)	
Total internal gains													
377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)	

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	6.5100	11.2829	0.6800	0.7000	0.7700	24.2294	(81)

Solar gains	24.2294	49.3197	88.8585	145.9312	196.1601	209.1274	195.6344	155.9620	108.2755	60.2726	30.4869	19.7870	(83)
Total gains	401.8204	434.0697	459.0200	503.4703	537.4268	539.2142	514.5511	476.0500	437.0995	399.4715	388.6443	390.6467	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761

alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451		
util living area	0.9385	0.9045	0.8384	0.6918	0.5140	0.3548	0.2559	0.2891	0.4702	0.7370	0.8913	0.9466	(86)
MIT	20.5988	20.7083	20.8394	20.9549	20.9932	20.9994	20.9999	20.9999	20.9969	20.9451	20.7725	20.5651	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house	0.9278	0.8895	0.8160	0.6604	0.4792	0.3189	0.2180	0.2482	0.4267	0.7006	0.8723	0.9371	(89)
MIT 2	19.8985	20.0296	20.1821	20.3071	20.3441	20.3492	20.3495	20.3495	20.3475	20.2996	20.1083	19.8576	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.2330	20.3538	20.4961	20.6165	20.6541	20.6598	20.6602	20.6601	20.6577	20.6079	20.4256	20.1955	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2330	20.3538	20.4961	20.6165	20.6541	20.6598	20.6602	20.6601	20.6577	20.6079	20.4256	20.1955	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9258	0.8896	0.8212	0.6735	0.4955	0.3361	0.2361	0.2677	0.4474	0.7154	0.8747	0.9346	(94)
Useful gains	371.9867	386.1506	376.9650	339.0812	266.3093	181.2125	121.4870	127.4582	195.5581	285.7765	339.9423	365.1173	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	476.7762	462.4368	418.8175	350.6035	267.9420	181.3321	121.4967	127.4801	196.2316	299.4757	398.7526	478.6486	(97)
Space heating kWh	77.9634	51.2643	31.1382	8.2961	1.2147	0.0000	0.0000	0.0000	0.0000	10.1922	42.3434	84.4673	(98a)
Space heating requirement - total per year (kWh/year)												306.8795	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	77.9634	51.2643	31.1382	8.2961	1.2147	0.0000	0.0000	0.0000	0.0000	10.1922	42.3434	84.4673	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												306.8795	
Space heating per m2											(98c) / (4) =	7.0775	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	77.9634	51.2643	31.1382	8.2961	1.2147	0.0000	0.0000	0.0000	0.0000	10.1922	42.3434	84.4673	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	116.9450	76.8964	46.7074	12.4441	1.8221	0.0000	0.0000	0.0000	0.0000	15.2883	63.5151	126.7009	
Space heating requirement	116.9450	76.8964	46.7074	12.4441	1.8221	0.0000	0.0000	0.0000	0.0000	15.2883	63.5151	126.7009	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												460.3193	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												4.6032	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2926.1821	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	997.8127	0.1583	19.4277	(367)
Electrical energy for heat distribution (space & water)	4.6032	0.0000	5.3464	(372)
Overall CO2 factor for heat network			0.0395	(386)
Total CO2 associated with community systems			147.9175	(373)
Space and water heating			147.9175	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			47.3898	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.0900	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	997.8127	1.5859	194.6684	(467)
Electrical energy for heat distribution (space & water)	4.6032	0.0000	57.1898	(472)
Overall CO2 factor for heat network			0.4229	(486)
Total CO2 associated with community systems			1582.2512	(473)
Space and water heating			1582.2512	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			948.6564	(483)
Dwelling Primary energy Rate (DPER)			21.8800	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)

Wall to Unheated Common area	16.5900	16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)		33.1800			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		13.7636	(33)
Main dwelling					
Party Wall		31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 199.1940 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	52.2400	0.0700	3.6568
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3858 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 20.1494 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	40.9650	40.8373	40.7122	40.1245	40.0146	39.5027	39.5027	39.4079	39.6999	40.0146	40.2370	40.4696	(39)

Average = Sum(39)m / 12 = 40.1240

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9448	0.9418	0.9389	0.9254	0.9228	0.9110	0.9110	0.9089	0.9156	0.9228	0.9280	0.9333	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)

Energy content (annual) Total = Sum(45)m = 1536.8125

Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)

Total per year (kWh/year) = Sum(64)m = 1875.8483 (64)

12Total per year (kWh/year) 1876 (64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
Northwest					6.5100	11.2829		0.6300	0.7000	0.7700		22.4479	(81)
Solar gains	22.4479	45.6933	82.3248	135.2009	181.7366	193.7504	181.2495	144.4942	100.3140	55.8408	28.2452	18.3321	(83)
Total gains	391.6686	421.8550	444.1160	484.3020	514.6330	512.3991	488.7959	453.2120	417.7000	386.6694	377.9646	380.8215	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.5666	58.7497	58.9302	59.7934	59.9577	60.7346	60.7346	60.8807	60.4330	59.9577	59.6262	59.2836	
alpha	4.9044	4.9166	4.9287	4.9862	4.9972	5.0490	5.0490	5.0587	5.0289	4.9972	4.9751	4.9522	
util living area	0.9712	0.9564	0.9253	0.8340	0.6769	0.4862	0.3544	0.3976	0.6264	0.8623	0.9489	0.9742	(86)
MIT	20.0637	20.2164	20.4462	20.7473	20.9263	20.9886	20.9981	20.9967	20.9619	20.7437	20.3791	20.0453	(87)
Th 2	20.1296	20.1321	20.1345	20.1460	20.1481	20.1581	20.1581	20.1600	20.1543	20.1481	20.1438	20.1393	(88)
util rest of house	0.9648	0.9470	0.9092	0.8022	0.6269	0.4251	0.2872	0.3262	0.5597	0.8282	0.9364	0.9685	(89)
MIT 2	19.0593	19.2512	19.5352	19.8967	20.0867	20.1512	20.1574	20.1586	20.1281	19.9024	19.4651	19.0437	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.5390	19.7122	19.9703	20.3030	20.4877	20.5511	20.5589	20.5589	20.5264	20.3042	19.9017	19.5221	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5390	19.7122	19.9703	20.3030	20.4877	20.5511	20.5589	20.5589	20.5264	20.3042	19.9017	19.5221	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9595	0.9416	0.9058	0.8084	0.6474	0.4539	0.3193	0.3603	0.5898	0.8350	0.9323	0.9635	(94)
Useful gains	375.8246	397.2337	402.2702	391.5168	333.1490	232.5742	156.0514	163.2827	246.3554	322.8744	352.3683	366.9170	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	624.2659	604.8904	548.4076	457.5389	351.6368	235.0862	156.3890	163.8935	255.1261	388.3102	515.1012	620.0797	(97)
Space heating kWh	184.8403	139.5453	108.7263	47.5359	13.7549	0.0000	0.0000	0.0000	0.0000	48.6842	117.1677	188.3530	(98a)
Space heating requirement - total per year (kWh/year)												848.6077	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	184.8403	139.5453	108.7263	47.5359	13.7549	0.0000	0.0000	0.0000	0.0000	48.6842	117.1677	188.3530	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												848.6077	
Space heating per m2											(98c) / (4) =	19.5712	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	184.8403	139.5453	108.7263	47.5359	13.7549	0.0000	0.0000	0.0000	0.0000	48.6842	117.1677	188.3530	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	200.2604	151.1867	117.7966	51.5016	14.9024	0.0000	0.0000	0.0000	0.0000	52.7456	126.9422	204.0661	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.0767	83.7214	83.0474	81.7582	80.4858	79.8000	79.8000	79.8000	79.8000	81.7733	83.3177	84.1412	(217)
Fuel for water heating, kWh/month	218.1938	193.9859	208.4152	187.8871	186.1830	170.5061	169.2907	175.3325	176.4869	190.5146	196.9517	215.8841	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												919.4016	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2289.6316	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3054.1072	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	919.4016	0.2100	193.0743	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2289.6316	0.2100	480.8226	(264)
Space and water heating			673.8970	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			656.1944	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.1300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	919.4016	1.1300	1038.9238	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2289.6316	1.1300	2587.2837	(278)
Space and water heating			3626.2075	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3544.7051	(286)
Target Primary Energy Rate (TPER)			81.7500	(287)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.09	**TER**	15.13
Environmental	99 A	**% DER < TER**			92.80
CO_2 Emissions (t/year)	0.03	**DFEE**	17.34	**TFEE**	28.45
Compliance Check	See BREL	**% DFEE < TFEE**			39.06
% DPER < TPER	73.24	**DPER**	21.88	**TPER**	81.75

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		8637.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							199.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							0.9954	(36)
Point Thermal bridges					(36a) =		0.0000	

Total fabric heat loss (33) + (36) + (36a) = 12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	6.5100	11.2829	0.6800	0.7000	0.7700	24.2294	(81)

Solar gains	24.2294	49.3197	88.8585	145.9312	196.1601	209.1274	195.6344	155.9620	108.2755	60.2726	30.4869	19.7870 (83)
Total gains	442.9902	466.1891	494.0426	529.3014	558.5808	552.5802	527.9837	490.8862	454.3003	425.8639	419.7138	429.5041 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451

util living area													
	0.9100	0.8776	0.8019	0.6634	0.4952	0.3463	0.2493	0.2803	0.4528	0.7009	0.8599	0.9217	(86)
MIT	20.6839	20.7624	20.8766	20.9642	20.9945	20.9995	21.0000	20.9999	20.9975	20.9584	20.8200	20.6504	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house													
	0.8961	0.8602	0.7777	0.6322	0.4615	0.3112	0.2125	0.2407	0.4108	0.6642	0.8381	0.9092	(89)
MIT 2	19.9999	20.0922	20.2227	20.3161	20.3451	20.3493	20.3495	20.3495	20.3479	20.3122	20.1617	19.9601	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.3266	20.4123	20.5350	20.6256	20.6553	20.6598	20.6602	20.6602	20.6582	20.6209	20.4761	20.2898	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3266	20.4123	20.5350	20.6256	20.6553	20.6598	20.6602	20.6602	20.6582	20.6209	20.4761	20.2898	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8956	0.8620	0.7848	0.6456	0.4774	0.3280	0.2301	0.2597	0.4308	0.6798	0.8425	0.9079	(94)
Useful gains	396.7481	401.8502	387.7355	341.7194	266.6513	181.2303	121.4885	127.4623	195.7030	289.4947	353.6183	389.9506	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	479.5785	464.1887	419.9827	350.8760	267.9765	181.3339	121.4969	127.4805	196.2463	299.8630	400.2659	481.4693	(97)
Space heating kWh	61.6258	41.8914	23.9919	6.5927	0.9859	0.0000	0.0000	0.0000	0.0000	7.7141	33.5863	68.0899	(98a)
Space heating requirement - total per year (kWh/year)												244.4781	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	61.6258	41.8914	23.9919	6.5927	0.9859	0.0000	0.0000	0.0000	0.0000	7.7141	33.5863	68.0899	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												244.4781	
Space heating per m2											(98c) / (4) =	5.6383	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	61.6258	41.8914	23.9919	6.5927	0.9859	0.0000	0.0000	0.0000	0.0000	7.7141	33.5863	68.0899	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	92.4387	62.8371	35.9879	9.8891	1.4789	0.0000	0.0000	0.0000	0.0000	11.5711	50.3794	102.1349	
Space heating requirement													
	92.4387	62.8371	35.9879	9.8891	1.4789	0.0000	0.0000	0.0000	0.0000	11.5711	50.3794	102.1349	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												366.7171	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												3.6672	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2832.5799	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	366.7171	4.4400	16.2822	(340a)
Space heating total			16.2822	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			179.6156	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7318	(357)
SAP value		88.1376	
SAP rating (Section 12)		88	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	972.8521	0.1583	15.4842	(367)
Electrical energy for heat distribution (space & water)	3.6672	0.0000	5.1985	(372)
Overall CO2 factor for heat network			0.0394	(386)
Total CO2 associated with community systems			143.8262	(373)
Space and water heating			143.8262	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			43.2984	(383)
CO2 emissions per m2			1.0000	(384)
EI value			99.3434	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	43.3600 (1b)	x 2.4500 (2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)

Adj infilt rate

	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104 (22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)

Heat transfer coeff

	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)

Average = Sum(39)m / 12 = 29.9239

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m													
	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Total per year (kWh/year) = Sum(64)m = 2187.6523 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)												
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874 (72)
Total internal gains												
	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	6.5100	13.7758	0.6800	0.7000	0.7700	29.5826	(81)

Solar gains	29.5826	53.8385	96.0030	159.3666	205.6523	234.6690	215.6278	175.8602	123.5269	69.5726	36.7370	24.2504 (83)
Total gains	448.3434	470.7078	501.1871	542.7367	568.0729	578.1218	547.9771	510.7844	469.5517	435.1638	425.9639	433.9675 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area													
	0.8996	0.8658	0.7758	0.6303	0.4617	0.3001	0.2130	0.2402	0.4196	0.6606	0.8399	0.9128	(86)
MIT	20.7140	20.7864	20.9015	20.9738	20.9965	20.9998	21.0000	21.0000	20.9985	20.9713	20.8488	20.6806	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house													
	0.8844	0.8471	0.7498	0.5987	0.4281	0.2665	0.1774	0.2021	0.3787	0.6224	0.8159	0.8991	(89)
MIT 2	20.0357	20.1203	20.2501	20.3256	20.3468	20.3495	20.3496	20.3495	20.3486	20.3247	20.1943	19.9964	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.3597	20.4384	20.5612	20.6352	20.6571	20.6601	20.6602	20.6602	20.6590	20.6336	20.5069	20.3232	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3597	20.4384	20.5612	20.6352	20.6571	20.6601	20.6602	20.6602	20.6590	20.6336	20.5069	20.3232	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8847	0.8498	0.7584	0.6127	0.4440	0.2825	0.1944	0.2203	0.3982	0.6393	0.8220	0.8985	(94)
Useful gains	396.6399	399.9871	380.1240	332.5366	252.2378	163.3483	106.5330	112.5141	186.9624	278.2211	350.1227	389.9009	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	471.5901	455.9937	405.8034	339.1921	253.0698	163.3869	106.5356	112.5200	187.2930	285.2810	389.2185	473.4918	(97)
Space heating kWh													
	55.7629	37.6365	19.1055	4.7920	0.6190	0.0000	0.0000	0.0000	0.0000	5.2526	28.1490	62.1916	(98a)
Space heating requirement - total per year (kWh/year)												213.5091	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	55.7629	37.6365	19.1055	4.7920	0.6190	0.0000	0.0000	0.0000	0.0000	5.2526	28.1490	62.1916	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												213.5091	
Space heating per m2										(98c) / (4) =		4.9241	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	55.7629	37.6365	19.1055	4.7920	0.6190	0.0000	0.0000	0.0000	0.0000	5.2526	28.1490	62.1916	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	83.6443	56.4547	28.6582	7.1880	0.9285	0.0000	0.0000	0.0000	0.0000	7.8789	42.2235	93.2874	
Space heating requirement													
	83.6443	56.4547	28.6582	7.1880	0.9285	0.0000	0.0000	0.0000	0.0000	7.8789	42.2235	93.2874	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												320.2636	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												3.2026	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1054.7470	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2689.6003	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	320.2636	6.5500	20.9773	(340a)
Space heating total			20.9773	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			221.3783	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	960.4645	0.1588	13.5614	(367)
Electrical energy for heat distribution (space & water)	3.2026	0.0000	5.1264	(372)
Overall CO2 factor for heat network			0.0394	(386)
Total CO2 associated with community systems			141.8312	(373)
Space and water heating			141.8312	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			29.0713	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	960.4645	1.5878	135.6032	(467)
Electrical energy for heat distribution (space & water)	3.2026	0.0000	54.9749	(472)
Overall CO2 factor for heat network			0.4223	(486)
Total CO2 associated with community systems			1520.9711	(473)
Space and water heating			1520.9711	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			816.6461	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Southeast

Current energy efficiency rating:	B 88
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£41	£41	£0
Community scheme	£340	£340	£0
Space heating	£128	£128	£0
Water heating	£215	£215	£0
Lighting	£37	£37	£0
Generated (PV)	-£159	-£159	£0
Total cost of fuels	£222	£222	£0
Total cost of uses	£221	£221	£0
Delivered energy	62 kWh/m²	62 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.0 tonnes	0.0 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	19 kWh/m²	19 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)

Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	11.4002	(33)
Main dwelling					
Party Wall	31.3600	0.0000	0.0000	70.0000	2195.2000 (32)
Party Floor	43.3600			70.0000	3035.2000 (32d)
Party Ceiling 1	43.3600			30.0000	1300.8000 (32b)
Internal TF Wall	68.4500			9.0000	616.0500 (32c)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =		8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K					199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)					0.9954 (36)
Point Thermal bridges				(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =		12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	6.5100	11.2829	0.6800	0.7000	0.7700	24.2294	(81)

Solar gains	24.2294	49.3197	88.8585	145.9312	196.1601	209.1274	195.6344	155.9620	108.2755	60.2726	30.4869	19.7870	(83)
Total gains	442.9902	466.1891	494.0426	529.3014	558.5808	552.5802	527.9837	490.8862	454.3003	425.8639	419.7138	429.5041	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area													
	0.9100	0.8776	0.8019	0.6634	0.4952	0.3463	0.2493	0.2803	0.4528	0.7009	0.8599	0.9217	(86)
MIT	20.6839	20.7624	20.8766	20.9642	20.9945	20.9995	21.0000	20.9999	20.9975	20.9584	20.8200	20.6504	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house													
	0.8961	0.8602	0.7777	0.6322	0.4615	0.3112	0.2125	0.2407	0.4108	0.6642	0.8381	0.9092	(89)
MIT 2	19.9999	20.0922	20.2227	20.3161	20.3451	20.3493	20.3495	20.3495	20.3479	20.3122	20.1617	19.9601	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.3266	20.4123	20.5350	20.6256	20.6553	20.6598	20.6602	20.6602	20.6582	20.6209	20.4761	20.2898	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3266	20.4123	20.5350	20.6256	20.6553	20.6598	20.6602	20.6602	20.6582	20.6209	20.4761	20.2898	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8956	0.8620	0.7848	0.6456	0.4774	0.3280	0.2301	0.2597	0.4308	0.6798	0.8425	0.9079	(94)
Useful gains	396.7481	401.8502	387.7355	341.7194	266.6513	181.2303	121.4885	127.4623	195.7030	289.4947	353.6183	389.9506	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	479.5785	464.1887	419.9827	350.8760	267.9765	181.3339	121.4969	127.4805	196.2463	299.8630	400.2659	481.4693	(97)
Space heating kWh													
	61.6258	41.8914	23.9919	6.5927	0.9859	0.0000	0.0000	0.0000	0.0000	7.7141	33.5863	68.0899	(98a)
Space heating requirement - total per year (kWh/year)												244.4781	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	61.6258	41.8914	23.9919	6.5927	0.9859	0.0000	0.0000	0.0000	0.0000	7.7141	33.5863	68.0899	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												244.4781	
Space heating per m2											(98c) / (4) =	5.6383	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	61.6258	41.8914	23.9919	6.5927	0.9859	0.0000	0.0000	0.0000	0.0000	7.7141	33.5863	68.0899	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	92.4387	62.8371	35.9879	9.8891	1.4789	0.0000	0.0000	0.0000	0.0000	11.5711	50.3794	102.1349	
Space heating requirement													
	92.4387	62.8371	35.9879	9.8891	1.4789	0.0000	0.0000	0.0000	0.0000	11.5711	50.3794	102.1349	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												366.7171	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												3.6672	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)

Appendix Q - special features

Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2832.5799	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	366.7171	4.4400	16.2822	(340a)
Space heating total			16.2822	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			179.6156	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7318	(357)
SAP value		88.1376	
SAP rating (Section 12)		88	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	972.8521	0.1583	15.4842	(367)
Electrical energy for heat distribution (space & water)	3.6672	0.0000	5.1985	(372)
Overall CO2 factor for heat network			0.0394	(386)
Total CO2 associated with community systems			143.8262	(373)
Space and water heating			143.8262	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			43.2984	(383)
CO2 emissions per m2			1.0000	(384)
EI value			99.3434	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

Measured/design AP50												3.0000	(17)
Infiltration rate												0.1500	(18)
Number of sides sheltered												3	(19)
Shelter factor									(20) = 1 - [0.075 x (19)] =			0.7750	(20)
Infiltration rate adjusted to include shelter factor									(21) = (18) x (20) =			0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4982	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)

Water heating gains (Table 5)

	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)

Total internal gains

	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	6.5100	13.7758	0.6800	0.7000	0.7700	29.5826	(81)

Solar gains	29.5826	53.8385	96.0030	159.3666	205.6523	234.6690	215.6278	175.8602	123.5269	69.5726	36.7370	24.2504	(83)
Total gains	448.3434	470.7078	501.1871	542.7367	568.0729	578.1218	547.9771	510.7844	469.5517	435.1638	425.9639	433.9675	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area	0.8996	0.8658	0.7758	0.6303	0.4617	0.3001	0.2130	0.2402	0.4196	0.6606	0.8399	0.9128	(86)
MIT	20.7140	20.7864	20.9015	20.9738	20.9965	20.9998	21.0000	21.0000	20.9985	20.9713	20.8488	20.6806	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house	0.8844	0.8471	0.7498	0.5987	0.4281	0.2665	0.1774	0.2021	0.3787	0.6224	0.8159	0.8991	(89)
MIT 2	20.0357	20.1203	20.2501	20.3256	20.3468	20.3495	20.3496	20.3495	20.3486	20.3247	20.1943	19.9964	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.3597	20.4384	20.5612	20.6352	20.6571	20.6601	20.6602	20.6602	20.6590	20.6336	20.5069	20.3232	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3597	20.4384	20.5612	20.6352	20.6571	20.6601	20.6602	20.6602	20.6590	20.6336	20.5069	20.3232	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8847	0.8498	0.7584	0.6127	0.4440	0.2825	0.1944	0.2203	0.3982	0.6393	0.8220	0.8985	(94)
Useful gains	396.6399	399.9871	380.1240	332.5366	252.2378	163.3483	106.5330	112.5141	186.9624	278.2211	350.1227	389.9009	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	471.5901	455.9937	405.8034	339.1921	253.0698	163.3869	106.5356	112.5200	187.2930	285.2810	389.2185	473.4918	(97)
Space heating kWh	55.7629	37.6365	19.1055	4.7920	0.6190	0.0000	0.0000	0.0000	0.0000	5.2526	28.1490	62.1916	(98a)
Space heating requirement - total per year (kWh/year)												213.5091	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	55.7629	37.6365	19.1055	4.7920	0.6190	0.0000	0.0000	0.0000	0.0000	5.2526	28.1490	62.1916	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												213.5091	
Space heating per m2											(98c) / (4) =	4.9241	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement

	55.7629	37.6365	19.1055	4.7920	0.6190	0.0000	0.0000	0.0000	0.0000	5.2526	28.1490	62.1916	(98)

Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50

307a	83.6443	56.4547	28.6582	7.1880	0.9285	0.0000	0.0000	0.0000	0.0000	7.8789	42.2235	93.2874	
Space heating requirement	83.6443	56.4547	28.6582	7.1880	0.9285	0.0000	0.0000	0.0000	0.0000	7.8789	42.2235	93.2874	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)

Space heating fuel for secondary/supplementary system

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement

	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50

310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)

Cooling System Energy Efficiency Ratio 0.0000 (314)

Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)

Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year	
Space heating fuel - community heating	320.2636 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	3281.4784 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	3.2026 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)	
mechanical ventilation fans (SFP = 0.0920)	11.9235 (330a)
Total electricity for the above, kWh/year	11.9235 (331)
Electricity for lighting (calculated in Appendix L)	130.6818 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	2689.6003 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	320.2636	6.5500	20.9773	(340a)
Space heating total			20.9773	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			221.3783	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	960.4645	0.1588	13.5614	(367)
Electrical energy for heat distribution (space & water)	3.2026	0.0000	5.1264	(372)
Overall CO2 factor for heat network			0.0394	(386)
Total CO2 associated with community systems			141.8312	(373)
Space and water heating			141.8312	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			29.0713	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	960.4645	1.5878	135.6032	(467)
Electrical energy for heat distribution (space & water)	3.2026	0.0000	54.9749	(472)
Overall CO2 factor for heat network			0.4223	(486)
Total CO2 associated with community systems			1520.9711	(473)
Space and water heating			1520.9711	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			816.6461	(483)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.09	**TER**	15.13
Environmental	99 A	**% DER < TER**			92.80
CO_2 Emissions (t/year)	0.03	**DFEE**	17.34	**TFEE**	28.45
Compliance Check	See BREL	**% DFEE < TFEE**			39.06
% DPER < TPER	73.24	**DPER**	21.88	**TPER**	81.75

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523 (64)
12Total per year (kWh/year)												2188 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.5100	11.2829	0.6800	0.7000	0.7700	24.2294	(75)

Solar gains	24.2294	49.3197	88.8585	145.9312	196.1601	209.1274	195.6344	155.9620	108.2755	60.2726	30.4869	19.7870 (83)
Total gains	401.8204	434.0697	459.0200	503.4703	537.4268	539.2142	514.5511	476.0500	437.0995	399.4715	388.6443	390.6467 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761

alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451		
util living area	0.9385	0.9045	0.8384	0.6918	0.5140	0.3548	0.2559	0.2891	0.4702	0.7370	0.8913	0.9466	(86)
MIT	20.5988	20.7083	20.8394	20.9549	20.9932	20.9994	20.9999	20.9999	20.9969	20.9451	20.7725	20.5651	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house	0.9278	0.8895	0.8160	0.6604	0.4792	0.3189	0.2180	0.2482	0.4267	0.7006	0.8723	0.9371	(89)
MIT 2	19.8985	20.0296	20.1821	20.3071	20.3441	20.3492	20.3495	20.3495	20.3475	20.2996	20.1083	19.8576	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.2330	20.3538	20.4961	20.6165	20.6541	20.6598	20.6602	20.6601	20.6577	20.6079	20.4256	20.1955	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2330	20.3538	20.4961	20.6165	20.6541	20.6598	20.6602	20.6601	20.6577	20.6079	20.4256	20.1955	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9258	0.8896	0.8212	0.6735	0.4955	0.3361	0.2361	0.2677	0.4474	0.7154	0.8747	0.9346	(94)
Useful gains	371.9867	386.1506	376.9650	339.0812	266.3093	181.2125	121.4870	127.4582	195.5581	285.7765	339.9423	365.1173	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	476.7762	462.4368	418.8175	350.6035	267.9420	181.3321	121.4967	127.4801	196.2316	299.4757	398.7526	478.6486	(97)
Space heating kWh	77.9634	51.2643	31.1382	8.2961	1.2147	0.0000	0.0000	0.0000	0.0000	10.1922	42.3434	84.4673	(98a)
Space heating requirement - total per year (kWh/year)												306.8795	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	77.9634	51.2643	31.1382	8.2961	1.2147	0.0000	0.0000	0.0000	0.0000	10.1922	42.3434	84.4673	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												306.8795	
Space heating per m2											(98c) / (4) =	7.0775	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	77.9634	51.2643	31.1382	8.2961	1.2147	0.0000	0.0000	0.0000	0.0000	10.1922	42.3434	84.4673	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	116.9450	76.8964	46.7074	12.4441	1.8221	0.0000	0.0000	0.0000	0.0000	15.2883	63.5151	126.7009	
Space heating requirement	116.9450	76.8964	46.7074	12.4441	1.8221	0.0000	0.0000	0.0000	0.0000	15.2883	63.5151	126.7009	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												460.3193	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												4.6032	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2926.1821	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	997.8127	0.1583	19.4277	(367)
Electrical energy for heat distribution (space & water)	4.6032	0.0000	5.3464	(372)
Overall CO2 factor for heat network			0.0395	(386)
Total CO2 associated with community systems			147.9175	(373)
Space and water heating			147.9175	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			47.3898	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.0900	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	997.8127	1.5859	194.6684	(467)
Electrical energy for heat distribution (space & water)	4.6032	0.0000	57.1898	(472)
Overall CO2 factor for heat network			0.4229	(486)
Total CO2 associated with community systems			1582.2512	(473)
Space and water heating			1582.2512	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			948.6564	(483)
Dwelling Primary energy Rate (DPER)			21.8800	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)

Wall to Unheated Common area	16.5900	16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)		33.1800			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		13.7636	(33)
Main dwelling					
Party Wall		31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 199.1940 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	52.2400	0.0700	3.6568
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3858 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 20.1494 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	40.9650	40.8373	40.7122	40.1245	40.0146	39.5027	39.5027	39.4079	39.6999	40.0146	40.2370	40.4696	(39)

Average = Sum(39)m / 12 = 40.1240

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9448	0.9418	0.9389	0.9254	0.9228	0.9110	0.9110	0.9089	0.9156	0.9228	0.9280	0.9333	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)

Energy content (annual) Total = Sum(45)m = 1536.8125

Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)

Total per year (kWh/year) = Sum(64)m = 1875.8483 (64)

12Total per year (kWh/year) 1876 (64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
Northeast					6.5100	11.2829		0.6300	0.7000	0.7700		22.4479	(75)
Solar gains	22.4479	45.6933	82.3248	135.2009	181.7366	193.7504	181.2495	144.4942	100.3140	55.8408	28.2452	18.3321	(83)
Total gains	391.6686	421.8550	444.1160	484.3020	514.6330	512.3991	488.7959	453.2120	417.7000	386.6694	377.9646	380.8215	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.5666	58.7497	58.9302	59.7934	59.9577	60.7346	60.7346	60.8807	60.4330	59.9577	59.6262	59.2836	
alpha	4.9044	4.9166	4.9287	4.9862	4.9972	5.0490	5.0490	5.0587	5.0289	4.9972	4.9751	4.9522	
util living area	0.9712	0.9564	0.9253	0.8340	0.6769	0.4862	0.3544	0.3976	0.6264	0.8623	0.9489	0.9742	(86)
MIT	20.0637	20.2164	20.4462	20.7473	20.9263	20.9886	20.9981	20.9967	20.9619	20.7437	20.3791	20.0453	(87)
Th 2	20.1296	20.1321	20.1345	20.1460	20.1481	20.1581	20.1581	20.1600	20.1543	20.1481	20.1438	20.1393	(88)
util rest of house	0.9648	0.9470	0.9092	0.8022	0.6269	0.4251	0.2872	0.3262	0.5597	0.8282	0.9364	0.9685	(89)
MIT 2	19.0593	19.2512	19.5352	19.8967	20.0867	20.1512	20.1574	20.1586	20.1281	19.9024	19.4651	19.0437	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.5390	19.7122	19.9703	20.3030	20.4877	20.5511	20.5589	20.5589	20.5264	20.3042	19.9017	19.5221	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5390	19.7122	19.9703	20.3030	20.4877	20.5511	20.5589	20.5589	20.5264	20.3042	19.9017	19.5221	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9595	0.9416	0.9058	0.8084	0.6474	0.4539	0.3193	0.3603	0.5898	0.8350	0.9323	0.9635	(94)
Useful gains	375.8246	397.2337	402.2702	391.5168	333.1490	232.5742	156.0514	163.2827	246.3554	322.8744	352.3683	366.9170	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	624.2659	604.8904	548.4076	457.5389	351.6368	235.0862	156.3890	163.8935	255.1261	388.3102	515.1012	620.0797	(97)
Space heating kWh	184.8403	139.5453	108.7263	47.5359	13.7549	0.0000	0.0000	0.0000	0.0000	48.6842	117.1677	188.3530	(98a)
Space heating requirement - total per year (kWh/year)												848.6077	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	184.8403	139.5453	108.7263	47.5359	13.7549	0.0000	0.0000	0.0000	0.0000	48.6842	117.1677	188.3530	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												848.6077	
Space heating per m2											(98c) / (4) =	19.5712	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	184.8403	139.5453	108.7263	47.5359	13.7549	0.0000	0.0000	0.0000	0.0000	48.6842	117.1677	188.3530	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	200.2604	151.1867	117.7966	51.5016	14.9024	0.0000	0.0000	0.0000	0.0000	52.7456	126.9422	204.0661	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.0767	83.7214	83.0474	81.7582	80.4858	79.8000	79.8000	79.8000	79.8000	81.7733	83.3177	84.1412	(217)
Fuel for water heating, kWh/month	218.1938	193.9859	208.4152	187.8871	186.1830	170.5061	169.2907	175.3325	176.4869	190.5146	196.9517	215.8841	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												919.4016	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2289.6316	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3054.1072	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	919.4016	0.2100	193.0743	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2289.6316	0.2100	480.8226	(264)
Space and water heating			673.8970	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			656.1944	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.1300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	919.4016	1.1300	1038.9238	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2289.6316	1.1300	2587.2837	(278)
Space and water heating			3626.2075	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3544.7051	(286)
Target Primary Energy Rate (TPER)			81.7500	(287)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.09	**TER**	15.13
Environmental	99 A	**% DER < TER**			92.80
CO_2 Emissions (t/year)	0.03	**DFEE**	17.34	**TFEE**	28.45
Compliance Check	See BREL	**% DFEE < TFEE**			39.06
% DPER < TPER	73.24	**DPER**	21.88	**TPER**	81.75

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2622	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	31.8822	31.8062	31.7316	31.3815	31.3160	31.0111	31.0111	30.9546	31.1285	31.3160	31.4485	31.5871	(39)
Average = Sum(39)m / 12 =												31.3812	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7353	0.7335	0.7318	0.7237	0.7222	0.7152	0.7152	0.7139	0.7179	0.7222	0.7253	0.7285	(40)
HLP (average)												0.7237	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		449.4572	(64a)
Heat gains from water heating, kWh/month	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.4004	291.4783	279.0119	271.5070	258.2448	250.2442	241.2477	240.9702	247.9561	254.7841	268.8582	277.3654	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.5100	11.2829	0.6800	0.7000	0.7700	24.2294	(75)

Solar gains	24.2294	49.3197	88.8585	145.9312	196.1601	209.1274	195.6344	155.9620	108.2755	60.2726	30.4869	19.7870	(83)
Total gains	307.6298	340.7981	367.8704	417.4382	454.4050	459.3717	436.8821	396.9323	356.2316	315.0568	299.3451	297.1524	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.2514	75.4313	75.6085	76.4520	76.6119	77.3652	77.3652	77.5064	77.0733	76.6119	76.2891	75.9545	
alpha	6.0168	6.0288	6.0406	6.0968	6.1075	6.1577	6.1577	6.1671	6.1382	6.1075	6.0859	6.0636	
util living area	0.9841	0.9695	0.9346	0.8154	0.6250	0.4306	0.3122	0.3583	0.5919	0.8731	0.9662	0.9867	(86)
MIT	20.2565	20.4118	20.6232	20.8723	20.9766	20.9979	20.9998	20.9995	20.9872	20.8357	20.5201	20.2301	(87)
Th 2	20.3098	20.3113	20.3128	20.3199	20.3212	20.3274	20.3274	20.3286	20.3250	20.3212	20.3185	20.3157	(88)
util rest of house	0.9806	0.9631	0.9213	0.7860	0.5839	0.3860	0.2645	0.3062	0.5380	0.8441	0.9580	0.9837	(89)

MIT 2	19.6340	19.7869	19.9909	20.2217	20.3061	20.3264	20.3273	20.3284	20.3181	20.1963	19.9002	19.6131	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.9313	20.0853	20.2929	20.5324	20.6263	20.6471	20.6485	20.6489	20.6377	20.5017	20.1963	19.9078	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9313	20.0853	20.2929	20.5324	20.6263	20.6471	20.6485	20.6489	20.6377	20.5017	20.1963	19.9078	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9783	0.9606	0.9209	0.7956	0.6026	0.4073	0.2873	0.3311	0.5633	0.8524	0.9563	0.9816	(94)
Useful gains	300.9423	327.3828	338.7633	332.0998	273.8223	187.0815	125.5074	131.4267	200.6496	268.5458	286.2511	291.6827	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	498.3618	482.9869	437.6710	365.0437	279.5367	187.5282	125.5488	131.5235	203.5092	310.0821	411.8594	496.1638	(97)
Space heating kWh													
	146.8801	104.5659	73.5873	23.7196	4.2515	0.0000	0.0000	0.0000	0.0000	30.9030	90.4379	152.1339	(98a)
Space heating requirement - total per year (kWh/year)												626.4793	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	146.8801	104.5659	73.5873	23.7196	4.2515	0.0000	0.0000	0.0000	0.0000	30.9030	90.4379	152.1339	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												626.4793	
Space heating per m2											(98c) / (4) =	14.4483	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	291.5043	229.4821	235.2551	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9858	0.9946	0.9899	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	287.3594	228.2466	232.8681	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	507.9054	483.1931	437.9038	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	158.7931	189.6802	152.5465	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	39.6983	47.4201	38.1366	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												125.2550	(107)
Energy for space heating												14.4483	(99)
Energy for space cooling												2.8887	(108)
Total												17.3370	(109)
Fabric Energy Efficiency (DFEE)												17.3	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	13.7636			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	199.1940	(35)
List of Thermal Bridges		

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	52.2400	0.0700	3.6568
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	6.3858	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	20.1494	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	40.9650	40.8373	40.7122	40.1245	40.0146	39.5027	39.5027	39.4079	39.6999	40.0146	40.2370	40.4696	(39)
Average = Sum(39)m / 12 =												40.1240	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9448	0.9418	0.9389	0.9254	0.9228	0.9110	0.9110	0.9089	0.9156	0.9228	0.9280	0.9333	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4982	(42)

Hot water usage for mixer showers

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												47.0349	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	

Distribution loss (46)m = 0.15 x (45)m

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)

Electric shower(s)

	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												449.4572	(64a)

Heat gains from water heating, kWh/month

	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													

	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931 (72)
Total internal gains	281.3655	289.2254	276.9770	269.4043	256.2100	248.1415	239.2128	238.9354	245.8534	252.7493	266.7555	275.3306 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.5100	11.2829	0.6300	0.7000	0.7700	22.4479	(75)

Solar gains	22.4479	45.6933	82.3248	135.2009	181.7366	193.7504	181.2495	144.4942	100.3140	55.8408	28.2452	18.3321 (83)
Total gains	303.8134	334.9187	359.3018	404.6052	437.9465	441.8920	420.4623	383.4296	346.1675	308.5901	295.0007	293.6626 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.5666	58.7497	58.9302	59.7934	59.9577	60.7346	60.7346	60.8807	60.4330	59.9577	59.6262	59.2836	
alpha	4.9044	4.9166	4.9287	4.9862	4.9972	5.0490	5.0490	5.0587	5.0289	4.9972	4.9751	4.9522	
util living area	0.9895	0.9819	0.9642	0.8989	0.7589	0.5570	0.4106	0.4671	0.7240	0.9304	0.9800	0.9911	(86)
MIT	19.8178	19.9862	20.2472	20.6228	20.8768	20.9792	20.9963	20.9932	20.9277	20.6002	20.1638	19.7981	(87)
Th 2	20.1296	20.1321	20.1345	20.1460	20.1481	20.1581	20.1581	20.1600	20.1543	20.1481	20.1438	20.1393	(88)
util rest of house	0.9870	0.9774	0.9553	0.8749	0.7106	0.4894	0.3334	0.3845	0.6562	0.9084	0.9743	0.9888	(89)
MIT 2	19.0549	19.2231	19.4805	19.8449	20.0650	20.1479	20.1570	20.1577	20.1133	19.8329	19.4090	19.0430	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.4193	19.5876	19.8467	20.2164	20.4528	20.5450	20.5579	20.5567	20.5023	20.1994	19.7695	19.4037	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4193	19.5876	19.8467	20.2164	20.4528	20.5450	20.5579	20.5567	20.5023	20.1994	19.7695	19.4037	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9843	0.9740	0.9517	0.8771	0.7287	0.5210	0.3703	0.4239	0.6854	0.9099	0.9712	0.9864	(94)
Useful gains	299.0367	326.2134	341.9614	354.8714	319.1366	230.2196	155.6797	162.5312	237.2568	280.7946	286.5012	289.6754	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	619.3624	599.8012	543.3748	454.0668	350.2380	234.8433	156.3466	163.8088	254.1701	384.1164	509.7844	615.2870	(97)
Space heating kWh	238.3223	183.8510	149.8516	71.4207	23.1394	0.0000	0.0000	0.0000	0.0000	76.8715	160.7639	242.2550	(98a)
Space heating requirement - total per year (kWh/year)												1146.4753	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	238.3223	183.8510	149.8516	71.4207	23.1394	0.0000	0.0000	0.0000	0.0000	76.8715	160.7639	242.2550	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1146.4753	
Space heating per m2										(98c) / (4) =		26.4409	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	371.3254	292.3200	299.5001	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9264	0.9624	0.9425	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	344.0135	281.3380	282.2830	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	489.7542	466.1872	424.2498	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	104.9333	137.5278	105.6233	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	26.2333	34.3820	26.4058	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												87.0211	(107)
Energy for space heating												26.4409	(99)
Energy for space cooling												2.0069	(108)
Total												28.4478	(109)
Fabric Energy Efficiency (TFEE)												28.4	(109)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.09	**TER**	15.13
Environmental	99 A	**% DER < TER**			92.80
CO_2 Emissions (t/year)	0.03	**DFEE**	17.34	**TFEE**	28.45
Compliance Check	See BREL	**% DFEE < TFEE**			39.06
% DPER < TPER	73.24	**DPER**	21.88	**TPER**	81.75

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523 (64)
12Total per year (kWh/year)												2188 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.5100	11.2829	0.6800	0.7000	0.7700	24.2294	(75)

Solar gains	24.2294	49.3197	88.8585	145.9312	196.1601	209.1274	195.6344	155.9620	108.2755	60.2726	30.4869	19.7870 (83)
Total gains	401.8204	434.0697	459.0200	503.4703	537.4268	539.2142	514.5511	476.0500	437.0995	399.4715	388.6443	390.6467 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761

alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451		
util living area	0.9385	0.9045	0.8384	0.6918	0.5140	0.3548	0.2559	0.2891	0.4702	0.7370	0.8913	0.9466	(86)
MIT	20.5988	20.7083	20.8394	20.9549	20.9932	20.9994	20.9999	20.9999	20.9969	20.9451	20.7725	20.5651	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house	0.9278	0.8895	0.8160	0.6604	0.4792	0.3189	0.2180	0.2482	0.4267	0.7006	0.8723	0.9371	(89)
MIT 2	19.8985	20.0296	20.1821	20.3071	20.3441	20.3492	20.3495	20.3495	20.3475	20.2996	20.1083	19.8576	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.2330	20.3538	20.4961	20.6165	20.6541	20.6598	20.6602	20.6601	20.6577	20.6079	20.4256	20.1955	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2330	20.3538	20.4961	20.6165	20.6541	20.6598	20.6602	20.6601	20.6577	20.6079	20.4256	20.1955	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9258	0.8896	0.8212	0.6735	0.4955	0.3361	0.2361	0.2677	0.4474	0.7154	0.8747	0.9346	(94)
Useful gains	371.9867	386.1506	376.9650	339.0812	266.3093	181.2125	121.4870	127.4582	195.5581	285.7765	339.9423	365.1173	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	476.7762	462.4368	418.8175	350.6035	267.9420	181.3321	121.4967	127.4801	196.2316	299.4757	398.7526	478.6486	(97)
Space heating kWh	77.9634	51.2643	31.1382	8.2961	1.2147	0.0000	0.0000	0.0000	0.0000	10.1922	42.3434	84.4673	(98a)
Space heating requirement - total per year (kWh/year)												306.8795	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	77.9634	51.2643	31.1382	8.2961	1.2147	0.0000	0.0000	0.0000	0.0000	10.1922	42.3434	84.4673	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												306.8795	
Space heating per m2											(98c) / (4) =	7.0775	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	77.9634	51.2643	31.1382	8.2961	1.2147	0.0000	0.0000	0.0000	0.0000	10.1922	42.3434	84.4673	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	116.9450	76.8964	46.7074	12.4441	1.8221	0.0000	0.0000	0.0000	0.0000	15.2883	63.5151	126.7009	
Space heating requirement	116.9450	76.8964	46.7074	12.4441	1.8221	0.0000	0.0000	0.0000	0.0000	15.2883	63.5151	126.7009	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												460.3193	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												4.6032	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2926.1821	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	997.8127	0.1583	19.4277	(367)
Electrical energy for heat distribution (space & water)	4.6032	0.0000	5.3464	(372)
Overall CO2 factor for heat network			0.0395	(386)
Total CO2 associated with community systems			147.9175	(373)
Space and water heating			147.9175	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			47.3898	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.0900	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	997.8127	1.5859	194.6684	(467)
Electrical energy for heat distribution (space & water)	4.6032	0.0000	57.1898	(472)
Overall CO2 factor for heat network			0.4229	(486)
Total CO2 associated with community systems			1582.2512	(473)
Space and water heating			1582.2512	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			948.6564	(483)
Dwelling Primary energy Rate (DPER)			21.8800	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)

Wall to Unheated Common area	16.5900	16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)		33.1800			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		13.7636	(33)
Main dwelling					
Party Wall		31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 199.1940 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	52.2400	0.0700	3.6568
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3858 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 20.1494 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	40.9650	40.8373	40.7122	40.1245	40.0146	39.5027	39.5027	39.4079	39.6999	40.0146	40.2370	40.4696	(39)

Average = Sum(39)m / 12 = 40.1240

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9448	0.9418	0.9389	0.9254	0.9228	0.9110	0.9110	0.9089	0.9156	0.9228	0.9280	0.9333	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)

Energy content (annual) Total = Sum(45)m = 1536.8125

Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)

Total per year (kWh/year) = Sum(64)m = 1875.8483 (64)

12Total per year (kWh/year) 1876 (64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
Northeast					6.5100	11.2829		0.6300	0.7000	0.7700		22.4479	(75)
Solar gains	22.4479	45.6933	82.3248	135.2009	181.7366	193.7504	181.2495	144.4942	100.3140	55.8408	28.2452	18.3321	(83)
Total gains	391.6686	421.8550	444.1160	484.3020	514.6330	512.3991	488.7959	453.2120	417.7000	386.6694	377.9646	380.8215	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.5666	58.7497	58.9302	59.7934	59.9577	60.7346	60.7346	60.8807	60.4330	59.9577	59.6262	59.2836	
alpha	4.9044	4.9166	4.9287	4.9862	4.9972	5.0490	5.0490	5.0587	5.0289	4.9972	4.9751	4.9522	
util living area	0.9712	0.9564	0.9253	0.8340	0.6769	0.4862	0.3544	0.3976	0.6264	0.8623	0.9489	0.9742	(86)
MIT	20.0637	20.2164	20.4462	20.7473	20.9263	20.9886	20.9981	20.9967	20.9619	20.7437	20.3791	20.0453	(87)
Th 2	20.1296	20.1321	20.1345	20.1460	20.1481	20.1581	20.1581	20.1600	20.1543	20.1481	20.1438	20.1393	(88)
util rest of house	0.9648	0.9470	0.9092	0.8022	0.6269	0.4251	0.2872	0.3262	0.5597	0.8282	0.9364	0.9685	(89)
MIT 2	19.0593	19.2512	19.5352	19.8967	20.0867	20.1512	20.1574	20.1586	20.1281	19.9024	19.4651	19.0437	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.5390	19.7122	19.9703	20.3030	20.4877	20.5511	20.5589	20.5589	20.5264	20.3042	19.9017	19.5221	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5390	19.7122	19.9703	20.3030	20.4877	20.5511	20.5589	20.5589	20.5264	20.3042	19.9017	19.5221	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9595	0.9416	0.9058	0.8084	0.6474	0.4539	0.3193	0.3603	0.5898	0.8350	0.9323	0.9635	(94)
Useful gains	375.8246	397.2337	402.2702	391.5168	333.1490	232.5742	156.0514	163.2827	246.3554	322.8744	352.3683	366.9170	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	624.2659	604.8904	548.4076	457.5389	351.6368	235.0862	156.3890	163.8935	255.1261	388.3102	515.1012	620.0797	(97)
Space heating kWh	184.8403	139.5453	108.7263	47.5359	13.7549	0.0000	0.0000	0.0000	0.0000	48.6842	117.1677	188.3530	(98a)
Space heating requirement - total per year (kWh/year)												848.6077	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	184.8403	139.5453	108.7263	47.5359	13.7549	0.0000	0.0000	0.0000	0.0000	48.6842	117.1677	188.3530	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												848.6077	
Space heating per m2											(98c) / (4) =	19.5712	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	184.8403	139.5453	108.7263	47.5359	13.7549	0.0000	0.0000	0.0000	0.0000	48.6842	117.1677	188.3530	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	200.2604	151.1867	117.7966	51.5016	14.9024	0.0000	0.0000	0.0000	0.0000	52.7456	126.9422	204.0661	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.0767	83.7214	83.0474	81.7582	80.4858	79.8000	79.8000	79.8000	79.8000	81.7733	83.3177	84.1412	(217)
Fuel for water heating, kWh/month	218.1938	193.9859	208.4152	187.8871	186.1830	170.5061	169.2907	175.3325	176.4869	190.5146	196.9517	215.8841	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												919.4016	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2289.6316	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3054.1072	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	919.4016	0.2100	193.0743	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2289.6316	0.2100	480.8226	(264)
Space and water heating			673.8970	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			656.1944	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.1300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	919.4016	1.1300	1038.9238	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2289.6316	1.1300	2587.2837	(278)
Space and water heating			3626.2075	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3544.7051	(286)
Target Primary Energy Rate (TPER)			81.7500	(287)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.09	**TER**	15.13
Environmental	99 A	**% DER < TER**			92.80
CO_2 Emissions (t/year)	0.03	**DFEE**	17.34	**TFEE**	28.45
Compliance Check	See BREL	**% DFEE < TFEE**			39.06
% DPER < TPER	73.24	**DPER**	21.88	**TPER**	81.75

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			3.0000 (17)
Infiltration rate			0.1500 (18)
Number of sides sheltered			3 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		8637.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							199.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							0.9954	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.5100	11.2829	0.6800	0.7000	0.7700	24.2294	(75)

Solar gains	24.2294	49.3197	88.8585	145.9312	196.1601	209.1274	195.6344	155.9620	108.2755	60.2726	30.4869	19.7870	(83)
Total gains	442.9902	466.1891	494.0426	529.3014	558.5808	552.5802	527.9837	490.8862	454.3003	425.8639	419.7138	429.5041	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451

util living area													
	0.9100	0.8776	0.8019	0.6634	0.4952	0.3463	0.2493	0.2803	0.4528	0.7009	0.8599	0.9217	(86)
MIT	20.6839	20.7624	20.8766	20.9642	20.9945	20.9995	21.0000	20.9999	20.9975	20.9584	20.8200	20.6504	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house													
	0.8961	0.8602	0.7777	0.6322	0.4615	0.3112	0.2125	0.2407	0.4108	0.6642	0.8381	0.9092	(89)
MIT 2	19.9999	20.0922	20.2227	20.3161	20.3451	20.3493	20.3495	20.3495	20.3479	20.3122	20.1617	19.9601	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.3266	20.4123	20.5350	20.6256	20.6553	20.6598	20.6602	20.6602	20.6582	20.6209	20.4761	20.2898	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3266	20.4123	20.5350	20.6256	20.6553	20.6598	20.6602	20.6602	20.6582	20.6209	20.4761	20.2898	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8956	0.8620	0.7848	0.6456	0.4774	0.3280	0.2301	0.2597	0.4308	0.6798	0.8425	0.9079	(94)
Useful gains	396.7481	401.8502	387.7355	341.7194	266.6513	181.2303	121.4885	127.4623	195.7030	289.4947	353.6183	389.9506	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	479.5785	464.1887	419.9827	350.8760	267.9765	181.3339	121.4969	127.4805	196.2463	299.8630	400.2659	481.4693	(97)
Space heating kWh	61.6258	41.8914	23.9919	6.5927	0.9859	0.0000	0.0000	0.0000	0.0000	7.7141	33.5863	68.0899	(98a)
Space heating requirement - total per year (kWh/year)												244.4781	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	61.6258	41.8914	23.9919	6.5927	0.9859	0.0000	0.0000	0.0000	0.0000	7.7141	33.5863	68.0899	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												244.4781	
Space heating per m2											(98c) / (4) =	5.6383	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	61.6258	41.8914	23.9919	6.5927	0.9859	0.0000	0.0000	0.0000	0.0000	7.7141	33.5863	68.0899	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	92.4387	62.8371	35.9879	9.8891	1.4789	0.0000	0.0000	0.0000	0.0000	11.5711	50.3794	102.1349	
Space heating requirement													
	92.4387	62.8371	35.9879	9.8891	1.4789	0.0000	0.0000	0.0000	0.0000	11.5711	50.3794	102.1349	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												366.7171	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												3.6672	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2832.5799	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	366.7171	4.4400	16.2822	(340a)
Space heating total			16.2822	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			179.6156	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7318	(357)
SAP value		88.1376	
SAP rating (Section 12)		88	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	972.8521	0.1583	15.4842	(367)
Electrical energy for heat distribution (space & water)	3.6672	0.0000	5.1985	(372)
Overall CO2 factor for heat network			0.0394	(386)
Total CO2 associated with community systems			143.8262	(373)
Space and water heating			143.8262	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			43.2984	(383)
CO2 emissions per m2			1.0000	(384)
EI value			99.3434	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	43.3600 (1b)	x 2.4500 (2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)

Adj infilt rate

	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104 (22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)

Heat transfer coeff

	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)

Average = Sum(39)m / 12 = 29.9239

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m													
	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Total per year (kWh/year) = Sum(64)m = 2187.6523 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)												
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874 (72)
Total internal gains												
	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.5100	13.7758	0.6800	0.7000	0.7700	29.5826	(75)

Solar gains	29.5826	53.8385	96.0030	159.3666	205.6523	234.6690	215.6278	175.8602	123.5269	69.5726	36.7370	24.2504 (83)
Total gains	448.3434	470.7078	501.1871	542.7367	568.0729	578.1218	547.9771	510.7844	469.5517	435.1638	425.9639	433.9675 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area													
	0.8996	0.8658	0.7758	0.6303	0.4617	0.3001	0.2130	0.2402	0.4196	0.6606	0.8399	0.9128	(86)
MIT	20.7140	20.7864	20.9015	20.9738	20.9965	20.9998	21.0000	21.0000	20.9985	20.9713	20.8488	20.6806	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house													
	0.8844	0.8471	0.7498	0.5987	0.4281	0.2665	0.1774	0.2021	0.3787	0.6224	0.8159	0.8991	(89)
MIT 2	20.0357	20.1203	20.2501	20.3256	20.3468	20.3495	20.3496	20.3495	20.3486	20.3247	20.1943	19.9964	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.3597	20.4384	20.5612	20.6352	20.6571	20.6601	20.6602	20.6602	20.6590	20.6336	20.5069	20.3232	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3597	20.4384	20.5612	20.6352	20.6571	20.6601	20.6602	20.6602	20.6590	20.6336	20.5069	20.3232	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8847	0.8498	0.7584	0.6127	0.4440	0.2825	0.1944	0.2203	0.3982	0.6393	0.8220	0.8985	(94)
Useful gains	396.6399	399.9871	380.1240	332.5366	252.2378	163.3483	106.5330	112.5141	186.9624	278.2211	350.1227	389.9009	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	471.5901	455.9937	405.8034	339.1921	253.0698	163.3869	106.5356	112.5200	187.2930	285.2810	389.2185	473.4918	(97)
Space heating kWh													
	55.7629	37.6365	19.1055	4.7920	0.6190	0.0000	0.0000	0.0000	0.0000	5.2526	28.1490	62.1916	(98a)
Space heating requirement - total per year (kWh/year)												213.5091	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	55.7629	37.6365	19.1055	4.7920	0.6190	0.0000	0.0000	0.0000	0.0000	5.2526	28.1490	62.1916	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												213.5091	
Space heating per m2											(98c) / (4) =	4.9241	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	55.7629	37.6365	19.1055	4.7920	0.6190	0.0000	0.0000	0.0000	0.0000	5.2526	28.1490	62.1916	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	83.6443	56.4547	28.6582	7.1880	0.9285	0.0000	0.0000	0.0000	0.0000	7.8789	42.2235	93.2874	
Space heating requirement													
	83.6443	56.4547	28.6582	7.1880	0.9285	0.0000	0.0000	0.0000	0.0000	7.8789	42.2235	93.2874	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year												
Space heating fuel - community heating											320.2636	(307)
Space heating fuel - secondary											0.0000	(309)
Water heating fuel - community heating											3281.4784	(310)
Efficiency of water heater											0.0000	(311)
Electricity used for heat distribution											3.2026	(313)
Space cooling fuel											0.0000	(321)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)												
mechanical ventilation fans (SFP = 0.0920)											11.9235	(330a)
Total electricity for the above, kWh/year											11.9235	(331)
Electricity for lighting (calculated in Appendix L)											130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											-1054.7470	(333)
Wind generation											0.0000	(334)
Hydro-electric generation (Appendix N)											0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)											0.0000	(335)
Appendix Q - special features												
Energy saved or generated											-0.0000	(336)
Energy used											0.0000	(337)
Total delivered energy for all uses											2689.6003	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	320.2636	6.5500	20.9773	(340a)
Space heating total			20.9773	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			221.3783	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	960.4645	0.1588	13.5614	(367)
Electrical energy for heat distribution (space & water)	3.2026	0.0000	5.1264	(372)
Overall CO2 factor for heat network			0.0394	(386)
Total CO2 associated with community systems			141.8312	(373)
Space and water heating			141.8312	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			29.0713	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	960.4645	1.5878	135.6032	(467)
Electrical energy for heat distribution (space & water)	3.2026	0.0000	54.9749	(472)
Overall CO2 factor for heat network			0.4223	(486)
Total CO2 associated with community systems			1520.9711	(473)
Space and water heating			1520.9711	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			816.6461	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Southwest

Current energy efficiency rating:	B 88
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£41	£41	£0
Community scheme	£340	£340	£0
Space heating	£128	£128	£0
Water heating	£215	£215	£0
Lighting	£37	£37	£0
Generated (PV)	-£159	-£159	£0
Total cost of fuels	£222	£222	£0
Total cost of uses	£221	£221	£0
Delivered energy	62 kWh/m²	62 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.0 tonnes	0.0 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	19 kWh/m²	19 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)

Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	11.4002	(33)
Main dwelling					
Party Wall	31.3600	0.0000	0.0000	70.0000	2195.2000 (32)
Party Floor	43.3600			70.0000	3035.2000 (32d)
Party Ceiling 1	43.3600			30.0000	1300.8000 (32b)
Internal TF Wall	68.4500			9.0000	616.0500 (32c)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =		8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K					199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)					0.9954 (36)
Point Thermal bridges				(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =		12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.5100	11.2829	0.6800	0.7000	0.7700	24.2294	(75)

Solar gains	24.2294	49.3197	88.8585	145.9312	196.1601	209.1274	195.6344	155.9620	108.2755	60.2726	30.4869	19.7870	(83)
Total gains	442.9902	466.1891	494.0426	529.3014	558.5808	552.5802	527.9837	490.8862	454.3003	425.8639	419.7138	429.5041	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area													
	0.9100	0.8776	0.8019	0.6634	0.4952	0.3463	0.2493	0.2803	0.4528	0.7009	0.8599	0.9217	(86)
MIT	20.6839	20.7624	20.8766	20.9642	20.9945	20.9995	21.0000	20.9999	20.9975	20.9584	20.8200	20.6504	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house													
	0.8961	0.8602	0.7777	0.6322	0.4615	0.3112	0.2125	0.2407	0.4108	0.6642	0.8381	0.9092	(89)
MIT 2	19.9999	20.0922	20.2227	20.3161	20.3451	20.3493	20.3495	20.3495	20.3479	20.3122	20.1617	19.9601	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.3266	20.4123	20.5350	20.6256	20.6553	20.6598	20.6602	20.6602	20.6582	20.6209	20.4761	20.2898	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3266	20.4123	20.5350	20.6256	20.6553	20.6598	20.6602	20.6602	20.6582	20.6209	20.4761	20.2898	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8956	0.8620	0.7848	0.6456	0.4774	0.3280	0.2301	0.2597	0.4308	0.6798	0.8425	0.9079	(94)
Useful gains	396.7481	401.8502	387.7355	341.7194	266.6513	181.2303	121.4885	127.4623	195.7030	289.4947	353.6183	389.9506	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	479.5785	464.1887	419.9827	350.8760	267.9765	181.3339	121.4969	127.4805	196.2463	299.8630	400.2659	481.4693	(97)
Space heating kWh													
	61.6258	41.8914	23.9919	6.5927	0.9859	0.0000	0.0000	0.0000	0.0000	7.7141	33.5863	68.0899	(98a)
Space heating requirement - total per year (kWh/year)												244.4781	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	61.6258	41.8914	23.9919	6.5927	0.9859	0.0000	0.0000	0.0000	0.0000	7.7141	33.5863	68.0899	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												244.4781	
Space heating per m2											(98c) / (4) =	5.6383	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	61.6258	41.8914	23.9919	6.5927	0.9859	0.0000	0.0000	0.0000	0.0000	7.7141	33.5863	68.0899	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	92.4387	62.8371	35.9879	9.8891	1.4789	0.0000	0.0000	0.0000	0.0000	11.5711	50.3794	102.1349	
Space heating requirement													
	92.4387	62.8371	35.9879	9.8891	1.4789	0.0000	0.0000	0.0000	0.0000	11.5711	50.3794	102.1349	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												366.7171	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												3.6672	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)

Appendix Q - special features

Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2832.5799	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	366.7171	4.4400	16.2822	(340a)
Space heating total			16.2822	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			179.6156	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7318	(357)
SAP value		88.1376	
SAP rating (Section 12)		88	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	972.8521	0.1583	15.4842	(367)
Electrical energy for heat distribution (space & water)	3.6672	0.0000	5.1985	(372)
Overall CO2 factor for heat network			0.0394	(386)
Total CO2 associated with community systems			143.8262	(373)
Space and water heating			143.8262	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			43.2984	(383)
CO2 emissions per m2			1.0000	(384)
EI value			99.3434	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

Measured/design AP50												3.0000	(17)
Infiltration rate												0.1500	(18)
Number of sides sheltered												3	(19)
Shelter factor									(20) = 1 - [0.075 x (19)] =			0.7750	(20)
Infiltration rate adjusted to include shelter factor									(21) = (18) x (20) =			0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4982	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)

Water heating gains (Table 5)

	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)

Total internal gains

	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.5100	13.7758	0.6800	0.7000	0.7700	29.5826	(75)

Solar gains	29.5826	53.8385	96.0030	159.3666	205.6523	234.6690	215.6278	175.8602	123.5269	69.5726	36.7370	24.2504	(83)
Total gains	448.3434	470.7078	501.1871	542.7367	568.0729	578.1218	547.9771	510.7844	469.5517	435.1638	425.9639	433.9675	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area	0.8996	0.8658	0.7758	0.6303	0.4617	0.3001	0.2130	0.2402	0.4196	0.6606	0.8399	0.9128	(86)
MIT	20.7140	20.7864	20.9015	20.9738	20.9965	20.9998	21.0000	21.0000	20.9985	20.9713	20.8488	20.6806	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house	0.8844	0.8471	0.7498	0.5987	0.4281	0.2665	0.1774	0.2021	0.3787	0.6224	0.8159	0.8991	(89)
MIT 2	20.0357	20.1203	20.2501	20.3256	20.3468	20.3495	20.3496	20.3495	20.3486	20.3247	20.1943	19.9964	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.3597	20.4384	20.5612	20.6352	20.6571	20.6601	20.6602	20.6602	20.6590	20.6336	20.5069	20.3232	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3597	20.4384	20.5612	20.6352	20.6571	20.6601	20.6602	20.6602	20.6590	20.6336	20.5069	20.3232	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8847	0.8498	0.7584	0.6127	0.4440	0.2825	0.1944	0.2203	0.3982	0.6393	0.8220	0.8985	(94)
Useful gains	396.6399	399.9871	380.1240	332.5366	252.2378	163.3483	106.5330	112.5141	186.9624	278.2211	350.1227	389.9009	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	471.5901	455.9937	405.8034	339.1921	253.0698	163.3869	106.5356	112.5200	187.2930	285.2810	389.2185	473.4918	(97)
Space heating kWh	55.7629	37.6365	19.1055	4.7920	0.6190	0.0000	0.0000	0.0000	0.0000	5.2526	28.1490	62.1916	(98a)
Space heating requirement - total per year (kWh/year)												213.5091	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	55.7629	37.6365	19.1055	4.7920	0.6190	0.0000	0.0000	0.0000	0.0000	5.2526	28.1490	62.1916	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												213.5091	
Space heating per m2											(98c) / (4) =	4.9241	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement

	55.7629	37.6365	19.1055	4.7920	0.6190	0.0000	0.0000	0.0000	0.0000	5.2526	28.1490	62.1916	(98)

Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50

307a	83.6443	56.4547	28.6582	7.1880	0.9285	0.0000	0.0000	0.0000	0.0000	7.8789	42.2235	93.2874	
Space heating requirement	83.6443	56.4547	28.6582	7.1880	0.9285	0.0000	0.0000	0.0000	0.0000	7.8789	42.2235	93.2874	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)

Space heating fuel for secondary/supplementary system

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement

	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50

310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)

Cooling System Energy Efficiency Ratio 0.0000 (314)

Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)

Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year	
Space heating fuel - community heating	320.2636 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	3281.4784 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	3.2026 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)	
mechanical ventilation fans (SFP = 0.0920)	11.9235 (330a)
Total electricity for the above, kWh/year	11.9235 (331)
Electricity for lighting (calculated in Appendix L)	130.6818 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	2689.6003 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	320.2636	6.5500	20.9773	(340a)
Space heating total			20.9773	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			221.3783	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	960.4645	0.1588	13.5614	(367)
Electrical energy for heat distribution (space & water)	3.2026	0.0000	5.1264	(372)
Overall CO2 factor for heat network			0.0394	(386)
Total CO2 associated with community systems			141.8312	(373)
Space and water heating			141.8312	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			29.0713	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	960.4645	1.5878	135.6032	(467)
Electrical energy for heat distribution (space & water)	3.2026	0.0000	54.9749	(472)
Overall CO2 factor for heat network			0.4223	(486)
Total CO2 associated with community systems			1520.9711	(473)
Space and water heating			1520.9711	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			816.6461	(483)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.02	**TER**	14.75
Environmental	99 A	**% DER < TER**			93.08
CO_2 Emissions (t/year)	0.03	**DFEE**	16.05	**TFEE**	26.65
Compliance Check	See BREL	**% DFEE < TFEE**			39.75
% DPER < TPER	73.41	**DPER**	21.18	**TPER**	79.68

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523 (64)
12Total per year (kWh/year)												2188 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(76)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837 (83)
Total gains	419.7672	467.2558	506.0368	555.7052	584.1265	578.6970	555.6038	523.3987	486.8526	437.0989	410.7463	405.5434 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761

alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area	0.9267	0.8767	0.7894	0.6359	0.4742	0.3307	0.2370	0.2630	0.4230	0.6861	0.8692	0.9377 (86)
MIT	20.6377	20.7640	20.8873	20.9715	20.9957	20.9996	21.0000	20.9999	20.9983	20.9630	20.8072	20.5993 (87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496 (88)
util rest of house	0.9146	0.8592	0.7647	0.6052	0.4417	0.2972	0.2019	0.2258	0.3836	0.6495	0.8481	0.9270 (89)
MIT 2	19.9451	20.0941	20.2343	20.3232	20.3461	20.3493	20.3495	20.3495	20.3484	20.3165	20.1475	19.8990 (90)
Living area fraction										fLA = Living area / (4) =		0.4776 (91)
MIT	20.2759	20.4141	20.5462	20.6328	20.6563	20.6599	20.6602	20.6602	20.6588	20.6253	20.4626	20.2335 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2759	20.4141	20.5462	20.6328	20.6563	20.6599	20.6602	20.6602	20.6588	20.6253	20.4626	20.2335 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9132	0.8610	0.7724	0.6187	0.4570	0.3132	0.2187	0.2435	0.4024	0.6652	0.8520	0.9249	(94)
Useful gains	383.3117	402.3273	390.8480	343.8261	266.9713	181.2577	121.4910	127.4688	195.8981	290.7775	349.9482	375.0866	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	478.0616	464.2416	420.3162	351.0924	268.0088	181.3367	121.4972	127.4812	196.2661	299.9958	399.8618	479.7839	(97)
Space heating kWh	70.4939	41.6064	21.9243	5.2317	0.7719	0.0000	0.0000	0.0000	0.0000	6.8584	35.9378	77.8947	(98a)
Space heating requirement - total per year (kWh/year)												260.7193	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	70.4939	41.6064	21.9243	5.2317	0.7719	0.0000	0.0000	0.0000	0.0000	6.8584	35.9378	77.8947	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												260.7193	
Space heating per m2											(98c) / (4) =	6.0129	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	70.4939	41.6064	21.9243	5.2317	0.7719	0.0000	0.0000	0.0000	0.0000	6.8584	35.9378	77.8947	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	105.7409	62.4096	32.8865	7.8476	1.1579	0.0000	0.0000	0.0000	0.0000	10.2876	53.9068	116.8421	
Space heating requirement	105.7409	62.4096	32.8865	7.8476	1.1579	0.0000	0.0000	0.0000	0.0000	10.2876	53.9068	116.8421	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												391.0789	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												3.9108	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2856.9417	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	979.3486	0.1588	16.5633	(367)
Electrical energy for heat distribution (space & water)	3.9108	0.0000	5.2390	(372)
Overall CO2 factor for heat network			0.0395	(386)
Total CO2 associated with community systems			144.9457	(373)
Space and water heating			144.9457	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			44.4179	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.0200	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	979.3486	1.5879	165.5957	(467)
Electrical energy for heat distribution (space & water)	3.9108	0.0000	56.0996	(472)
Overall CO2 factor for heat network			0.4226	(486)
Total CO2 associated with community systems			1552.0883	(473)
Space and water heating			1552.0883	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			918.4935	(483)
Dwelling Primary energy Rate (DPER)			21.1800	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)

Wall to Unheated Common area	16.5900	16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)		33.1800			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		13.7636	(33)
Main dwelling					
Party Wall		31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 199.1940 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	52.2400	0.0700	3.6568
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3858 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 20.1494 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	40.9650	40.8373	40.7122	40.1245	40.0146	39.5027	39.5027	39.4079	39.6999	40.0146	40.2370	40.4696	(39)

Average = Sum(39)m / 12 = 40.1240

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9448	0.9418	0.9389	0.9254	0.9228	0.9110	0.9110	0.9089	0.9156	0.9228	0.9280	0.9333	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)

Energy content (annual) Total = Sum(45)m = 1536.8125

Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)

Total per year (kWh/year) = Sum(64)m = 1875.8483 (64)

12Total per year (kWh/year) 1876 (64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
East					6.5100	19.6403		0.6300	0.7000	0.7700		39.0751	(76)
Solar gains	39.0751	76.4392	125.8845	183.5950	225.0025	230.3301	219.2837	188.3614	146.4088	90.7015	48.7221	32.1335	(83)
Total gains	408.2958	452.6009	487.6757	532.6961	557.8990	548.9788	526.8301	497.0792	463.7948	421.5301	398.4414	394.6229	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.5666	58.7497	58.9302	59.7934	59.9577	60.7346	60.7346	60.8807	60.4330	59.9577	59.6262	59.2836	
alpha	4.9044	4.9166	4.9287	4.9862	4.9972	5.0490	5.0490	5.0587	5.0289	4.9972	4.9751	4.9522	
util living area	0.9663	0.9442	0.8999	0.7921	0.6348	0.4555	0.3291	0.3633	0.5728	0.8279	0.9387	0.9705	(86)
MIT	20.1073	20.2900	20.5325	20.8032	20.9443	20.9915	20.9987	20.9978	20.9743	20.7919	20.4266	20.0823	(87)
Th 2	20.1296	20.1321	20.1345	20.1460	20.1481	20.1581	20.1581	20.1600	20.1543	20.1481	20.1438	20.1393	(88)
util rest of house	0.9590	0.9327	0.8803	0.7572	0.5854	0.3976	0.2665	0.2976	0.5089	0.7898	0.9243	0.9640	(89)
MIT 2	19.1134	19.3408	19.6362	19.9557	20.1025	20.1530	20.1576	20.1591	20.1370	19.9528	19.5220	19.0897	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.5881	19.7942	20.0643	20.3605	20.5046	20.5535	20.5593	20.5597	20.5369	20.3535	19.9541	19.5638	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5881	19.7942	20.0643	20.3605	20.5046	20.5535	20.5593	20.5597	20.5369	20.3535	19.9541	19.5638	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9536	0.9276	0.8785	0.7664	0.6065	0.4250	0.2964	0.3290	0.5383	0.7996	0.9206	0.9588	(94)
Useful gains	389.3451	419.8155	428.4360	408.2411	338.3719	233.3060	156.1646	163.5224	249.6558	337.0589	366.7973	378.3642	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	626.2782	608.2396	552.2334	459.8455	352.3128	235.1778	156.4037	163.9244	255.5453	390.2837	517.2101	621.7659	(97)
Space heating kWh	176.2783	126.6210	92.1053	37.1552	10.3720	0.0000	0.0000	0.0000	0.0000	39.5992	108.2973	181.0909	(98a)
Space heating requirement - total per year (kWh/year)												771.5190	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	176.2783	126.6210	92.1053	37.1552	10.3720	0.0000	0.0000	0.0000	0.0000	39.5992	108.2973	181.0909	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												771.5190	
Space heating per m2											(98c) / (4) =	17.7933	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	176.2783	126.6210	92.1053	37.1552	10.3720	0.0000	0.0000	0.0000	0.0000	39.5992	108.2973	181.0909	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	190.9841	137.1842	99.7890	40.2548	11.2372	0.0000	0.0000	0.0000	0.0000	42.9027	117.3318	196.1981	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	83.9704	83.5078	82.7116	81.4070	80.3270	79.8000	79.8000	79.8000	79.8000	81.4735	83.1506	84.0529	(217)
Fuel for water heating, kWh/month	218.4700	194.4820	209.2614	188.6979	186.5510	170.5061	169.2907	175.3325	176.4869	191.2155	197.3476	216.1109	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												835.8819	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2293.7526	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2974.7086	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	835.8819	0.2100	175.5352	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2293.7526	0.2100	481.6881	(264)
Space and water heating			657.2233	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			639.5207	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.7500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	835.8819	1.1300	944.5466	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2293.7526	1.1300	2591.9405	(278)
Space and water heating			3536.4870	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3454.9846	(286)
Target Primary Energy Rate (TPER)			79.6800	(287)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.02	**TER**	14.75
Environmental	99 A	**% DER < TER**			93.08
CO_2 Emissions (t/year)	0.03	**DFEE**	16.05	**TFEE**	26.65
Compliance Check	See BREL	**% DFEE < TFEE**			39.75
% DPER < TPER	73.41	**DPER**	21.18	**TPER**	79.68

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area		Storey height		Volume	
Main dwelling		(m2)		(m)		(m3)	
Ground floor		43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2622	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		8637.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							199.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							0.9954	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		12.3956	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	31.8822	31.8062	31.7316	31.3815	31.3160	31.0111	31.0111	30.9546	31.1285	31.3160	31.4485	31.5871	(39)
Average = Sum(39)m / 12 =												31.3812	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7353	0.7335	0.7318	0.7237	0.7222	0.7152	0.7152	0.7139	0.7179	0.7222	0.7253	0.7285	(40)
HLP (average)												0.7237	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		449.4572	(64a)
Heat gains from water heating, kWh/month	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.4004	291.4783	279.0119	271.5070	258.2448	250.2442	241.2477	240.9702	247.9561	254.7841	268.8582	277.3654	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(76)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	325.5767	373.9841	414.8872	469.6730	501.1047	498.8545	477.9348	444.2810	405.9847	352.6842	321.4470	312.0492	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.2514	75.4313	75.6085	76.4520	76.6119	77.3652	77.3652	77.5064	77.0733	76.6119	76.2891	75.9545	
alpha	6.0168	6.0288	6.0406	6.0968	6.1075	6.1577	6.1577	6.1671	6.1382	6.1075	6.0859	6.0636	
util living area	0.9792	0.9544	0.8983	0.7541	0.5722	0.3970	0.2854	0.3203	0.5240	0.8229	0.9540	0.9831	(86)
MIT	20.3085	20.4977	20.7168	20.9171	20.9853	20.9987	20.9999	20.9997	20.9933	20.8848	20.5767	20.2742	(87)
Th 2	20.3098	20.3113	20.3128	20.3199	20.3212	20.3274	20.3274	20.3286	20.3250	20.3212	20.3185	20.3157	(88)
util rest of house	0.9747	0.9455	0.8804	0.7223	0.5330	0.3556	0.2418	0.2737	0.4746	0.7890	0.9434	0.9794	(89)

MIT 2	19.6848	19.8690	20.0762	20.2578	20.3119	20.3268	20.3274	20.3285	20.3215	20.2363	19.9537	19.6563	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.9827	20.1693	20.3822	20.5727	20.6335	20.6477	20.6486	20.6491	20.6424	20.5461	20.2513	19.9514	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9827	20.1693	20.3822	20.5727	20.6335	20.6477	20.6486	20.6491	20.6424	20.5461	20.2513	19.9514	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9722	0.9434	0.8823	0.7344	0.5512	0.3754	0.2626	0.2959	0.4980	0.8008	0.9423	0.9771	(94)
Useful gains	316.5357	352.8131	366.0688	344.9320	276.1907	187.2621	125.5261	131.4778	202.1742	282.4211	302.8894	304.9109	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	499.9996	485.6573	440.5044	366.3071	279.7621	187.5456	125.5508	131.5287	203.6550	311.4719	413.5891	497.5408	(97)
Space heating kWh	136.4971	89.2713	55.3801	15.3900	2.6571	0.0000	0.0000	0.0000	0.0000	21.6138	79.7037	143.3166	(98a)
Space heating requirement - total per year (kWh/year)												543.8298	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	136.4971	89.2713	55.3801	15.3900	2.6571	0.0000	0.0000	0.0000	0.0000	21.6138	79.7037	143.3166	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												543.8298	
Space heating per m2											(98c) / (4) =	12.5422	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	291.5043	229.4821	235.2551	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9908	0.9968	0.9945	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	288.8295	228.7378	233.9688	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	554.0542	531.1768	493.2464	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	190.9618	225.0146	192.9026	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	47.7404	56.2537	48.2256	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												152.2197	(107)
Energy for space heating												12.5422	(99)
Energy for space cooling												3.5106	(108)
Total												16.0528	(109)
Fabric Energy Efficiency (DFEE)												16.1	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	13.7636			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	199.1940	(35)
List of Thermal Bridges		

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	52.2400	0.0700	3.6568
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	6.3858	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	20.1494	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	40.9650	40.8373	40.7122	40.1245	40.0146	39.5027	39.5027	39.4079	39.6999	40.0146	40.2370	40.4696	(39)
Average = Sum(39)m / 12 =												40.1240	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9448	0.9418	0.9389	0.9254	0.9228	0.9110	0.9110	0.9089	0.9156	0.9228	0.9280	0.9333	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4982	(42)

Hot water usage for mixer showers

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												47.0349	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	

Distribution loss (46)m = 0.15 x (45)m

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)

Electric shower(s)

	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												449.4572	(64a)

Heat gains from water heating, kWh/month

	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													

	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931 (72)
Total internal gains	281.3655	289.2254	276.9770	269.4043	256.2100	248.1415	239.2128	238.9354	245.8534	252.7493	266.7555	275.3306 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	6.5100	19.6403	0.6300	0.7000	0.7700	39.0751	(76)

Solar gains	39.0751	76.4392	125.8845	183.5950	225.0025	230.3301	219.2837	188.3614	146.4088	90.7015	48.7221	32.1335 (83)
Total gains	320.4406	365.6646	402.8615	452.9993	481.2125	478.4717	458.4965	427.2968	392.2623	343.4508	315.4775	307.4640 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.5666	58.7497	58.9302	59.7934	59.9577	60.7346	60.7346	60.8807	60.4330	59.9577	59.6262	59.2836	
alpha	4.9044	4.9166	4.9287	4.9862	4.9972	5.0490	5.0490	5.0587	5.0289	4.9972	4.9751	4.9522	
util living area	0.9870	0.9744	0.9461	0.8604	0.7116	0.5182	0.3773	0.4210	0.6592	0.9021	0.9739	0.9891	(86)
MIT	19.8660	20.0709	20.3543	20.7036	20.9080	20.9849	20.9975	20.9957	20.9524	20.6706	20.2200	19.8386	(87)
Th 2	20.1296	20.1321	20.1345	20.1460	20.1481	20.1581	20.1581	20.1600	20.1543	20.1481	20.1438	20.1393	(88)
util rest of house	0.9838	0.9684	0.9336	0.8313	0.6618	0.4540	0.3060	0.3457	0.5914	0.8743	0.9667	0.9865	(89)
MIT 2	19.1024	19.3056	19.5820	19.9148	20.0875	20.1508	20.1574	20.1586	20.1283	19.8948	19.4634	19.0830	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.4671	19.6711	19.9509	20.2916	20.4794	20.5492	20.5586	20.5584	20.5219	20.2653	19.8248	19.4439	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4671	19.6711	19.9509	20.2916	20.4794	20.5492	20.5586	20.5584	20.5219	20.2653	19.8248	19.4439	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9808	0.9646	0.9305	0.8367	0.6818	0.4842	0.3401	0.3817	0.6218	0.8786	0.9635	0.9838	(94)
Useful gains	314.2852	352.7043	374.8723	379.0078	328.1045	231.6630	155.9246	163.0799	243.9040	301.7465	303.9544	302.4822	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	621.3211	603.2137	547.6150	457.0809	351.3023	235.0097	156.3764	163.8747	254.9492	386.7541	512.0068	616.9138	(97)
Space heating kWh	228.4347	168.3423	128.5206	56.2126	17.2592	0.0000	0.0000	0.0000	0.0000	63.2456	149.7977	233.9371	(98a)
Space heating requirement - total per year (kWh/year)												1045.7499	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	228.4347	168.3423	128.5206	56.2126	17.2592	0.0000	0.0000	0.0000	0.0000	63.2456	149.7977	233.9371	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1045.7499	
Space heating per m2										(98c) / (4) =		24.1178	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	371.3254	292.3200	299.5001	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9447	0.9735	0.9620	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	350.8010	284.5787	288.1146	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	532.5097	510.6427	475.5231	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	130.8303	168.1917	139.4320	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	32.7076	42.0479	34.8580	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												109.6135	(107)
Energy for space heating												24.1178	(99)
Energy for space cooling												2.5280	(108)
Total												26.6458	(109)
Fabric Energy Efficiency (TFEE)												26.6	(109)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.02	**TER**	14.75
Environmental	99 A	**% DER < TER**			93.08
CO_2 Emissions (t/year)	0.03	**DFEE**	16.05	**TFEE**	26.65
Compliance Check	See BREL	**% DFEE < TFEE**			39.75
% DPER < TPER	73.41	**DPER**	21.18	**TPER**	79.68

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523 (64)
12Total per year (kWh/year)												2188 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.3710	79.0179	71.3710	73.7500	71.3710	73.7500	71.3710	71.3710	73.7500	71.3710	73.7500	71.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.5909	384.7500	370.1615	357.5392	341.2667	330.0867	318.9166	320.0880	328.8240	339.1988	358.1574	370.8597	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(76)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837 (83)
Total gains	419.7672	467.2558	506.0368	555.7052	584.1265	578.6970	555.6038	523.3987	486.8526	437.0989	410.7463	405.5434 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761

alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area	0.9267	0.8767	0.7894	0.6359	0.4742	0.3307	0.2370	0.2630	0.4230	0.6861	0.8692	0.9377 (86)
MIT	20.6377	20.7640	20.8873	20.9715	20.9957	20.9996	21.0000	20.9999	20.9983	20.9630	20.8072	20.5993 (87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496 (88)
util rest of house	0.9146	0.8592	0.7647	0.6052	0.4417	0.2972	0.2019	0.2258	0.3836	0.6495	0.8481	0.9270 (89)
MIT 2	19.9451	20.0941	20.2343	20.3232	20.3461	20.3493	20.3495	20.3495	20.3484	20.3165	20.1475	19.8990 (90)
Living area fraction										fLA = Living area / (4) =		0.4776 (91)
MIT	20.2759	20.4141	20.5462	20.6328	20.6563	20.6599	20.6602	20.6602	20.6588	20.6253	20.4626	20.2335 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2759	20.4141	20.5462	20.6328	20.6563	20.6599	20.6602	20.6602	20.6588	20.6253	20.4626	20.2335 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9132	0.8610	0.7724	0.6187	0.4570	0.3132	0.2187	0.2435	0.4024	0.6652	0.8520	0.9249	(94)
Useful gains	383.3117	402.3273	390.8480	343.8261	266.9713	181.2577	121.4910	127.4688	195.8981	290.7775	349.9482	375.0866	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	478.0616	464.2416	420.3162	351.0924	268.0088	181.3367	121.4972	127.4812	196.2661	299.9958	399.8618	479.7839	(97)
Space heating kWh	70.4939	41.6064	21.9243	5.2317	0.7719	0.0000	0.0000	0.0000	0.0000	6.8584	35.9378	77.8947	(98a)
Space heating requirement - total per year (kWh/year)												260.7193	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	70.4939	41.6064	21.9243	5.2317	0.7719	0.0000	0.0000	0.0000	0.0000	6.8584	35.9378	77.8947	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												260.7193	
Space heating per m2											(98c) / (4) =	6.0129	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	70.4939	41.6064	21.9243	5.2317	0.7719	0.0000	0.0000	0.0000	0.0000	6.8584	35.9378	77.8947	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	105.7409	62.4096	32.8865	7.8476	1.1579	0.0000	0.0000	0.0000	0.0000	10.2876	53.9068	116.8421	
Space heating requirement	105.7409	62.4096	32.8865	7.8476	1.1579	0.0000	0.0000	0.0000	0.0000	10.2876	53.9068	116.8421	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												391.0789	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												3.9108	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2856.9417	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	979.3486	0.1588	16.5633	(367)
Electrical energy for heat distribution (space & water)	3.9108	0.0000	5.2390	(372)
Overall CO2 factor for heat network			0.0395	(386)
Total CO2 associated with community systems			144.9457	(373)
Space and water heating			144.9457	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			44.4179	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.0200	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	979.3486	1.5879	165.5957	(467)
Electrical energy for heat distribution (space & water)	3.9108	0.0000	56.0996	(472)
Overall CO2 factor for heat network			0.4226	(486)
Total CO2 associated with community systems			1552.0883	(473)
Space and water heating			1552.0883	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	1.4901	-605.8107	
PV Unit electricity exported	-551.6584	0.4464	-246.2661	
Total			-852.0768	(480)
Total Primary energy kWh/year			918.4935	(483)
Dwelling Primary energy Rate (DPER)			21.1800	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.5100	1.1450	7.4542			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.1800	1.4832			(29a)

Wall to Unheated Common area	16.5900	16.5900	0.1800	2.9862	(29a)
Total net area of external elements Aum(A, m2)		33.1800			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		13.7636	(33)
Main dwelling					
Party Wall		31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 199.1940 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.6600	0.0500	0.2830
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	23.1600	0.0500	1.1580
E7 Party floor between dwellings (in blocks of flats)	52.2400	0.0700	3.6568
E16 Corner (normal)	5.0000	0.0900	0.4500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3858 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 20.1494 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	40.9650	40.8373	40.7122	40.1245	40.0146	39.5027	39.5027	39.4079	39.6999	40.0146	40.2370	40.4696	(39)

Average = Sum(39)m / 12 = 40.1240

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9448	0.9418	0.9389	0.9254	0.9228	0.9110	0.9110	0.9089	0.9156	0.9228	0.9280	0.9333	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)

Energy content (annual) Total = Sum(45)m = 1536.8125

Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)

Total per year (kWh/year) = Sum(64)m = 1875.8483 (64)

12Total per year (kWh/year) 1876 (64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.3361	76.7650	69.3361	71.6473	69.3361	71.6473	69.3361	69.3361	71.6473	69.3361	71.6473	69.3361	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	369.2207	376.1617	361.7913	349.1011	332.8964	318.6486	307.5464	308.7177	317.3859	330.8286	349.7193	362.4895	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
East					6.5100	19.6403		0.6300	0.7000	0.7700		39.0751	(76)
Solar gains	39.0751	76.4392	125.8845	183.5950	225.0025	230.3301	219.2837	188.3614	146.4088	90.7015	48.7221	32.1335	(83)
Total gains	408.2958	452.6009	487.6757	532.6961	557.8990	548.9788	526.8301	497.0792	463.7948	421.5301	398.4414	394.6229	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.5666	58.7497	58.9302	59.7934	59.9577	60.7346	60.7346	60.8807	60.4330	59.9577	59.6262	59.2836	
alpha	4.9044	4.9166	4.9287	4.9862	4.9972	5.0490	5.0490	5.0587	5.0289	4.9972	4.9751	4.9522	
util living area	0.9663	0.9442	0.8999	0.7921	0.6348	0.4555	0.3291	0.3633	0.5728	0.8279	0.9387	0.9705	(86)
MIT	20.1073	20.2900	20.5325	20.8032	20.9443	20.9915	20.9987	20.9978	20.9743	20.7919	20.4266	20.0823	(87)
Th 2	20.1296	20.1321	20.1345	20.1460	20.1481	20.1581	20.1581	20.1600	20.1543	20.1481	20.1438	20.1393	(88)
util rest of house	0.9590	0.9327	0.8803	0.7572	0.5854	0.3976	0.2665	0.2976	0.5089	0.7898	0.9243	0.9640	(89)
MIT 2	19.1134	19.3408	19.6362	19.9557	20.1025	20.1530	20.1576	20.1591	20.1370	19.9528	19.5220	19.0897	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.5881	19.7942	20.0643	20.3605	20.5046	20.5535	20.5593	20.5597	20.5369	20.3535	19.9541	19.5638	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5881	19.7942	20.0643	20.3605	20.5046	20.5535	20.5593	20.5597	20.5369	20.3535	19.9541	19.5638	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9536	0.9276	0.8785	0.7664	0.6065	0.4250	0.2964	0.3290	0.5383	0.7996	0.9206	0.9588	(94)
Useful gains	389.3451	419.8155	428.4360	408.2411	338.3719	233.3060	156.1646	163.5224	249.6558	337.0589	366.7973	378.3642	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	626.2782	608.2396	552.2334	459.8455	352.3128	235.1778	156.4037	163.9244	255.5453	390.2837	517.2101	621.7659	(97)
Space heating kWh	176.2783	126.6210	92.1053	37.1552	10.3720	0.0000	0.0000	0.0000	0.0000	39.5992	108.2973	181.0909	(98a)
Space heating requirement - total per year (kWh/year)												771.5190	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	176.2783	126.6210	92.1053	37.1552	10.3720	0.0000	0.0000	0.0000	0.0000	39.5992	108.2973	181.0909	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												771.5190	
Space heating per m2											(98c) / (4) =	17.7933	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	176.2783	126.6210	92.1053	37.1552	10.3720	0.0000	0.0000	0.0000	0.0000	39.5992	108.2973	181.0909	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	190.9841	137.1842	99.7890	40.2548	11.2372	0.0000	0.0000	0.0000	0.0000	42.9027	117.3318	196.1981	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	83.9704	83.5078	82.7116	81.4070	80.3270	79.8000	79.8000	79.8000	79.8000	81.4735	83.1506	84.0529	(217)
Fuel for water heating, kWh/month	218.4700	194.4820	209.2614	188.6979	186.5510	170.5061	169.2907	175.3325	176.4869	191.2155	197.3476	216.1109	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.4067	11.5576	10.4063	7.6241	5.8891	4.8114	5.3722	6.9830	9.0702	11.9006	13.4418	14.8071	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3199	-12.6521	-19.6031	-23.8233	-27.3062	-26.1058	-25.8080	-23.5598	-19.8851	-15.2384	-9.4742	-7.0908	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2613	-4.9162	-10.0724	-15.5767	-21.0354	-21.2819	-21.0127	-17.5728	-12.6102	-7.1547	-3.0594	-1.7754	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												835.8819	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2293.7526	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	116.2701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2974.7086	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	835.8819	0.2100	175.5352	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2293.7526	0.2100	481.6881	(264)
Space and water heating			657.2233	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	116.2701	0.1443	16.7814	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	0.1330	-29.1118	
PV Unit electricity exported	-138.3291	0.1251	-17.3013	
Total			-46.4132	(269)
Total CO2, kg/year			639.5207	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.7500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	835.8819	1.1300	944.5466	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2293.7526	1.1300	2591.9405	(278)
Space and water heating			3536.4870	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	116.2701	1.5338	178.3390	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8670	1.4915	-326.4396	
PV Unit electricity exported	-138.3291	0.4591	-63.5026	
Total			-389.9422	(283)
Total Primary energy kWh/year			3454.9846	(286)
Target Primary Energy Rate (TPER)			79.6800	(287)

Full SAP Calculation Printout

Property Reference	Flat MF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.02	**TER**	14.75
Environmental	99 A	**% DER < TER**			93.08
CO_2 Emissions (t/year)	0.03	**DFEE**	16.05	**TFEE**	26.65
Compliance Check	See BREL	**% DFEE < TFEE**			39.75
% DPER < TPER	73.41	**DPER**	21.18	**TPER**	79.68

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		8637.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							199.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							0.9954	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(76)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	460.9371	499.3751	541.0594	581.5362	605.2805	592.0631	569.0364	538.2350	504.0534	463.4913	441.8157	444.4008	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451

util living area													
	0.8961	0.8479	0.7531	0.6106	0.4580	0.3233	0.2314	0.2557	0.4088	0.6528	0.8364	0.9109	(86)
MIT	20.7164	20.8090	20.9136	20.9772	20.9964	20.9997	21.0000	20.9999	20.9986	20.9718	20.8482	20.6797	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house													
	0.8809	0.8284	0.7275	0.5805	0.4265	0.2905	0.1972	0.2196	0.3706	0.6167	0.8129	0.8972	(89)
MIT 2	20.0380	20.1453	20.2622	20.3285	20.3467	20.3494	20.3496	20.3495	20.3486	20.3247	20.1929	19.9947	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.3620	20.4623	20.5734	20.6383	20.6570	20.6600	20.6602	20.6602	20.6591	20.6337	20.5059	20.3219	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3620	20.4623	20.5734	20.6383	20.6570	20.6600	20.6602	20.6602	20.6591	20.6337	20.5059	20.3219	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8812	0.8319	0.7365	0.5940	0.4414	0.3062	0.2135	0.2368	0.3888	0.6327	0.8188	0.8966	(94)
Useful gains	406.1975	415.4286	398.5023	345.4377	267.1774	181.2688	121.4920	127.4710	195.9715	293.2321	361.7645	398.4587	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	480.6386	465.6856	421.1295	351.2571	268.0296	181.3378	121.4973	127.4814	196.2735	300.2486	401.1566	482.4290	(97)
Space heating kWh													
	55.3841	33.7727	16.8346	4.1900	0.6341	0.0000	0.0000	0.0000	0.0000	5.2203	28.3624	62.4739	(98a)
Space heating requirement - total per year (kWh/year)												206.8720	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	55.3841	33.7727	16.8346	4.1900	0.6341	0.0000	0.0000	0.0000	0.0000	5.2203	28.3624	62.4739	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												206.8720	
Space heating per m2											(98c) / (4) =	4.7710	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	55.3841	33.7727	16.8346	4.1900	0.6341	0.0000	0.0000	0.0000	0.0000	5.2203	28.3624	62.4739	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	83.0762	50.6591	25.2519	6.2849	0.9511	0.0000	0.0000	0.0000	0.0000	7.8304	42.5435	93.7109	
Space heating requirement													
	83.0762	50.6591	25.2519	6.2849	0.9511	0.0000	0.0000	0.0000	0.0000	7.8304	42.5435	93.7109	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												310.3080	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												3.1031	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												11.9235	(330a)
Total electricity for the above, kWh/year												11.9235	(331)
Electricity for lighting (calculated in Appendix L)												130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2776.1708	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	310.3080	4.4400	13.7777	(340a)
Space heating total			13.7777	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			177.1111	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7216	(357)
SAP value		88.3030	
SAP rating (Section 12)		88	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	957.8097	0.1589	13.1463	(367)
Electrical energy for heat distribution (space & water)	3.1031	0.0000	5.1109	(372)
Overall CO2 factor for heat network			0.0394	(386)
Total CO2 associated with community systems			141.4005	(373)
Space and water heating			141.4005	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			40.8728	(383)
CO2 emissions per m2			0.9400	(384)
EI value			99.3802	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	43.3600 (1b)	x 2.4500 (2b)	= 106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)

Adj infilt rate

	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104 (22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)

Heat transfer coeff

	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)

Average = Sum(39)m / 12 = 29.9239

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m													
	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Total per year (kWh/year) = Sum(64)m = 2187.6523 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)												
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874 (72)
Total internal gains												
	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	6.5100	23.7835	0.6800	0.7000	0.7700	51.0736	(76)

Solar gains	51.0736	88.7763	143.8339	211.6843	249.5125	273.8424	255.8751	224.3556	176.4207	111.0901	62.7325	42.2420 (83)
Total gains	469.8344	505.6456	549.0181	595.0545	611.9331	617.2952	588.2244	559.2798	522.4455	476.6813	451.9594	451.9591 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area													
	0.8819	0.8332	0.7254	0.5798	0.4292	0.2811	0.1984	0.2194	0.3775	0.6096	0.8109	0.8989	(86)
MIT	20.7500	20.8315	20.9323	20.9834	20.9977	20.9999	21.0000	21.0000	20.9992	20.9815	20.8774	20.7138	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house													
	0.8652	0.8125	0.6984	0.5496	0.3978	0.2496	0.1653	0.1846	0.3405	0.5728	0.7852	0.8838	(89)
MIT 2	20.0775	20.1710	20.2823	20.3345	20.3478	20.3495	20.3496	20.3496	20.3490	20.3338	20.2252	20.0353	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.3987	20.4865	20.5928	20.6444	20.6582	20.6601	20.6602	20.6602	20.6596	20.6432	20.5367	20.3593	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3987	20.4865	20.5928	20.6444	20.6582	20.6601	20.6602	20.6602	20.6596	20.6432	20.5367	20.3593	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8665	0.8170	0.7087	0.5634	0.4127	0.2646	0.1811	0.2012	0.3582	0.5896	0.7929	0.8840	(94)
Useful gains	407.1210	413.1029	389.0811	335.2603	252.5528	163.3622	106.5340	112.5169	187.1309	281.0281	358.3499	399.5327	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	472.7596	457.4313	406.7486	339.4698	253.1016	163.3884	106.5357	112.5203	187.3102	285.5683	390.1095	474.5735	(97)
Space heating kWh													
	48.8351	29.7887	13.1446	3.0308	0.4083	0.0000	0.0000	0.0000	0.0000	3.3779	22.8669	55.8303	(98a)
Space heating requirement - total per year (kWh/year)												177.2826	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	48.8351	29.7887	13.1446	3.0308	0.4083	0.0000	0.0000	0.0000	0.0000	3.3779	22.8669	55.8303	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												177.2826	
Space heating per m2											(98c) / (4) =	4.0886	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	48.8351	29.7887	13.1446	3.0308	0.4083	0.0000	0.0000	0.0000	0.0000	3.3779	22.8669	55.8303	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	73.2526	44.6830	19.7169	4.5462	0.6124	0.0000	0.0000	0.0000	0.0000	5.0669	34.3004	83.7455	
Space heating requirement													
	73.2526	44.6830	19.7169	4.5462	0.6124	0.0000	0.0000	0.0000	0.0000	5.0669	34.3004	83.7455	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	265.9239	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	2.6592	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(330a)
Total electricity for the above, kWh/year	11.9235	(331)
Electricity for lighting (calculated in Appendix L)	130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2635.2607	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	265.9239	6.5500	17.4180	(340a)
Space heating total			17.4180	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			217.8191	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	945.9740	0.1593	11.2950	(367)
Electrical energy for heat distribution (space & water)	2.6592	0.0000	5.0414	(372)
Overall CO2 factor for heat network			0.0393	(386)
Total CO2 associated with community systems			139.4798	(373)
Space and water heating			139.4798	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			26.7199	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	945.9740	1.5896	112.7204	(467)
Electrical energy for heat distribution (space & water)	2.6592	0.0000	54.1168	(472)
Overall CO2 factor for heat network			0.4221	(486)
Total CO2 associated with community systems			1497.2302	(473)
Space and water heating			1497.2302	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			792.9052	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - West

Current energy efficiency rating:	B 88
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£41	£41	£0
Community scheme	£336	£336	£0
Space heating	£125	£125	£0
Water heating	£215	£215	£0
Lighting	£37	£37	£0
Generated (PV)	-£159	-£159	£0
Total cost of fuels	£218	£218	£0
Total cost of uses	£218	£218	£0
Delivered energy	61 kWh/m²	61 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.0 tonnes	0.0 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	18 kWh/m²	18 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)

Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	11.4002		(33)
Main dwelling						
Party Wall	31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor	43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1	43.3600			30.0000	1300.8000	(32b)
Internal TF Wall	68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =		8637.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K					199.1940	(35)
Thermal bridges (User defined value 0.030 * total exposed area)					0.9954	(36)
Point Thermal bridges				(36a) =	0.0000	
Total fabric heat loss			(33) + (36) + (36a) =		12.3956	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	6.5100	19.6403	0.6800	0.7000	0.7700	42.1763	(76)

Solar gains	42.1763	82.5058	135.8753	198.1660	242.8599	248.6103	236.6871	203.3108	158.0286	97.9001	52.5889	34.6837	(83)
Total gains	460.9371	499.3751	541.0594	581.5362	605.2805	592.0631	569.0364	538.2350	504.0534	463.4913	441.8157	444.4008	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area	0.8961	0.8479	0.7531	0.6106	0.4580	0.3233	0.2314	0.2557	0.4088	0.6528	0.8364	0.9109	(86)
MIT	20.7164	20.8090	20.9136	20.9772	20.9964	20.9997	21.0000	20.9999	20.9986	20.9718	20.8482	20.6797	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house	0.8809	0.8284	0.7275	0.5805	0.4265	0.2905	0.1972	0.2196	0.3706	0.6167	0.8129	0.8972	(89)
MIT 2	20.0380	20.1453	20.2622	20.3285	20.3467	20.3494	20.3496	20.3495	20.3486	20.3247	20.1929	19.9947	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.3620	20.4623	20.5734	20.6383	20.6570	20.6600	20.6602	20.6602	20.6591	20.6337	20.5059	20.3219	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3620	20.4623	20.5734	20.6383	20.6570	20.6600	20.6602	20.6602	20.6591	20.6337	20.5059	20.3219	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8812	0.8319	0.7365	0.5940	0.4414	0.3062	0.2135	0.2368	0.3888	0.6327	0.8188	0.8966	(94)
Useful gains	406.1975	415.4286	398.5023	345.4377	267.1774	181.2688	121.4920	127.4710	195.9715	293.2321	361.7645	398.4587	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	480.6386	465.6856	421.1295	351.2571	268.0296	181.3378	121.4973	127.4814	196.2735	300.2486	401.1566	482.4290	(97)
Space heating kWh	55.3841	33.7727	16.8346	4.1900	0.6341	0.0000	0.0000	0.0000	0.0000	5.2203	28.3624	62.4739	(98a)
Space heating requirement - total per year (kWh/year)												206.8720	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	55.3841	33.7727	16.8346	4.1900	0.6341	0.0000	0.0000	0.0000	0.0000	5.2203	28.3624	62.4739	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												206.8720	
Space heating per m2											(98c) / (4) =	4.7710	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

Space heating:

Space heating requirement												
	55.3841	33.7727	16.8346	4.1900	0.6341	0.0000	0.0000	0.0000	0.0000	5.2203	28.3624	62.4739 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	83.0762	50.6591	25.2519	6.2849	0.9511	0.0000	0.0000	0.0000	0.0000	7.8304	42.5435	93.7109
Space heating requirement												
	83.0762	50.6591	25.2519	6.2849	0.9511	0.0000	0.0000	0.0000	0.0000	7.8304	42.5435	93.7109 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement												
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016
Water heating fuel												
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127 (331)
Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-13.9785	-22.5443	-37.1410	-46.0679	-52.0882	-49.3603	-48.5232	-44.4638	-37.1153	-27.5247	-16.1309	-11.6245 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.5203	-14.0340	-34.8544	-62.7961	-91.9026	-95.7917	-93.2177	-73.2787	-46.3471	-21.9722	-7.8191	-4.1245 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year
Space heating fuel - community heating 310.3080 (307)
Space heating fuel - secondary 0.0000 (309)
Water heating fuel - community heating 3281.4784 (310)
Efficiency of water heater 0.0000 (311)
Electricity used for heat distribution 3.1031 (313)
Space cooling fuel 0.0000 (321)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)
mechanical ventilation fans (SFP = 0.0920) 11.9235 (330a)
Total electricity for the above, kWh/year 11.9235 (331)
Electricity for lighting (calculated in Appendix L) 130.6818 (332)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation -958.2209 (333)
Wind generation 0.0000 (334)
Hydro-electric generation (Appendix N) 0.0000 (335a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (335)

Appendix Q - special features

Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2776.1708	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	310.3080	4.4400	13.7777	(340a)
Space heating total			13.7777	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	16.4900	1.9662	(349)
Energy for lighting	130.6818	16.4900	21.5494	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	16.4900	-67.0422	
PV Unit electricity exported	-551.6584	5.5900	-30.8377	
Total			-97.8799	(352)
Total energy cost			177.1111	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7216	(357)
SAP value		88.3030	
SAP rating (Section 12)		88	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	957.8097	0.1589	13.1463	(367)
Electrical energy for heat distribution (space & water)	3.1031	0.0000	5.1109	(372)
Overall CO2 factor for heat network			0.0394	(386)
Total CO2 associated with community systems			141.4005	(373)
Space and water heating			141.4005	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.5625	0.1326	-53.9227	
PV Unit electricity exported	-551.6584	0.1217	-67.1204	
Total			-121.0431	(380)
Total CO2, kg/year			40.8728	(383)
CO2 emissions per m2			0.9400	(384)
EI value			99.3802	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

Measured/design AP50												3.0000	(17)
Infiltration rate												0.1500	(18)
Number of sides sheltered												3	(19)
Shelter factor									(20) = 1 - [0.075 x (19)] =			0.7750	(20)
Infiltration rate adjusted to include shelter factor									(21) = (18) x (20) =			0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
FD Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.5100	0.7752	5.0465			(27)
100mm Cavity	16.5900	8.3500	8.2400	0.2300	1.8952	60.0000	494.4000	(29a)
Wall to Unheated Common area	16.5900		16.5900	0.1900	3.1521	60.0000	995.4000	(29a)
Total net area of external elements Aum(A, m2)			33.1800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	11.4002			(33)
Main dwelling								
Party Wall			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor			43.3600			70.0000	3035.2000	(32d)
Party Ceiling 1			43.3600			30.0000	1300.8000	(32b)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8637.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.1940 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		0.9954 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	12.3956 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	29.9239	(39)
Average = Sum(39)m / 12 =												29.9239	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	0.6901	(40)
HLP (average)												0.6901	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4982	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	18.4994	16.4310	13.3626	10.1163	7.5621	6.3842	6.8984	8.9668	12.0352	15.2814	17.8357	19.0135	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)

Water heating gains (Table 5)

	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)

Total internal gains

	418.7608	416.8693	405.1841	383.3702	362.4207	343.4528	332.3492	334.9242	346.0248	365.5912	389.2268	409.7171	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	6.5100	23.7835	0.6800	0.7000	0.7700	51.0736	(76)

Solar gains	51.0736	88.7763	143.8339	211.6843	249.5125	273.8424	255.8751	224.3556	176.4207	111.0901	62.7325	42.2420	(83)
Total gains	469.8344	505.6456	549.0181	595.0545	611.9331	617.2952	588.2244	559.2798	522.4455	476.6813	451.9594	451.9591	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	80.1761	
alpha	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	6.3451	
util living area	0.8819	0.8332	0.7254	0.5798	0.4292	0.2811	0.1984	0.2194	0.3775	0.6096	0.8109	0.8989	(86)
MIT	20.7500	20.8315	20.9323	20.9834	20.9977	20.9999	21.0000	21.0000	20.9992	20.9815	20.8774	20.7138	(87)
Th 2	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	20.3496	(88)
util rest of house	0.8652	0.8125	0.6984	0.5496	0.3978	0.2496	0.1653	0.1846	0.3405	0.5728	0.7852	0.8838	(89)
MIT 2	20.0775	20.1710	20.2823	20.3345	20.3478	20.3495	20.3496	20.3496	20.3490	20.3338	20.2252	20.0353	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.3987	20.4865	20.5928	20.6444	20.6582	20.6601	20.6602	20.6602	20.6596	20.6432	20.5367	20.3593	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3987	20.4865	20.5928	20.6444	20.6582	20.6601	20.6602	20.6602	20.6596	20.6432	20.5367	20.3593	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8665	0.8170	0.7087	0.5634	0.4127	0.2646	0.1811	0.2012	0.3582	0.5896	0.7929	0.8840	(94)
Useful gains	407.1210	413.1029	389.0811	335.2603	252.5528	163.3622	106.5340	112.5169	187.1309	281.0281	358.3499	399.5327	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	472.7596	457.4313	406.7486	339.4698	253.1016	163.3884	106.5357	112.5203	187.3102	285.5683	390.1095	474.5735	(97)
Space heating kWh	48.8351	29.7887	13.1446	3.0308	0.4083	0.0000	0.0000	0.0000	0.0000	3.3779	22.8669	55.8303	(98a)
Space heating requirement - total per year (kWh/year)												177.2826	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	48.8351	29.7887	13.1446	3.0308	0.4083	0.0000	0.0000	0.0000	0.0000	3.3779	22.8669	55.8303	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												177.2826	
Space heating per m2										(98c) / (4) =		4.0886	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement

	48.8351	29.7887	13.1446	3.0308	0.4083	0.0000	0.0000	0.0000	0.0000	3.3779	22.8669	55.8303	(98)

Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50

307a	73.2526	44.6830	19.7169	4.5462	0.6124	0.0000	0.0000	0.0000	0.0000	5.0669	34.3004	83.7455	

Space heating requirement

	73.2526	44.6830	19.7169	4.5462	0.6124	0.0000	0.0000	0.0000	0.0000	5.0669	34.3004	83.7455	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)

Space heating fuel for secondary/supplementary system

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement

	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50

310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	

Water heating fuel

	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.0127	0.9147	1.0127	0.9800	1.0127	0.9800	1.0127	1.0127	0.9800	1.0127	0.9800	1.0127	(331)

Lighting	16.1924	12.9901	11.6962	8.5691	6.6190	5.4078	6.0381	7.8486	10.1945	13.3757	15.1079	16.6424	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5751	-24.0861	-38.8949	-48.0664	-52.9830	-51.6466	-50.3973	-46.8840	-39.8147	-30.3347	-18.7705	-13.8970	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4234	-15.8791	-38.3501	-69.5067	-96.2575	-109.4721	-104.0928	-84.3576	-54.5341	-26.6616	-10.2599	-5.6017	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	265.9239	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	2.6592	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	11.9235	(330a)
Total electricity for the above, kWh/year	11.9235	(331)
Electricity for lighting (calculated in Appendix L)	130.6818	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2635.2607	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	265.9239	6.5500	17.4180	(340a)
Space heating total			17.4180	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	11.9235	28.4300	3.3898	(349)
Energy for lighting	130.6818	28.4300	37.1528	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	28.4300	-122.9172	
PV Unit electricity exported	-622.3967	5.8100	-36.1612	
Total			-159.0784	(352)
Total energy cost			217.8191	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	945.9740	0.1593	11.2950	(367)
Electrical energy for heat distribution (space & water)	2.6592	0.0000	5.0414	(372)
Overall CO2 factor for heat network			0.0393	(386)
Total CO2 associated with community systems			139.4798	(373)
Space and water heating			139.4798	(376)
Pumps, fans and electric keep-hot	11.9235	0.1387	1.6539	(378)
Energy for lighting	130.6818	0.1443	18.8614	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	0.1330	-57.4989	
PV Unit electricity exported	-622.3967	0.1217	-75.7764	
Total			-133.2752	(380)
Total CO2, kg/year			26.7199	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	945.9740	1.5896	112.7204	(467)
Electrical energy for heat distribution (space & water)	2.6592	0.0000	54.1168	(472)
Overall CO2 factor for heat network			0.4221	(486)
Total CO2 associated with community systems			1497.2302	(473)
Space and water heating			1497.2302	(476)
Pumps, fans and electric keep-hot	11.9235	1.5128	18.0378	(478)
Energy for lighting	130.6818	1.5338	200.4441	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.3503	1.4914	-644.8171	
PV Unit electricity exported	-622.3967	0.4466	-277.9898	
Total			-922.8069	(480)
Total Primary energy kWh/year			792.9052	(483)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	81 B	**DER**	4.14	**TER**	16.09
Environmental	97 A	**% DER < TER**			74.27
CO_2 Emissions (t/year)	0.17	**DFEE**	21.90	**TFEE**	32.86
Compliance Check	See BREL	**% DFEE < TFEE**			33.34
% DPER < TPER	49.18	**DPER**	44.14	**TPER**	86.87

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600 (1b)	x	2.4500 (2b)	=	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
12Total per year (kWh/year)												2188	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0601	78.6737	71.0601	73.4288	71.0601	73.4288	71.0601	71.0601	73.4288	71.0601	73.4288	71.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.2801	384.4058	369.8506	357.2179	340.9558	329.7655	318.6057	319.7771	328.5028	338.8880	357.8362	370.5488	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	19.6403	0.6800	0.7000	0.7700	43.0185	(80)

Solar gains	43.0185	84.1534	138.5886	202.1232	247.7096	253.5749	241.4136	207.3707	161.1843	99.8551	53.6391	35.3763	(83)
Total gains	420.2986	468.5592	508.4392	559.3412	588.6654	583.3403	560.0194	527.1478	489.6871	438.7430	411.4752	405.9252	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292

alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.9398	0.9028	0.8353	0.7026	0.5404	0.3821	0.2746	0.3048	0.4861	0.7494	0.8975	0.9479	(86)
MIT	20.3438	20.5137	20.7137	20.8948	20.9749	20.9964	20.9995	20.9991	20.9884	20.8785	20.5944	20.2962	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.9295	0.8876	0.8122	0.6690	0.5000	0.3378	0.2278	0.2552	0.4355	0.7111	0.8791	0.9387	(89)
MIT 2	19.5032	19.7088	19.9449	20.1459	20.2265	20.2451	20.2472	20.2470	20.2393	20.1338	19.8104	19.4449	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.9047	20.0932	20.3121	20.5036	20.5840	20.6039	20.6065	20.6062	20.5971	20.4895	20.1848	19.8515	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9047	20.0932	20.3121	20.5036	20.5840	20.6039	20.6065	20.6062	20.5971	20.4895	20.1848	19.8515	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9242	0.8842	0.8143	0.6807	0.5183	0.3588	0.2501	0.2789	0.4592	0.7239	0.8774	0.9332	(94)
Useful gains	388.4213	414.2950	414.0272	380.7485	305.0774	209.3208	140.0800	146.9996	224.8671	317.5946	361.0486	378.8125	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	545.9365	531.5426	483.2225	405.9587	310.8096	210.0504	140.1688	147.1562	227.3042	345.9883	457.7791	547.5744	(97)
Space heating kWh	117.1913	78.7904	51.4812	18.1513	4.2647	0.0000	0.0000	0.0000	0.0000	21.1249	69.6459	125.5588	(98a)
Space heating requirement - total per year (kWh/year)												486.2086	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	117.1913	78.7904	51.4812	18.1513	4.2647	0.0000	0.0000	0.0000	0.0000	21.1249	69.6459	125.5588	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												486.2086	
Space heating per m2											(98c) / (4) =	11.2133	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	117.1913	78.7904	51.4812	18.1513	4.2647	0.0000	0.0000	0.0000	0.0000	21.1249	69.6459	125.5588	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	175.7869	118.1856	77.2219	27.2270	6.3971	0.0000	0.0000	0.0000	0.0000	31.6873	104.4689	188.3383	
Space heating requirement	175.7869	118.1856	77.2219	27.2270	6.3971	0.0000	0.0000	0.0000	0.0000	31.6873	104.4689	188.3383	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												729.3129	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												7.2931	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4150.7259	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1069.5443	0.1575	30.6398	(367)
Electrical energy for heat distribution (space & water)	7.2931	0.0000	5.7669	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			159.5500	(373)
Space and water heating			159.5500	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Total CO2, kg/year			179.6612	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.1400	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1069.5443	1.5832	307.9063	(467)
Electrical energy for heat distribution (space & water)	7.2931	0.0000	61.4362	(472)
Overall CO2 factor for heat network			0.4238	(486)
Total CO2 associated with community systems			1699.7356	(473)
Space and water heating			1699.7356	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Total Primary energy kWh/year			1914.0510	(483)
Dwelling Primary energy Rate (DPER)			44.1400	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.6400	1.1450	7.6031			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.1800	1.7910			(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.1800	2.6550			(29a)
500mm mineral wool	43.3600		43.3600	0.1100	4.7696			(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.6587			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							179.0141	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E2 Other lintels (including other steel lintels)	4.7800	0.0500	0.2390		
E3 Sill	3.8800	0.0500	0.1940		
E4 Jamb	17.9200	0.0500	0.8960		
E7 Party floor between dwellings (in blocks of flats)	17.6700	0.0700	1.2369		
E16 Corner (normal)	5.0000	0.0900	0.4500		
E18 Party wall between dwellings	5.0000	0.0600	0.3000		
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.5900	0.0000	0.0000		
E14 Flat roof	17.6700	0.0800	1.4136		
P4 Party wall - Roof (insulation at ceiling level)	12.5900	0.1200	1.5108		
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				6.5403	(36)
Point Thermal bridges			(36a) =	0.0000	
Total fabric heat loss			(33) + (36) + (36a) =	25.1990	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	46.0145	45.8869	45.7618	45.1741	45.0641	44.5523	44.5523	44.4575	44.7494	45.0641	45.2866	45.5191	(39)
Average = Sum(39)m / 12 =												45.1735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0612	1.0583	1.0554	1.0418	1.0393	1.0275	1.0275	1.0253	1.0320	1.0393	1.0444	1.0498	(40)
HLP (average)												1.0418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)											Total = Sum(45)m =	1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
										Total per year (kWh/year) = Sum(64)m =		1875.8483	(64)
12Total per year (kWh/year)												1876	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.0518	76.4502	69.0518	71.3535	69.0518	71.3535	69.0518	69.0518	71.3535	69.0518	71.3535	69.0518	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	368.9363	375.8469	361.5069	348.8073	332.6121	318.3548	307.2620	308.4334	317.0921	330.5443	349.4255	362.2051	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	19.6403	0.6300	0.7000	0.7700	39.8554	(80)

Solar gains	39.8554	77.9656	128.3983	187.2612	229.4957	234.9297	223.6626	192.1229	149.3325	92.5128	49.6950	32.7751	(83)
Total gains	408.7917	453.8125	489.9052	536.0685	562.1078	553.2845	530.9247	500.5563	466.4246	423.0570	399.1205	394.9803	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8575	46.9878	47.1163	47.7293	47.8457	48.3954	48.3954	48.4986	48.1822	47.8457	47.6107	47.3675	
alpha	4.1238	4.1325	4.1411	4.1820	4.1897	4.2264	4.2264	4.2332	4.2121	4.1897	4.1740	4.1578	
util living area	0.9639	0.9439	0.9057	0.8148	0.6747	0.4997	0.3658	0.4030	0.6174	0.8463	0.9397	0.9679	(86)
MIT	19.7811	19.9887	20.2832	20.6408	20.8696	20.9716	20.9939	20.9909	20.9319	20.6378	20.1682	19.7516	(87)
Th 2	20.0326	20.0351	20.0374	20.0486	20.0507	20.0605	20.0605	20.0623	20.0567	20.0507	20.0465	20.0420	(88)
util rest of house	0.9564	0.9327	0.8871	0.7810	0.6224	0.4319	0.2893	0.3234	0.5470	0.8100	0.9257	0.9612	(89)
MIT 2	18.6417	18.9012	19.2638	19.6921	19.9396	20.0424	20.0580	20.0583	20.0086	19.7012	19.1370	18.6117	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.1859	19.4206	19.7507	20.1452	20.3838	20.4862	20.5050	20.5038	20.4496	20.1486	19.6295	19.1561	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1859	19.4206	19.7507	20.1452	20.3838	20.4862	20.5050	20.5038	20.4496	20.1486	19.6295	19.1561	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9483	0.9242	0.8808	0.7847	0.6414	0.4631	0.3257	0.3612	0.5773	0.8141	0.9185	0.9535	(94)
Useful gains	387.6771	419.4251	431.4878	420.6633	360.5559	256.2432	172.9274	180.8171	269.2477	344.4106	366.5953	376.6321	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	684.9669	666.3041	606.3758	507.9927	391.3278	262.2440	173.9782	182.4424	284.1393	430.2985	567.4198	680.7898	(97)
Space heating kWh	221.1836	165.9027	130.1167	62.8771	22.8943	0.0000	0.0000	0.0000	0.0000	63.9006	144.5936	226.2934	(98a)
Space heating requirement - total per year (kWh/year)												1037.7620	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	221.1836	165.9027	130.1167	62.8771	22.8943	0.0000	0.0000	0.0000	0.0000	63.9006	144.5936	226.2934	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1037.7620	
Space heating per m2										(98c) / (4) =		23.9336	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 92.3000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	221.1836	165.9027	130.1167	62.8771	22.8943	0.0000	0.0000	0.0000	0.0000	63.9006	144.5936	226.2934	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	239.6355	179.7429	140.9715	68.1226	24.8042	0.0000	0.0000	0.0000	0.0000	69.2315	156.6561	245.1716	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.4803	84.1076	83.4287	82.2203	80.8865	79.8000	79.8000	79.8000	79.8000	82.2239	83.7773	84.5538	(217)
Fuel for water heating, kWh/month	217.1514	193.0952	207.4627	186.8313	185.2607	170.5061	169.2907	175.3325	176.4869	189.4704	195.8713	214.8307	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.3476	11.5102	10.3636	7.5928	5.8649	4.7917	5.3502	6.9544	9.0330	11.8518	13.3866	14.7464	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3196	-12.6515	-19.6021	-23.8221	-27.3050	-26.1047	-25.8068	-23.5584	-19.8837	-15.2375	-9.4737	-7.0906	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2617	-4.9168	-10.0734	-15.5779	-21.0367	-21.2830	-21.0140	-17.5742	-12.6116	-7.1556	-3.0599	-1.7757	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 1124.3359 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 79.8000

Water heating fuel used 2281.5901 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

Total electricity for the above, kWh/year 86.0000 (231)

Electricity for lighting (calculated in Appendix L) 115.7933 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3250.5231	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1124.3359	0.2100	236.1105	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2281.5901	0.2100	479.1339	(264)
Space and water heating			715.2444	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	115.7933	0.1443	16.7126	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	0.1330	-29.1103	
PV Unit electricity exported	-138.3404	0.1251	-17.3028	
Total			-46.4132	(269)
Total CO2, kg/year			697.4731	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.0900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1124.3359	1.1300	1270.4995	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2281.5901	1.1300	2578.1968	(278)
Space and water heating			3848.6963	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	115.7933	1.5338	177.6076	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	1.4915	-326.4228	
PV Unit electricity exported	-138.3404	0.4591	-63.5081	
Total			-389.9309	(283)
Total Primary energy kWh/year			3766.4739	(286)
Target Primary Energy Rate (TPER)			86.8700	(287)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	81 B	**DER**	4.14	**TER**	16.09
Environmental	97 A	**% DER < TER**			74.27
CO_2 Emissions (t/year)	0.17	**DFEE**	21.90	**TFEE**	32.86
Compliance Check	See BREL	**% DFEE < TFEE**			33.34
% DPER < TPER	49.18	**DPER**	44.14	**TPER**	86.87

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		2 * 10 =	20.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		20.0000 / (5) =	0.1883 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			3.0000 (17)
Infiltration rate			0.3383 (18)
Number of sides sheltered			3 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2622 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		7762.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							179.0141	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		17.4572	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	36.9438	36.8677	36.7932	36.4431	36.3776	36.0727	36.0727	36.0162	36.1901	36.3776	36.5101	36.6486	(39)
Average = Sum(39)m / 12 =												36.4428	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8520	0.8503	0.8486	0.8405	0.8390	0.8319	0.8319	0.8306	0.8346	0.8390	0.8420	0.8452	(40)
HLP (average)												0.8405	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												449.4572	(64a)
Heat gains from water heating, kWh/month	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0601	78.6737	71.0601	73.4288	71.0601	73.4288	71.0601	71.0601	73.4288	71.0601	73.4288	71.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.0895	291.1341	278.7010	271.1858	257.9340	249.9230	240.9368	240.6593	247.6349	254.4733	268.5369	277.0546	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	19.6403	0.6800	0.7000	0.7700	43.0185	(80)

Solar gains	43.0185	84.1534	138.5886	202.1232	247.7096	253.5749	241.4136	207.3707	161.1843	99.8551	53.6391	35.3763	(83)
Total gains	326.1080	375.2875	417.2896	473.3090	505.6436	503.4979	482.3504	448.0301	408.8192	354.3283	322.1760	312.4309	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.3623	58.4827	58.6012	59.1642	59.2707	59.7717	59.7717	59.8654	59.5777	59.2707	59.0556	58.8323	
alpha	4.8908	4.8988	4.9067	4.9443	4.9514	4.9848	4.9848	4.9910	4.9718	4.9514	4.9370	4.9222	
util living area	0.9786	0.9583	0.9148	0.8010	0.6358	0.4534	0.3282	0.3682	0.5892	0.8580	0.9585	0.9822	(86)
MIT	19.9792	20.1978	20.4793	20.7875	20.9421	20.9911	20.9986	20.9975	20.9696	20.7444	20.3172	19.9396	(87)
Th 2	20.2085	20.2100	20.2115	20.2184	20.2197	20.2257	20.2257	20.2269	20.2234	20.2197	20.2171	20.2143	(88)
util rest of house	0.9742	0.9501	0.8989	0.7699	0.5907	0.4004	0.2709	0.3070	0.5299	0.8267	0.9489	0.9785	(89)

MIT 2	19.2829	19.4971	19.7676	20.0531	20.1810	20.2212	20.2253	20.2259	20.2063	20.0237	19.6219	19.2488	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.6155	19.8318	20.1075	20.4039	20.5445	20.5889	20.5946	20.5945	20.5709	20.3679	19.9540	19.5788	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6155	19.8318	20.1075	20.4039	20.5445	20.5889	20.5946	20.5945	20.5709	20.3679	19.9540	19.5788	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9702	0.9456	0.8966	0.7776	0.6098	0.4254	0.2982	0.3362	0.5569	0.8331	0.9452	0.9748	(94)
Useful gains	316.3988	354.8752	374.1523	368.0670	308.3573	214.2081	143.8510	150.6270	227.6810	295.2080	304.5131	304.5609	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	565.8119	550.5012	500.6651	419.2363	321.7425	216.0367	144.0961	151.0683	234.1815	355.3338	469.3010	563.6107	(97)
Space heating kWh	185.5633	131.4607	94.1255	36.8419	9.9586	0.0000	0.0000	0.0000	0.0000	44.7336	118.6473	192.7331	(98a)
Space heating requirement - total per year (kWh/year)												814.0640	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	185.5633	131.4607	94.1255	36.8419	9.9586	0.0000	0.0000	0.0000	0.0000	44.7336	118.6473	192.7331	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												814.0640	
Space heating per m2											(98c) / (4) =	18.7745	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	339.0831	266.9377	273.7231	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9659	0.9843	0.9766	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	327.5254	262.7454	267.3261	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	559.8297	536.6719	497.9536	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	167.2592	203.8013	171.5869	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	41.8148	50.9503	42.8967	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												135.6618	(107)
Energy for space heating												18.7745	(99)
Energy for space cooling												3.1287	(108)
Total												21.9033	(109)
Fabric Energy Efficiency (DFEE)												21.9	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.6400	1.1450	7.6031			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.1800	1.7910			(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.1800	2.6550			(29a)
500mm mineral wool	43.3600		43.3600	0.1100	4.7696			(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.6587			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.0141 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	4.7800	0.0500	0.2390
E3 Sill	3.8800	0.0500	0.1940
E4 Jamb	17.9200	0.0500	0.8960
E7 Party floor between dwellings (in blocks of flats)	17.6700	0.0700	1.2369
E16 Corner (normal)	5.0000	0.0900	0.4500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.5900	0.0000	0.0000
E14 Flat roof	17.6700	0.0800	1.4136
P4 Party wall - Roof (insulation at ceiling level)	12.5900	0.1200	1.5108
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5403 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.1990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	46.0145	45.8869	45.7618	45.1741	45.0641	44.5523	44.5523	44.4575	44.7494	45.0641	45.2866	45.5191	(39)
Average = Sum(39)m / 12 =												45.1735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0612	1.0583	1.0554	1.0418	1.0393	1.0275	1.0275	1.0253	1.0320	1.0393	1.0444	1.0498	(40)
HLP (average)												1.0418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)													
	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							449.4572	(64a)
Heat gains from water heating, kWh/month													
	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	69.0518	76.4502	69.0518	71.3535	69.0518	71.3535	69.0518	69.0518	71.3535	69.0518	71.3535	69.0518	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains													
	281.0812	288.9106	276.6927	269.1105	255.9256	247.8477	238.9285	238.6510	245.5596	252.4649	266.4616	275.0462	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	19.6403	0.6300	0.7000	0.7700	39.8554	(80)

Solar gains	39.8554	77.9656	128.3983	187.2612	229.4957	234.9297	223.6626	192.1229	149.3325	92.5128	49.6950	32.7751	(83)
Total gains	320.9366	366.8763	405.0910	456.3717	485.4213	482.7774	462.5911	430.7739	394.8921	344.9777	316.1566	307.8214	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8575	46.9878	47.1163	47.7293	47.8457	48.3954	48.3954	48.4986	48.1822	47.8457	47.6107	47.3675	
alpha	4.1238	4.1325	4.1411	4.1820	4.1897	4.2264	4.2264	4.2332	4.2121	4.1897	4.1740	4.1578	
util living area													
	0.9839	0.9713	0.9452	0.8722	0.7439	0.5627	0.4172	0.4639	0.6982	0.9082	0.9711	0.9863	(86)
MIT	19.5262	19.7540	20.0850	20.5141	20.8102	20.9558	20.9900	20.9846	20.8916	20.4915	19.9459	19.4946	(87)
Th 2	20.0326	20.0351	20.0374	20.0486	20.0507	20.0605	20.0605	20.0623	20.0567	20.0507	20.0465	20.0420	(88)
util rest of house													
	0.9803	0.9649	0.9328	0.8446	0.6934	0.4897	0.3311	0.3741	0.6269	0.8818	0.9635	0.9832	(89)
MIT 2	18.7000	18.9257	19.2497	19.6620	19.9208	20.0380	20.0572	20.0569	19.9944	19.6525	19.1257	18.6759	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.0946	19.3213	19.6487	20.0690	20.3456	20.4764	20.5028	20.5000	20.4229	20.0532	19.5174	19.0669	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0946	19.3213	19.6487	20.0690	20.3456	20.4764	20.5028	20.5000	20.4229	20.0532	19.5174	19.0669	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9757	0.9591	0.9270	0.8452	0.7100	0.5228	0.3721	0.4167	0.6560	0.8819	0.9583	0.9790	(94)
Useful gains	313.1370	351.8664	375.5045	385.7415	344.6275	252.3984	172.1308	179.4860	259.0434	304.2354	302.9775	301.3667	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	680.7677	661.7509	601.7063	504.5490	389.6051	261.8051	173.8771	182.2749	282.9482	426.0007	562.3435	676.7286	(97)
Space heating kWh													
	273.5173	208.2424	168.2941	85.5414	33.4633	0.0000	0.0000	0.0000	0.0000	90.5934	186.7436	279.2692	(98a)
Space heating requirement - total per year (kWh/year)												1325.6646	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	273.5173	208.2424	168.2941	85.5414	33.4633	0.0000	0.0000	0.0000	0.0000	90.5934	186.7436	279.2692	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1325.6646	
Space heating per m2											(98c) / (4) =	30.5734	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	418.7912	329.6867	337.8767	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8946	0.9397	0.9203	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	374.6578	309.8225	310.9425	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	537.8609	515.7341	479.8847	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	117.5062	153.1982	125.6930	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	29.3766	38.2996	31.4232	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												99.0993	(107)
Energy for space heating												30.5734	(99)
Energy for space cooling												2.2855	(108)
Total												32.8589	(109)
Fabric Energy Efficiency (TFEE)												32.9	(109)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	81 B	**DER**	4.14	**TER**	16.09
Environmental	97 A	**% DER < TER**			74.27
CO_2 Emissions (t/year)	0.17	**DFEE**	21.90	**TFEE**	32.86
Compliance Check	See BREL	**% DFEE < TFEE**			33.34
% DPER < TPER	49.18	**DPER**	44.14	**TPER**	86.87

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600 (1b)	x	2.4500 (2b)	=	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
12Total per year (kWh/year)												2188	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0601	78.6737	71.0601	73.4288	71.0601	73.4288	71.0601	71.0601	73.4288	71.0601	73.4288	71.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.2801	384.4058	369.8506	357.2179	340.9558	329.7655	318.6057	319.7771	328.5028	338.8880	357.8362	370.5488	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	19.6403	0.6800	0.7000	0.7700	43.0185	(80)

Solar gains	43.0185	84.1534	138.5886	202.1232	247.7096	253.5749	241.4136	207.3707	161.1843	99.8551	53.6391	35.3763	(83)
Total gains	420.2986	468.5592	508.4392	559.3412	588.6654	583.3403	560.0194	527.1478	489.6871	438.7430	411.4752	405.9252	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292

alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.9398	0.9028	0.8353	0.7026	0.5404	0.3821	0.2746	0.3048	0.4861	0.7494	0.8975	0.9479	(86)
MIT	20.3438	20.5137	20.7137	20.8948	20.9749	20.9964	20.9995	20.9991	20.9884	20.8785	20.5944	20.2962	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.9295	0.8876	0.8122	0.6690	0.5000	0.3378	0.2278	0.2552	0.4355	0.7111	0.8791	0.9387	(89)
MIT 2	19.5032	19.7088	19.9449	20.1459	20.2265	20.2451	20.2472	20.2470	20.2393	20.1338	19.8104	19.4449	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.9047	20.0932	20.3121	20.5036	20.5840	20.6039	20.6065	20.6062	20.5971	20.4895	20.1848	19.8515	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9047	20.0932	20.3121	20.5036	20.5840	20.6039	20.6065	20.6062	20.5971	20.4895	20.1848	19.8515	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9242	0.8842	0.8143	0.6807	0.5183	0.3588	0.2501	0.2789	0.4592	0.7239	0.8774	0.9332	(94)
Useful gains	388.4213	414.2950	414.0272	380.7485	305.0774	209.3208	140.0800	146.9996	224.8671	317.5946	361.0486	378.8125	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	545.9365	531.5426	483.2225	405.9587	310.8096	210.0504	140.1688	147.1562	227.3042	345.9883	457.7791	547.5744	(97)
Space heating kWh	117.1913	78.7904	51.4812	18.1513	4.2647	0.0000	0.0000	0.0000	0.0000	21.1249	69.6459	125.5588	(98a)
Space heating requirement - total per year (kWh/year)												486.2086	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	117.1913	78.7904	51.4812	18.1513	4.2647	0.0000	0.0000	0.0000	0.0000	21.1249	69.6459	125.5588	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												486.2086	
Space heating per m2											(98c) / (4) =	11.2133	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	117.1913	78.7904	51.4812	18.1513	4.2647	0.0000	0.0000	0.0000	0.0000	21.1249	69.6459	125.5588	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	175.7869	118.1856	77.2219	27.2270	6.3971	0.0000	0.0000	0.0000	0.0000	31.6873	104.4689	188.3383	
Space heating requirement	175.7869	118.1856	77.2219	27.2270	6.3971	0.0000	0.0000	0.0000	0.0000	31.6873	104.4689	188.3383	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												729.3129	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												7.2931	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4150.7259	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1069.5443	0.1575	30.6398	(367)
Electrical energy for heat distribution (space & water)	7.2931	0.0000	5.7669	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			159.5500	(373)
Space and water heating			159.5500	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Total CO2, kg/year			179.6612	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.1400	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1069.5443	1.5832	307.9063	(467)
Electrical energy for heat distribution (space & water)	7.2931	0.0000	61.4362	(472)
Overall CO2 factor for heat network			0.4238	(486)
Total CO2 associated with community systems			1699.7356	(473)
Space and water heating			1699.7356	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Total Primary energy kWh/year			1914.0510	(483)
Dwelling Primary energy Rate (DPER)			44.1400	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.6400	1.1450	7.6031			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.1800	1.7910			(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.1800	2.6550			(29a)
500mm mineral wool	43.3600		43.3600	0.1100	4.7696			(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.6587			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							179.0141	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E2 Other lintels (including other steel lintels)	4.7800	0.0500	0.2390		
E3 Sill	3.8800	0.0500	0.1940		
E4 Jamb	17.9200	0.0500	0.8960		
E7 Party floor between dwellings (in blocks of flats)	17.6700	0.0700	1.2369		
E16 Corner (normal)	5.0000	0.0900	0.4500		
E18 Party wall between dwellings	5.0000	0.0600	0.3000		
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.5900	0.0000	0.0000		
E14 Flat roof	17.6700	0.0800	1.4136		
P4 Party wall - Roof (insulation at ceiling level)	12.5900	0.1200	1.5108		
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				6.5403	(36)
Point Thermal bridges			(36a) =	0.0000	
Total fabric heat loss			(33) + (36) + (36a) =	25.1990	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	46.0145	45.8869	45.7618	45.1741	45.0641	44.5523	44.5523	44.4575	44.7494	45.0641	45.2866	45.5191	(39)
Average = Sum(39)m / 12 =												45.1735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0612	1.0583	1.0554	1.0418	1.0393	1.0275	1.0275	1.0253	1.0320	1.0393	1.0444	1.0498	(40)
HLP (average)												1.0418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)											Total = Sum(45)m =	1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
										Total per year (kWh/year) = Sum(64)m =		1875.8483	(64)
12Total per year (kWh/year)												1876	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.0518	76.4502	69.0518	71.3535	69.0518	71.3535	69.0518	69.0518	71.3535	69.0518	71.3535	69.0518	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	368.9363	375.8469	361.5069	348.8073	332.6121	318.3548	307.2620	308.4334	317.0921	330.5443	349.4255	362.2051	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	19.6403	0.6300	0.7000	0.7700	39.8554	(80)

Solar gains	39.8554	77.9656	128.3983	187.2612	229.4957	234.9297	223.6626	192.1229	149.3325	92.5128	49.6950	32.7751	(83)
Total gains	408.7917	453.8125	489.9052	536.0685	562.1078	553.2845	530.9247	500.5563	466.4246	423.0570	399.1205	394.9803	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8575	46.9878	47.1163	47.7293	47.8457	48.3954	48.3954	48.4986	48.1822	47.8457	47.6107	47.3675	
alpha	4.1238	4.1325	4.1411	4.1820	4.1897	4.2264	4.2264	4.2332	4.2121	4.1897	4.1740	4.1578	
util living area	0.9639	0.9439	0.9057	0.8148	0.6747	0.4997	0.3658	0.4030	0.6174	0.8463	0.9397	0.9679	(86)
MIT	19.7811	19.9887	20.2832	20.6408	20.8696	20.9716	20.9939	20.9909	20.9319	20.6378	20.1682	19.7516	(87)
Th 2	20.0326	20.0351	20.0374	20.0486	20.0507	20.0605	20.0605	20.0623	20.0567	20.0507	20.0465	20.0420	(88)
util rest of house	0.9564	0.9327	0.8871	0.7810	0.6224	0.4319	0.2893	0.3234	0.5470	0.8100	0.9257	0.9612	(89)
MIT 2	18.6417	18.9012	19.2638	19.6921	19.9396	20.0424	20.0580	20.0583	20.0086	19.7012	19.1370	18.6117	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.1859	19.4206	19.7507	20.1452	20.3838	20.4862	20.5050	20.5038	20.4496	20.1486	19.6295	19.1561	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1859	19.4206	19.7507	20.1452	20.3838	20.4862	20.5050	20.5038	20.4496	20.1486	19.6295	19.1561	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9483	0.9242	0.8808	0.7847	0.6414	0.4631	0.3257	0.3612	0.5773	0.8141	0.9185	0.9535	(94)
Useful gains	387.6771	419.4251	431.4878	420.6633	360.5559	256.2432	172.9274	180.8171	269.2477	344.4106	366.5953	376.6321	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	684.9669	666.3041	606.3758	507.9927	391.3278	262.2440	173.9782	182.4424	284.1393	430.2985	567.4198	680.7898	(97)
Space heating kWh	221.1836	165.9027	130.1167	62.8771	22.8943	0.0000	0.0000	0.0000	0.0000	63.9006	144.5936	226.2934	(98a)
Space heating requirement - total per year (kWh/year)												1037.7620	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	221.1836	165.9027	130.1167	62.8771	22.8943	0.0000	0.0000	0.0000	0.0000	63.9006	144.5936	226.2934	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1037.7620	
Space heating per m2										(98c) / (4) =		23.9336	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 92.3000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	221.1836	165.9027	130.1167	62.8771	22.8943	0.0000	0.0000	0.0000	0.0000	63.9006	144.5936	226.2934	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	239.6355	179.7429	140.9715	68.1226	24.8042	0.0000	0.0000	0.0000	0.0000	69.2315	156.6561	245.1716	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.4803	84.1076	83.4287	82.2203	80.8865	79.8000	79.8000	79.8000	79.8000	82.2239	83.7773	84.5538	(217)
Fuel for water heating, kWh/month	217.1514	193.0952	207.4627	186.8313	185.2607	170.5061	169.2907	175.3325	176.4869	189.4704	195.8713	214.8307	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.3476	11.5102	10.3636	7.5928	5.8649	4.7917	5.3502	6.9544	9.0330	11.8518	13.3866	14.7464	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3196	-12.6515	-19.6021	-23.8221	-27.3050	-26.1047	-25.8068	-23.5584	-19.8837	-15.2375	-9.4737	-7.0906	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2617	-4.9168	-10.0734	-15.5779	-21.0367	-21.2830	-21.0140	-17.5742	-12.6116	-7.1556	-3.0599	-1.7757	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 1124.3359 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 79.8000

Water heating fuel used 2281.5901 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

Total electricity for the above, kWh/year 86.0000 (231)

Electricity for lighting (calculated in Appendix L) 115.7933 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3250.5231	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1124.3359	0.2100	236.1105	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2281.5901	0.2100	479.1339	(264)
Space and water heating			715.2444	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	115.7933	0.1443	16.7126	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	0.1330	-29.1103	
PV Unit electricity exported	-138.3404	0.1251	-17.3028	
Total			-46.4132	(269)
Total CO2, kg/year			697.4731	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.0900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1124.3359	1.1300	1270.4995	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2281.5901	1.1300	2578.1968	(278)
Space and water heating			3848.6963	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	115.7933	1.5338	177.6076	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	1.4915	-326.4228	
PV Unit electricity exported	-138.3404	0.4591	-63.5081	
Total			-389.9309	(283)
Total Primary energy kWh/year			3766.4739	(286)
Target Primary Energy Rate (TPER)			86.8700	(287)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	81 B	**DER**	4.14	**TER**	16.09
Environmental	97 A	**% DER < TER**			74.27
CO_2 Emissions (t/year)	0.17	**DFEE**	21.90	**TFEE**	32.86
Compliance Check	See BREL	**% DFEE < TFEE**			33.34
% DPER < TPER	49.18	**DPER**	44.14	**TPER**	86.87

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

		Area		Storey height		Volume	
Main dwelling		(m2)		(m)		(m3)	
Ground floor		43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			3.0000 (17)
Infiltration rate			0.1500 (18)
Number of sides sheltered			3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	

Distribution loss (46)m = 0.15 x (45)m

23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
									Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	19.6403	0.6800	0.7000	0.7700	43.0185	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	43.0185	84.1534	138.5886	202.1232	247.7096	253.5749	241.4136	207.3707	161.1843	99.8551	53.6391	35.3763	(83)
Total gains	460.9295	500.2679	543.1589	585.0287	609.7829	596.7343	573.4459	541.8830	506.6562	464.7443	442.0465	444.2200	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086

util living area													
	0.9178	0.8816	0.8065	0.6791	0.5233	0.3736	0.2682	0.2966	0.4707	0.7201	0.8735	0.9287	(86)
MIT	20.4411	20.5762	20.7599	20.9098	20.9783	20.9967	20.9995	20.9992	20.9900	20.8989	20.6526	20.3925	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house													
	0.9048	0.8644	0.7816	0.6454	0.4837	0.3303	0.2224	0.2482	0.4214	0.6810	0.8525	0.9170	(89)
MIT 2	19.6207	19.7824	19.9963	20.1610	20.2294	20.2453	20.2472	20.2470	20.2404	20.1539	19.8775	19.5620	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0125	20.1616	20.3610	20.5186	20.5871	20.6042	20.6065	20.6063	20.5984	20.5097	20.2477	19.9586	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0125	20.1616	20.3610	20.5186	20.5871	20.6042	20.6065	20.6063	20.5984	20.5097	20.2477	19.9586	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9004	0.8623	0.7855	0.6578	0.5017	0.3509	0.2443	0.2713	0.4446	0.6951	0.8525	0.9121	(94)
Useful gains	414.9991	431.3661	426.6509	384.8327	305.9559	209.4025	140.0909	147.0215	225.2448	323.0388	376.8273	405.1517	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	549.7096	533.9329	484.9335	406.4836	310.9181	210.0605	140.1702	147.1590	227.3508	346.6970	459.9785	551.3236	(97)
Space heating kWh													
	100.2246	68.9249	43.3623	15.5886	3.6919	0.0000	0.0000	0.0000	0.0000	17.6016	59.8688	108.7519	(98a)
Space heating requirement - total per year (kWh/year)												418.0146	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	100.2246	68.9249	43.3623	15.5886	3.6919	0.0000	0.0000	0.0000	0.0000	17.6016	59.8688	108.7519	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												418.0146	
Space heating per m2											(98c) / (4) =	9.6406	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	100.2246	68.9249	43.3623	15.5886	3.6919	0.0000	0.0000	0.0000	0.0000	17.6016	59.8688	108.7519	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	150.3369	103.3873	65.0434	23.3829	5.5379	0.0000	0.0000	0.0000	0.0000	26.4025	89.8032	163.1279	
Space heating requirement													
	150.3369	103.3873	65.0434	23.3829	5.5379	0.0000	0.0000	0.0000	0.0000	26.4025	89.8032	163.1279	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												627.0220	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												6.2702	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4048.4350	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	627.0220	4.4400	27.8398	(340a)
Space heating total			27.8398	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	16.4900	2.5157	(349)
Energy for lighting	124.6784	16.4900	20.5595	(350)
Additional standing charges			92.0000	(351)
Total energy cost			288.6126	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1759	(357)
SAP value		80.9390	
SAP rating (Section 12)		81	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1042.2668	0.1576	26.3504	(367)
Electrical energy for heat distribution (space & water)	6.2702	0.0000	5.6060	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			155.0998	(373)
Space and water heating			155.0998	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Total CO2, kg/year			175.2110	(383)
CO2 emissions per m2			4.0400	(384)
EI value			97.3429	(384a)
EI rating			97	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.4982 (42)
Hot water usage for mixer showers	49.3398 48.5983 47.5178 45.4505 43.9249 42.2235 41.2565 42.3288 43.5042 45.3309 47.4427	49.1507 (42a)
Hot water usage for baths	21.3409 21.0240 20.5777 19.7547 19.1385 18.4553 18.0862 18.5294 19.0120 19.7431 20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733 28.8834 27.7935 26.7035 25.6136 24.5236 24.5236 25.6136 26.7035 27.7935 28.8834	29.9733 (42c)
Average daily hot water use (litres/day)		92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
									Total per year (kWh/year) = Sum(64)m =			2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	23.7835	0.6800	0.7000	0.7700	52.0935	(80)

Solar gains	52.0935	90.5491	146.7062	215.9115	254.4951	279.3109	260.9848	228.8358	179.9437	113.3085	63.9852	43.0855	(83)
Total gains	470.0045	506.6636	551.2765	598.8169	616.5683	622.4703	593.0171	563.3481	525.4156	478.1977	452.3927	451.9291	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.9073	0.8704	0.7832	0.6492	0.4920	0.3253	0.2300	0.2544	0.4358	0.6796	0.8538	0.9199	(86)
MIT	20.4892	20.6125	20.7987	20.9287	20.9844	20.9985	20.9998	20.9997	20.9932	20.9260	20.7016	20.4399	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.8929	0.8519	0.7563	0.6145	0.4521	0.2834	0.1857	0.2078	0.3874	0.6381	0.8303	0.9069	(89)
MIT 2	19.6790	19.8255	20.0402	20.1804	20.2349	20.2465	20.2473	20.2473	20.2429	20.1812	19.9343	19.6198	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.0660	20.2014	20.4025	20.5378	20.5929	20.6056	20.6067	20.6066	20.6013	20.5369	20.3008	20.0115	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0660	20.2014	20.4025	20.5378	20.5929	20.6056	20.6067	20.6066	20.6013	20.5369	20.3008	20.0115	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8891	0.8507	0.7620	0.6281	0.4705	0.3033	0.2068	0.2301	0.4103	0.6545	0.8320	0.9024	(94)
Useful gains	417.8877	431.0011	420.0844	376.1181	290.1150	188.8195	122.6533	129.6230	215.5592	312.9642	376.4086	407.8368	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	541.0846	524.8315	468.8937	393.1603	293.6284	189.1192	122.6844	129.6780	216.9544	330.1544	447.8414	542.6760	(97)
Space heating kWh	91.6585	63.0540	36.3141	12.2704	2.6140	0.0000	0.0000	0.0000	0.0000	12.7895	51.4316	100.3204	(98a)
Space heating requirement - total per year (kWh/year)												370.4525	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	91.6585	63.0540	36.3141	12.2704	2.6140	0.0000	0.0000	0.0000	0.0000	12.7895	51.4316	100.3204	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												370.4525	
Space heating per m2											(98c) / (4) =	8.5436	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	91.6585	63.0540	36.3141	12.2704	2.6140	0.0000	0.0000	0.0000	0.0000	12.7895	51.4316	100.3204	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	137.4878	94.5810	54.4711	18.4056	3.9210	0.0000	0.0000	0.0000	0.0000	19.1843	77.1474	150.4806	
Space heating requirement	137.4878	94.5810	54.4711	18.4056	3.9210	0.0000	0.0000	0.0000	0.0000	19.1843	77.1474	150.4806	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												555.6787	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												5.5568	(313)
Space cooling fuel												0.0000	(321)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)

mechanical ventilation fans (SFP = 0.1177)	15.2561	(330a)
Total electricity for the above, kWh/year	15.2561	(331)
Electricity for lighting (calculated in Appendix L)	124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3977.0917	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	555.6787	6.5500	36.3970	(340a)
Space heating total			36.3970	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	28.4300	4.3373	(349)
Energy for lighting	124.6784	28.4300	35.4461	(350)
Additional standing charges			104.0000	(351)
Total energy cost			395.1172	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1023.2419	0.1580	23.4170	(367)
Electrical energy for heat distribution (space & water)	5.5568	0.0000	5.4960	(372)
Overall CO2 factor for heat network			0.0396	(386)
Total CO2 associated with community systems			152.0564	(373)
Space and water heating			152.0564	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Total CO2, kg/year			172.1676	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1023.2419	1.5850	234.8652	(467)
Electrical energy for heat distribution (space & water)	5.5568	0.0000	58.6972	(472)
Overall CO2 factor for heat network			0.4232	(486)
Total CO2 associated with community systems			1623.9554	(473)
Space and water heating			1623.9554	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Total Primary energy kWh/year			1838.2708	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Be Clean

Current energy efficiency rating: B 81
Current environmental impact rating: A 97

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 81
Potential environmental impact rating: A 97

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£40	£40	£0
Community scheme	£355	£355	£0
Space heating	£145	£145	£0
Water heating	£215	£215	£0
Lighting	£35	£35	£0

Total cost of fuels	£395	£395	£0
Total cost of uses	£395	£395	£0
Delivered energy	92 kWh/m²	92 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	4 kg/m²	4 kg/m²	0 kg/m²
Primary energy	42 kWh/m²	42 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers													
	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths													
	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses													
	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m													
	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	19.6403	0.6800	0.7000	0.7700	43.0185	(80)

Solar gains	43.0185	84.1534	138.5886	202.1232	247.7096	253.5749	241.4136	207.3707	161.1843	99.8551	53.6391	35.3763	(83)
Total gains	460.9295	500.2679	543.1589	585.0287	609.7829	596.7343	573.4459	541.8830	506.6562	464.7443	442.0465	444.2200	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area													
	0.9178	0.8816	0.8065	0.6791	0.5233	0.3736	0.2682	0.2966	0.4707	0.7201	0.8735	0.9287	(86)
MIT	20.4411	20.5762	20.7599	20.9098	20.9783	20.9967	20.9995	20.9992	20.9900	20.8989	20.6526	20.3925	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house													
	0.9048	0.8644	0.7816	0.6454	0.4837	0.3303	0.2224	0.2482	0.4214	0.6810	0.8525	0.9170	(89)
MIT 2	19.6207	19.7824	19.9963	20.1610	20.2294	20.2453	20.2472	20.2470	20.2404	20.1539	19.8775	19.5620	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0125	20.1616	20.3610	20.5186	20.5871	20.6042	20.6065	20.6063	20.5984	20.5097	20.2477	19.9586	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0125	20.1616	20.3610	20.5186	20.5871	20.6042	20.6065	20.6063	20.5984	20.5097	20.2477	19.9586	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9004	0.8623	0.7855	0.6578	0.5017	0.3509	0.2443	0.2713	0.4446	0.6951	0.8525	0.9121	(94)
Useful gains	414.9991	431.3661	426.6509	384.8327	305.9559	209.4025	140.0909	147.0215	225.2448	323.0388	376.8273	405.1517	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	549.7096	533.9329	484.9335	406.4836	310.9181	210.0605	140.1702	147.1590	227.3508	346.6970	459.9785	551.3236	(97)
Space heating kWh	100.2246	68.9249	43.3623	15.5886	3.6919	0.0000	0.0000	0.0000	0.0000	17.6016	59.8688	108.7519	(98a)
Space heating requirement - total per year (kWh/year)												418.0146	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	100.2246	68.9249	43.3623	15.5886	3.6919	0.0000	0.0000	0.0000	0.0000	17.6016	59.8688	108.7519	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												418.0146	
Space heating per m2											(98c) / (4) =	9.6406	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

100.2246	68.9249	43.3623	15.5886	3.6919	0.0000	0.0000	0.0000	0.0000	17.6016	59.8688	108.7519	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a 150.3369	103.3873	65.0434	23.3829	5.5379	0.0000	0.0000	0.0000	0.0000	26.4025	89.8032	163.1279	
Space heating requirement												
150.3369	103.3873	65.0434	23.3829	5.5379	0.0000	0.0000	0.0000	0.0000	26.4025	89.8032	163.1279	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a 322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel												
322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)

Cooling System Energy Efficiency Ratio	0.0000	(314)

Space coolin 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa 1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting 15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year

Space heating fuel - community heating	627.0220	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	6.2702	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)		
mechanical ventilation fans (SFP = 0.1177)	15.2561	(330a)
Total electricity for the above, kWh/year	15.2561	(331)
Electricity for lighting (calculated in Appendix L)	124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4048.4350	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	627.0220	4.4400	27.8398	(340a)
Space heating total			27.8398	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	16.4900	2.5157	(349)
Energy for lighting	124.6784	16.4900	20.5595	(350)
Additional standing charges			92.0000	(351)
Total energy cost			288.6126	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1759	(357)
SAP value		80.9390	
SAP rating (Section 12)		81	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1042.2668	0.1576	26.3504	(367)
Electrical energy for heat distribution (space & water)	6.2702	0.0000	5.6060	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			155.0998	(373)
Space and water heating			155.0998	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Total CO2, kg/year			175.2110	(383)
CO2 emissions per m2			4.0400	(384)
EI value			97.3429	(384a)
EI rating			97	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)

Party Floor 1	43.3600	70.0000	3035.2000 (32d)
Internal TF Wall	68.4500	9.0000	616.0500 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982 (42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)											Total = Sum(45)m =	1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	23.7835	0.6800	0.7000	0.7700	52.0935	(80)

Solar gains	52.0935	90.5491	146.7062	215.9115	254.4951	279.3109	260.9848	228.8358	179.9437	113.3085	63.9852	43.0855	(83)
Total gains	470.0045	506.6636	551.2765	598.8169	616.5683	622.4703	593.0171	563.3481	525.4156	478.1977	452.3927	451.9291	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.9073	0.8704	0.7832	0.6492	0.4920	0.3253	0.2300	0.2544	0.4358	0.6796	0.8538	0.9199	(86)
MIT	20.4892	20.6125	20.7987	20.9287	20.9844	20.9985	20.9998	20.9997	20.9932	20.9260	20.7016	20.4399	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.8929	0.8519	0.7563	0.6145	0.4521	0.2834	0.1857	0.2078	0.3874	0.6381	0.8303	0.9069	(89)
MIT 2	19.6790	19.8255	20.0402	20.1804	20.2349	20.2465	20.2473	20.2473	20.2429	20.1812	19.9343	19.6198	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0660	20.2014	20.4025	20.5378	20.5929	20.6056	20.6067	20.6066	20.6013	20.5369	20.3008	20.0115	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0660	20.2014	20.4025	20.5378	20.5929	20.6056	20.6067	20.6066	20.6013	20.5369	20.3008	20.0115	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8891	0.8507	0.7620	0.6281	0.4705	0.3033	0.2068	0.2301	0.4103	0.6545	0.8320	0.9024	(94)
Useful gains	417.8877	431.0011	420.0844	376.1181	290.1150	188.8195	122.6533	129.6230	215.5592	312.9642	376.4086	407.8368	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	541.0846	524.8315	468.8937	393.1603	293.6284	189.1192	122.6844	129.6780	216.9544	330.1544	447.8414	542.6760	(97)
Space heating kWh	91.6585	63.0540	36.3141	12.2704	2.6140	0.0000	0.0000	0.0000	0.0000	12.7895	51.4316	100.3204	(98a)
Space heating requirement - total per year (kWh/year)												370.4525	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	91.6585	63.0540	36.3141	12.2704	2.6140	0.0000	0.0000	0.0000	0.0000	12.7895	51.4316	100.3204	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												370.4525	
Space heating per m2										(98c) / (4) =		8.5436	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	91.6585	63.0540	36.3141	12.2704	2.6140	0.0000	0.0000	0.0000	0.0000	12.7895	51.4316	100.3204	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	137.4878	94.5810	54.4711	18.4056	3.9210	0.0000	0.0000	0.0000	0.0000	19.1843	77.1474	150.4806	
Space heating requirement	137.4878	94.5810	54.4711	18.4056	3.9210	0.0000	0.0000	0.0000	0.0000	19.1843	77.1474	150.4806	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												555.6787	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												5.5568	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3977.0917	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	555.6787	6.5500	36.3970	(340a)
Space heating total			36.3970	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	28.4300	4.3373	(349)
Energy for lighting	124.6784	28.4300	35.4461	(350)
Additional standing charges			104.0000	(351)
Total energy cost			395.1172	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1023.2419	0.1580	23.4170	(367)
Electrical energy for heat distribution (space & water)	5.5568	0.0000	5.4960	(372)
Overall CO2 factor for heat network			0.0396	(386)
Total CO2 associated with community systems			152.0564	(373)
Space and water heating			152.0564	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Total CO2, kg/year			172.1676	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1023.2419	1.5850	234.8652	(467)
Electrical energy for heat distribution (space & water)	5.5568	0.0000	58.6972	(472)
Overall CO2 factor for heat network			0.4232	(486)
Total CO2 associated with community systems			1623.9554	(473)
Space and water heating			1623.9554	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Total Primary energy kWh/year			1838.2708	(483)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.35	**TER**	16.09
Environmental	99 A	**% DER < TER**			91.61
CO_2 Emissions (t/year)	0.04	**DFEE**	21.90	**TFEE**	32.86
Compliance Check	See BREL	**% DFEE < TFEE**			33.34
% DPER < TPER	71.80	**DPER**	24.49	**TPER**	86.87

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			7762.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							179.0141	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
12Total per year (kWh/year)												2188	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0601	78.6737	71.0601	73.4288	71.0601	73.4288	71.0601	71.0601	73.4288	71.0601	73.4288	71.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.2801	384.4058	369.8506	357.2179	340.9558	329.7655	318.6057	319.7771	328.5028	338.8880	357.8362	370.5488	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	19.6403	0.6800	0.7000	0.7700	43.0185	(80)

Solar gains	43.0185	84.1534	138.5886	202.1232	247.7096	253.5749	241.4136	207.3707	161.1843	99.8551	53.6391	35.3763	(83)
Total gains	420.2986	468.5592	508.4392	559.3412	588.6654	583.3403	560.0194	527.1478	489.6871	438.7430	411.4752	405.9252	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292

alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.9398	0.9028	0.8353	0.7026	0.5404	0.3821	0.2746	0.3048	0.4861	0.7494	0.8975	0.9479	(86)
MIT	20.3438	20.5137	20.7137	20.8948	20.9749	20.9964	20.9995	20.9991	20.9884	20.8785	20.5944	20.2962	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.9295	0.8876	0.8122	0.6690	0.5000	0.3378	0.2278	0.2552	0.4355	0.7111	0.8791	0.9387	(89)
MIT 2	19.5032	19.7088	19.9449	20.1459	20.2265	20.2451	20.2472	20.2470	20.2393	20.1338	19.8104	19.4449	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.9047	20.0932	20.3121	20.5036	20.5840	20.6039	20.6065	20.6062	20.5971	20.4895	20.1848	19.8515	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9047	20.0932	20.3121	20.5036	20.5840	20.6039	20.6065	20.6062	20.5971	20.4895	20.1848	19.8515	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9242	0.8842	0.8143	0.6807	0.5183	0.3588	0.2501	0.2789	0.4592	0.7239	0.8774	0.9332	(94)
Useful gains	388.4213	414.2950	414.0272	380.7485	305.0774	209.3208	140.0800	146.9996	224.8671	317.5946	361.0486	378.8125	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	545.9365	531.5426	483.2225	405.9587	310.8096	210.0504	140.1688	147.1562	227.3042	345.9883	457.7791	547.5744	(97)
Space heating kWh	117.1913	78.7904	51.4812	18.1513	4.2647	0.0000	0.0000	0.0000	0.0000	21.1249	69.6459	125.5588	(98a)
Space heating requirement - total per year (kWh/year)												486.2086	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	117.1913	78.7904	51.4812	18.1513	4.2647	0.0000	0.0000	0.0000	0.0000	21.1249	69.6459	125.5588	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												486.2086	
Space heating per m2											(98c) / (4) =	11.2133	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	117.1913	78.7904	51.4812	18.1513	4.2647	0.0000	0.0000	0.0000	0.0000	21.1249	69.6459	125.5588	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	175.7869	118.1856	77.2219	27.2270	6.3971	0.0000	0.0000	0.0000	0.0000	31.6873	104.4689	188.3383	
Space heating requirement	175.7869	118.1856	77.2219	27.2270	6.3971	0.0000	0.0000	0.0000	0.0000	31.6873	104.4689	188.3383	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												729.3129	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												7.2931	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3192.5049	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1069.5443	0.1575	30.6398	(367)
Electrical energy for heat distribution (space & water)	7.2931	0.0000	5.7669	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			159.5500	(373)
Space and water heating			159.5500	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			58.6170	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.3500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1069.5443	1.5832	307.9063	(467)
Electrical energy for heat distribution (space & water)	7.2931	0.0000	61.4362	(472)
Overall CO2 factor for heat network			0.4238	(486)
Total CO2 associated with community systems			1699.7356	(473)
Space and water heating			1699.7356	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	1.4901	-605.6307	
PV Unit electricity exported	-551.7766	0.4464	-246.3315	
Total			-851.9622	(480)
Total Primary energy kWh/year			1062.0888	(483)
Dwelling Primary energy Rate (DPER)			24.4900	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.6400	1.1450	7.6031			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.1800	1.7910			(29a)

Wall to Unheated Com	16.5900	1.8400	14.7500	0.1800	2.6550	(29a)
500mm mineral wool	43.3600		43.3600	0.1100	4.7696	(30)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.6587	(33)
Main dwelling						
Party Wall 1			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.0141 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	4.7800	0.0500	0.2390
E3 Sill	3.8800	0.0500	0.1940
E4 Jamb	17.9200	0.0500	0.8960
E7 Party floor between dwellings (in blocks of flats)	17.6700	0.0700	1.2369
E16 Corner (normal)	5.0000	0.0900	0.4500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.5900	0.0000	0.0000
E14 Flat roof	17.6700	0.0800	1.4136
P4 Party wall - Roof (insulation at ceiling level)	12.5900	0.1200	1.5108
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5403 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 25.1990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	46.0145	45.8869	45.7618	45.1741	45.0641	44.5523	44.5523	44.4575	44.7494	45.0641	45.2866	45.5191	(39)
Average = Sum(39)m / 12 =												45.1735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0612	1.0583	1.0554	1.0418	1.0393	1.0275	1.0275	1.0253	1.0320	1.0393	1.0444	1.0498	(40)
HLP (average)												1.0418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.0518	76.4502	69.0518	71.3535	69.0518	71.3535	69.0518	69.0518	71.3535	69.0518	71.3535	69.0518	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	368.9363	375.8469	361.5069	348.8073	332.6121	318.3548	307.2620	308.4334	317.0921	330.5443	349.4255	362.2051	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	19.6403	0.6300	0.7000	0.7700	39.8554	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	39.8554	77.9656	128.3983	187.2612	229.4957	234.9297	223.6626	192.1229	149.3325	92.5128	49.6950	32.7751	(83)
Total gains	408.7917	453.8125	489.9052	536.0685	562.1078	553.2845	530.9247	500.5563	466.4246	423.0570	399.1205	394.9803	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8575	46.9878	47.1163	47.7293	47.8457	48.3954	48.3954	48.4986	48.1822	47.8457	47.6107	47.3675	
alpha	4.1238	4.1325	4.1411	4.1820	4.1897	4.2264	4.2264	4.2332	4.2121	4.1897	4.1740	4.1578	
util living area	0.9639	0.9439	0.9057	0.8148	0.6747	0.4997	0.3658	0.4030	0.6174	0.8463	0.9397	0.9679	(86)
MIT	19.7811	19.9887	20.2832	20.6408	20.8696	20.9716	20.9939	20.9909	20.9319	20.6378	20.1682	19.7516	(87)
Th 2	20.0326	20.0351	20.0374	20.0486	20.0507	20.0605	20.0605	20.0623	20.0567	20.0507	20.0465	20.0420	(88)
util rest of house	0.9564	0.9327	0.8871	0.7810	0.6224	0.4319	0.2893	0.3234	0.5470	0.8100	0.9257	0.9612	(89)
MIT 2	18.6417	18.9012	19.2638	19.6921	19.9396	20.0424	20.0580	20.0583	20.0086	19.7012	19.1370	18.6117	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.1859	19.4206	19.7507	20.1452	20.3838	20.4862	20.5050	20.5038	20.4496	20.1486	19.6295	19.1561	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1859	19.4206	19.7507	20.1452	20.3838	20.4862	20.5050	20.5038	20.4496	20.1486	19.6295	19.1561	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9483	0.9242	0.8808	0.7847	0.6414	0.4631	0.3257	0.3612	0.5773	0.8141	0.9185	0.9535	(94)
Useful gains	387.6771	419.4251	431.4878	420.6633	360.5559	256.2432	172.9274	180.8171	269.2477	344.4106	366.5953	376.6321	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	684.9669	666.3041	606.3758	507.9927	391.3278	262.2440	173.9782	182.4424	284.1393	430.2985	567.4198	680.7898	(97)
Space heating kWh	221.1836	165.9027	130.1167	62.8771	22.8943	0.0000	0.0000	0.0000	0.0000	63.9006	144.5936	226.2934	(98a)
Space heating requirement - total per year (kWh/year)												1037.7620	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	221.1836	165.9027	130.1167	62.8771	22.8943	0.0000	0.0000	0.0000	0.0000	63.9006	144.5936	226.2934	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1037.7620	
Space heating per m2										(98c) / (4) =		23.9336	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	221.1836	165.9027	130.1167	62.8771	22.8943	0.0000	0.0000	0.0000	0.0000	63.9006	144.5936	226.2934	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	239.6355	179.7429	140.9715	68.1226	24.8042	0.0000	0.0000	0.0000	0.0000	69.2315	156.6561	245.1716	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.4803	84.1076	83.4287	82.2203	80.8865	79.8000	79.8000	79.8000	79.8000	82.2239	83.7773	84.5538	(217)
Fuel for water heating, kWh/month	217.1514	193.0952	207.4627	186.8313	185.2607	170.5061	169.2907	175.3325	176.4869	189.4704	195.8713	214.8307	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.3476	11.5102	10.3636	7.5928	5.8649	4.7917	5.3502	6.9544	9.0330	11.8518	13.3866	14.7464	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3196	-12.6515	-19.6021	-23.8221	-27.3050	-26.1047	-25.8068	-23.5584	-19.8837	-15.2375	-9.4737	-7.0906	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2617	-4.9168	-10.0734	-15.5779	-21.0367	-21.2830	-21.0140	-17.5742	-12.6116	-7.1556	-3.0599	-1.7757	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1124.3359	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2281.5901	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	115.7933	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3250.5231	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1124.3359	0.2100	236.1105	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2281.5901	0.2100	479.1339	(264)
Space and water heating			715.2444	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	115.7933	0.1443	16.7126	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	0.1330	-29.1103	
PV Unit electricity exported	-138.3404	0.1251	-17.3028	
Total			-46.4132	(269)
Total CO2, kg/year			697.4731	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.0900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1124.3359	1.1300	1270.4995	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2281.5901	1.1300	2578.1968	(278)
Space and water heating			3848.6963	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	115.7933	1.5338	177.6076	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	1.4915	-326.4228	
PV Unit electricity exported	-138.3404	0.4591	-63.5081	
Total			-389.9309	(283)
Total Primary energy kWh/year			3766.4739	(286)
Target Primary Energy Rate (TPER)			86.8700	(287)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.35	**TER**	16.09
Environmental	99 A	**% DER < TER**			91.61
CO_2 Emissions (t/year)	0.04	**DFEE**	21.90	**TFEE**	32.86
Compliance Check	See BREL	**% DFEE < TFEE**			33.34
% DPER < TPER	71.80	**DPER**	24.49	**TPER**	86.87

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		2 * 10 =	20.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		20.0000 / (5) =	0.1883 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			3.0000 (17)
Infiltration rate			0.3383 (18)
Number of sides sheltered			3 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2622 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		7762.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							179.0141	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		17.4572	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	36.9438	36.8677	36.7932	36.4431	36.3776	36.0727	36.0727	36.0162	36.1901	36.3776	36.5101	36.6486	(39)
Average = Sum(39)m / 12 =												36.4428	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8520	0.8503	0.8486	0.8405	0.8390	0.8319	0.8319	0.8306	0.8346	0.8390	0.8420	0.8452	(40)
HLP (average)												0.8405	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												449.4572	(64a)
Heat gains from water heating, kWh/month	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0601	78.6737	71.0601	73.4288	71.0601	73.4288	71.0601	71.0601	73.4288	71.0601	73.4288	71.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.0895	291.1341	278.7010	271.1858	257.9340	249.9230	240.9368	240.6593	247.6349	254.4733	268.5369	277.0546	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	19.6403	0.6800	0.7000	0.7700	43.0185	(80)

Solar gains	43.0185	84.1534	138.5886	202.1232	247.7096	253.5749	241.4136	207.3707	161.1843	99.8551	53.6391	35.3763	(83)
Total gains	326.1080	375.2875	417.2896	473.3090	505.6436	503.4979	482.3504	448.0301	408.8192	354.3283	322.1760	312.4309	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.3623	58.4827	58.6012	59.1642	59.2707	59.7717	59.7717	59.8654	59.5777	59.2707	59.0556	58.8323	
alpha	4.8908	4.8988	4.9067	4.9443	4.9514	4.9848	4.9848	4.9910	4.9718	4.9514	4.9370	4.9222	
util living area	0.9786	0.9583	0.9148	0.8010	0.6358	0.4534	0.3282	0.3682	0.5892	0.8580	0.9585	0.9822	(86)
MIT	19.9792	20.1978	20.4793	20.7875	20.9421	20.9911	20.9986	20.9975	20.9696	20.7444	20.3172	19.9396	(87)
Th 2	20.2085	20.2100	20.2115	20.2184	20.2197	20.2257	20.2257	20.2269	20.2234	20.2197	20.2171	20.2143	(88)
util rest of house	0.9742	0.9501	0.8989	0.7699	0.5907	0.4004	0.2709	0.3070	0.5299	0.8267	0.9489	0.9785	(89)

MIT 2	19.2829	19.4971	19.7676	20.0531	20.1810	20.2212	20.2253	20.2259	20.2063	20.0237	19.6219	19.2488	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.6155	19.8318	20.1075	20.4039	20.5445	20.5889	20.5946	20.5945	20.5709	20.3679	19.9540	19.5788	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6155	19.8318	20.1075	20.4039	20.5445	20.5889	20.5946	20.5945	20.5709	20.3679	19.9540	19.5788	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9702	0.9456	0.8966	0.7776	0.6098	0.4254	0.2982	0.3362	0.5569	0.8331	0.9452	0.9748	(94)
Useful gains	316.3988	354.8752	374.1523	368.0670	308.3573	214.2081	143.8510	150.6270	227.6810	295.2080	304.5131	304.5609	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	565.8119	550.5012	500.6651	419.2363	321.7425	216.0367	144.0961	151.0683	234.1815	355.3338	469.3010	563.6107	(97)
Space heating kWh	185.5633	131.4607	94.1255	36.8419	9.9586	0.0000	0.0000	0.0000	0.0000	44.7336	118.6473	192.7331	(98a)
Space heating requirement - total per year (kWh/year)												814.0640	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	185.5633	131.4607	94.1255	36.8419	9.9586	0.0000	0.0000	0.0000	0.0000	44.7336	118.6473	192.7331	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												814.0640	
Space heating per m2											(98c) / (4) =	18.7745	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	339.0831	266.9377	273.7231	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9659	0.9843	0.9766	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	327.5254	262.7454	267.3261	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	559.8297	536.6719	497.9536	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	167.2592	203.8013	171.5869	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	41.8148	50.9503	42.8967	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												135.6618	(107)
Energy for space heating												18.7745	(99)
Energy for space cooling												3.1287	(108)
Total												21.9033	(109)
Fabric Energy Efficiency (DFEE)												21.9	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.6400	1.1450	7.6031			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.1800	1.7910			(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.1800	2.6550			(29a)
500mm mineral wool	43.3600		43.3600	0.1100	4.7696			(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.6587			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.0141 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	4.7800	0.0500	0.2390
E3 Sill	3.8800	0.0500	0.1940
E4 Jamb	17.9200	0.0500	0.8960
E7 Party floor between dwellings (in blocks of flats)	17.6700	0.0700	1.2369
E16 Corner (normal)	5.0000	0.0900	0.4500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.5900	0.0000	0.0000
E14 Flat roof	17.6700	0.0800	1.4136
P4 Party wall - Roof (insulation at ceiling level)	12.5900	0.1200	1.5108
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5403 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.1990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	46.0145	45.8869	45.7618	45.1741	45.0641	44.5523	44.5523	44.4575	44.7494	45.0641	45.2866	45.5191	(39)
Average = Sum(39)m / 12 =												45.1735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0612	1.0583	1.0554	1.0418	1.0393	1.0275	1.0275	1.0253	1.0320	1.0393	1.0444	1.0498	(40)
HLP (average)												1.0418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)													
	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							449.4572	(64a)
Heat gains from water heating, kWh/month													
	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	69.0518	76.4502	69.0518	71.3535	69.0518	71.3535	69.0518	69.0518	71.3535	69.0518	71.3535	69.0518	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains													
	281.0812	288.9106	276.6927	269.1105	255.9256	247.8477	238.9285	238.6510	245.5596	252.4649	266.4616	275.0462	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	19.6403	0.6300	0.7000	0.7700	39.8554	(80)

Solar gains	39.8554	77.9656	128.3983	187.2612	229.4957	234.9297	223.6626	192.1229	149.3325	92.5128	49.6950	32.7751	(83)
Total gains	320.9366	366.8763	405.0910	456.3717	485.4213	482.7774	462.5911	430.7739	394.8921	344.9777	316.1566	307.8214	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8575	46.9878	47.1163	47.7293	47.8457	48.3954	48.3954	48.4986	48.1822	47.8457	47.6107	47.3675	
alpha	4.1238	4.1325	4.1411	4.1820	4.1897	4.2264	4.2264	4.2332	4.2121	4.1897	4.1740	4.1578	
util living area													
	0.9839	0.9713	0.9452	0.8722	0.7439	0.5627	0.4172	0.4639	0.6982	0.9082	0.9711	0.9863	(86)
MIT	19.5262	19.7540	20.0850	20.5141	20.8102	20.9558	20.9900	20.9846	20.8916	20.4915	19.9459	19.4946	(87)
Th 2	20.0326	20.0351	20.0374	20.0486	20.0507	20.0605	20.0605	20.0623	20.0567	20.0507	20.0465	20.0420	(88)
util rest of house													
	0.9803	0.9649	0.9328	0.8446	0.6934	0.4897	0.3311	0.3741	0.6269	0.8818	0.9635	0.9832	(89)
MIT 2	18.7000	18.9257	19.2497	19.6620	19.9208	20.0380	20.0572	20.0569	19.9944	19.6525	19.1257	18.6759	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.0946	19.3213	19.6487	20.0690	20.3456	20.4764	20.5028	20.5000	20.4229	20.0532	19.5174	19.0669	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0946	19.3213	19.6487	20.0690	20.3456	20.4764	20.5028	20.5000	20.4229	20.0532	19.5174	19.0669	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9757	0.9591	0.9270	0.8452	0.7100	0.5228	0.3721	0.4167	0.6560	0.8819	0.9583	0.9790	(94)
Useful gains	313.1370	351.8664	375.5045	385.7415	344.6275	252.3984	172.1308	179.4860	259.0434	304.2354	302.9775	301.3667	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	680.7677	661.7509	601.7063	504.5490	389.6051	261.8051	173.8771	182.2749	282.9482	426.0007	562.3435	676.7286	(97)
Space heating kWh													
	273.5173	208.2424	168.2941	85.5414	33.4633	0.0000	0.0000	0.0000	0.0000	90.5934	186.7436	279.2692	(98a)
Space heating requirement - total per year (kWh/year)												1325.6646	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	273.5173	208.2424	168.2941	85.5414	33.4633	0.0000	0.0000	0.0000	0.0000	90.5934	186.7436	279.2692	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1325.6646	
Space heating per m2											(98c) / (4) =	30.5734	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	418.7912	329.6867	337.8767	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8946	0.9397	0.9203	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	374.6578	309.8225	310.9425	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	537.8609	515.7341	479.8847	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	117.5062	153.1982	125.6930	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	29.3766	38.2996	31.4232	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												99.0993	(107)
Energy for space heating												30.5734	(99)
Energy for space cooling												2.2855	(108)
Total												32.8589	(109)
Fabric Energy Efficiency (TFEE)												32.9	(109)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.35	**TER**	16.09
Environmental	99 A	**% DER < TER**			91.61
CO_2 Emissions (t/year)	0.04	**DFEE**	21.90	**TFEE**	32.86
Compliance Check	See BREL	**% DFEE < TFEE**			33.34
% DPER < TPER	71.80	**DPER**	24.49	**TPER**	86.87

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			7762.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							179.0141	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
12Total per year (kWh/year)												2188	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0601	78.6737	71.0601	73.4288	71.0601	73.4288	71.0601	71.0601	73.4288	71.0601	73.4288	71.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.2801	384.4058	369.8506	357.2179	340.9558	329.7655	318.6057	319.7771	328.5028	338.8880	357.8362	370.5488	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	19.6403	0.6800	0.7000	0.7700	43.0185	(80)

Solar gains	43.0185	84.1534	138.5886	202.1232	247.7096	253.5749	241.4136	207.3707	161.1843	99.8551	53.6391	35.3763	(83)
Total gains	420.2986	468.5592	508.4392	559.3412	588.6654	583.3403	560.0194	527.1478	489.6871	438.7430	411.4752	405.9252	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292

alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.9398	0.9028	0.8353	0.7026	0.5404	0.3821	0.2746	0.3048	0.4861	0.7494	0.8975	0.9479	(86)
MIT	20.3438	20.5137	20.7137	20.8948	20.9749	20.9964	20.9995	20.9991	20.9884	20.8785	20.5944	20.2962	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.9295	0.8876	0.8122	0.6690	0.5000	0.3378	0.2278	0.2552	0.4355	0.7111	0.8791	0.9387	(89)
MIT 2	19.5032	19.7088	19.9449	20.1459	20.2265	20.2451	20.2472	20.2470	20.2393	20.1338	19.8104	19.4449	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.9047	20.0932	20.3121	20.5036	20.5840	20.6039	20.6065	20.6062	20.5971	20.4895	20.1848	19.8515	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9047	20.0932	20.3121	20.5036	20.5840	20.6039	20.6065	20.6062	20.5971	20.4895	20.1848	19.8515	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9242	0.8842	0.8143	0.6807	0.5183	0.3588	0.2501	0.2789	0.4592	0.7239	0.8774	0.9332	(94)
Useful gains	388.4213	414.2950	414.0272	380.7485	305.0774	209.3208	140.0800	146.9996	224.8671	317.5946	361.0486	378.8125	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	545.9365	531.5426	483.2225	405.9587	310.8096	210.0504	140.1688	147.1562	227.3042	345.9883	457.7791	547.5744	(97)
Space heating kWh	117.1913	78.7904	51.4812	18.1513	4.2647	0.0000	0.0000	0.0000	0.0000	21.1249	69.6459	125.5588	(98a)
Space heating requirement - total per year (kWh/year)												486.2086	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	117.1913	78.7904	51.4812	18.1513	4.2647	0.0000	0.0000	0.0000	0.0000	21.1249	69.6459	125.5588	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												486.2086	
Space heating per m2											(98c) / (4) =	11.2133	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	117.1913	78.7904	51.4812	18.1513	4.2647	0.0000	0.0000	0.0000	0.0000	21.1249	69.6459	125.5588	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	175.7869	118.1856	77.2219	27.2270	6.3971	0.0000	0.0000	0.0000	0.0000	31.6873	104.4689	188.3383	
Space heating requirement	175.7869	118.1856	77.2219	27.2270	6.3971	0.0000	0.0000	0.0000	0.0000	31.6873	104.4689	188.3383	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												729.3129	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												7.2931	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3192.5049	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1069.5443	0.1575	30.6398	(367)
Electrical energy for heat distribution (space & water)	7.2931	0.0000	5.7669	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			159.5500	(373)
Space and water heating			159.5500	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			58.6170	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.3500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1069.5443	1.5832	307.9063	(467)
Electrical energy for heat distribution (space & water)	7.2931	0.0000	61.4362	(472)
Overall CO2 factor for heat network			0.4238	(486)
Total CO2 associated with community systems			1699.7356	(473)
Space and water heating			1699.7356	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	1.4901	-605.6307	
PV Unit electricity exported	-551.7766	0.4464	-246.3315	
Total			-851.9622	(480)
Total Primary energy kWh/year			1062.0888	(483)
Dwelling Primary energy Rate (DPER)			24.4900	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.6400	1.1450	7.6031			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.1800	1.7910			(29a)

Wall to Unheated Com	16.5900	1.8400	14.7500	0.1800	2.6550	(29a)
500mm mineral wool	43.3600		43.3600	0.1100	4.7696	(30)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.6587	(33)
Main dwelling						
Party Wall 1			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.0141 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	4.7800	0.0500	0.2390
E3 Sill	3.8800	0.0500	0.1940
E4 Jamb	17.9200	0.0500	0.8960
E7 Party floor between dwellings (in blocks of flats)	17.6700	0.0700	1.2369
E16 Corner (normal)	5.0000	0.0900	0.4500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.5900	0.0000	0.0000
E14 Flat roof	17.6700	0.0800	1.4136
P4 Party wall - Roof (insulation at ceiling level)	12.5900	0.1200	1.5108
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5403 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 25.1990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	46.0145	45.8869	45.7618	45.1741	45.0641	44.5523	44.5523	44.4575	44.7494	45.0641	45.2866	45.5191	(39)
Average = Sum(39)m / 12 =												45.1735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0612	1.0583	1.0554	1.0418	1.0393	1.0275	1.0275	1.0253	1.0320	1.0393	1.0444	1.0498	(40)
HLP (average)												1.0418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.0518	76.4502	69.0518	71.3535	69.0518	71.3535	69.0518	69.0518	71.3535	69.0518	71.3535	69.0518	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	368.9363	375.8469	361.5069	348.8073	332.6121	318.3548	307.2620	308.4334	317.0921	330.5443	349.4255	362.2051	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	19.6403	0.6300	0.7000	0.7700	39.8554	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	39.8554	77.9656	128.3983	187.2612	229.4957	234.9297	223.6626	192.1229	149.3325	92.5128	49.6950	32.7751	(83)
Total gains	408.7917	453.8125	489.9052	536.0685	562.1078	553.2845	530.9247	500.5563	466.4246	423.0570	399.1205	394.9803	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8575	46.9878	47.1163	47.7293	47.8457	48.3954	48.3954	48.4986	48.1822	47.8457	47.6107	47.3675	
alpha	4.1238	4.1325	4.1411	4.1820	4.1897	4.2264	4.2264	4.2332	4.2121	4.1897	4.1740	4.1578	
util living area	0.9639	0.9439	0.9057	0.8148	0.6747	0.4997	0.3658	0.4030	0.6174	0.8463	0.9397	0.9679	(86)
MIT	19.7811	19.9887	20.2832	20.6408	20.8696	20.9716	20.9939	20.9909	20.9319	20.6378	20.1682	19.7516	(87)
Th 2	20.0326	20.0351	20.0374	20.0486	20.0507	20.0605	20.0605	20.0623	20.0567	20.0507	20.0465	20.0420	(88)
util rest of house	0.9564	0.9327	0.8871	0.7810	0.6224	0.4319	0.2893	0.3234	0.5470	0.8100	0.9257	0.9612	(89)
MIT 2	18.6417	18.9012	19.2638	19.6921	19.9396	20.0424	20.0580	20.0583	20.0086	19.7012	19.1370	18.6117	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.1859	19.4206	19.7507	20.1452	20.3838	20.4862	20.5050	20.5038	20.4496	20.1486	19.6295	19.1561	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1859	19.4206	19.7507	20.1452	20.3838	20.4862	20.5050	20.5038	20.4496	20.1486	19.6295	19.1561	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9483	0.9242	0.8808	0.7847	0.6414	0.4631	0.3257	0.3612	0.5773	0.8141	0.9185	0.9535	(94)
Useful gains	387.6771	419.4251	431.4878	420.6633	360.5559	256.2432	172.9274	180.8171	269.2477	344.4106	366.5953	376.6321	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	684.9669	666.3041	606.3758	507.9927	391.3278	262.2440	173.9782	182.4424	284.1393	430.2985	567.4198	680.7898	(97)
Space heating kWh	221.1836	165.9027	130.1167	62.8771	22.8943	0.0000	0.0000	0.0000	0.0000	63.9006	144.5936	226.2934	(98a)
Space heating requirement - total per year (kWh/year)												1037.7620	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	221.1836	165.9027	130.1167	62.8771	22.8943	0.0000	0.0000	0.0000	0.0000	63.9006	144.5936	226.2934	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1037.7620	
Space heating per m2										(98c) / (4) =		23.9336	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	221.1836	165.9027	130.1167	62.8771	22.8943	0.0000	0.0000	0.0000	0.0000	63.9006	144.5936	226.2934	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	239.6355	179.7429	140.9715	68.1226	24.8042	0.0000	0.0000	0.0000	0.0000	69.2315	156.6561	245.1716	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.4803	84.1076	83.4287	82.2203	80.8865	79.8000	79.8000	79.8000	79.8000	82.2239	83.7773	84.5538	(217)
Fuel for water heating, kWh/month	217.1514	193.0952	207.4627	186.8313	185.2607	170.5061	169.2907	175.3325	176.4869	189.4704	195.8713	214.8307	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.3476	11.5102	10.3636	7.5928	5.8649	4.7917	5.3502	6.9544	9.0330	11.8518	13.3866	14.7464	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3196	-12.6515	-19.6021	-23.8221	-27.3050	-26.1047	-25.8068	-23.5584	-19.8837	-15.2375	-9.4737	-7.0906	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2617	-4.9168	-10.0734	-15.5779	-21.0367	-21.2830	-21.0140	-17.5742	-12.6116	-7.1556	-3.0599	-1.7757	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1124.3359	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2281.5901	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	115.7933	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3250.5231	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1124.3359	0.2100	236.1105	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2281.5901	0.2100	479.1339	(264)
Space and water heating			715.2444	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	115.7933	0.1443	16.7126	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	0.1330	-29.1103	
PV Unit electricity exported	-138.3404	0.1251	-17.3028	
Total			-46.4132	(269)
Total CO2, kg/year			697.4731	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.0900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1124.3359	1.1300	1270.4995	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2281.5901	1.1300	2578.1968	(278)
Space and water heating			3848.6963	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	115.7933	1.5338	177.6076	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	1.4915	-326.4228	
PV Unit electricity exported	-138.3404	0.4591	-63.5081	
Total			-389.9309	(283)
Total Primary energy kWh/year			3766.4739	(286)
Target Primary Energy Rate (TPER)			86.8700	(287)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.35	**TER**	16.09
Environmental	99 A	**% DER < TER**			91.61
CO_2 Emissions (t/year)	0.04	**DFEE**	21.90	**TFEE**	32.86
Compliance Check	See BREL	**% DFEE < TFEE**			33.34
% DPER < TPER	71.80	**DPER**	24.49	**TPER**	86.87

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross (m2)	Openings (m2)	NetArea (m2)	U-value (W/m2K)	A x U (W/K)	K-value (kJ/m2K)	A x K (kJ/K)	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	19.6403	0.6800	0.7000	0.7700	43.0185	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	43.0185	84.1534	138.5886	202.1232	247.7096	253.5749	241.4136	207.3707	161.1843	99.8551	53.6391	35.3763	(83)
Total gains	460.9295	500.2679	543.1589	585.0287	609.7829	596.7343	573.4459	541.8830	506.6562	464.7443	442.0465	444.2200	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086

util living area													
	0.9178	0.8816	0.8065	0.6791	0.5233	0.3736	0.2682	0.2966	0.4707	0.7201	0.8735	0.9287	(86)
MIT	20.4411	20.5762	20.7599	20.9098	20.9783	20.9967	20.9995	20.9992	20.9900	20.8989	20.6526	20.3925	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house													
	0.9048	0.8644	0.7816	0.6454	0.4837	0.3303	0.2224	0.2482	0.4214	0.6810	0.8525	0.9170	(89)
MIT 2	19.6207	19.7824	19.9963	20.1610	20.2294	20.2453	20.2472	20.2470	20.2404	20.1539	19.8775	19.5620	(90)
Living area fraction											fLA = Living area / (4) =	0.4776	(91)
MIT	20.0125	20.1616	20.3610	20.5186	20.5871	20.6042	20.6065	20.6063	20.5984	20.5097	20.2477	19.9586	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0125	20.1616	20.3610	20.5186	20.5871	20.6042	20.6065	20.6063	20.5984	20.5097	20.2477	19.9586	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9004	0.8623	0.7855	0.6578	0.5017	0.3509	0.2443	0.2713	0.4446	0.6951	0.8525	0.9121	(94)
Useful gains	414.9991	431.3661	426.6509	384.8327	305.9559	209.4025	140.0909	147.0215	225.2448	323.0388	376.8273	405.1517	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	549.7096	533.9329	484.9335	406.4836	310.9181	210.0605	140.1702	147.1590	227.3508	346.6970	459.9785	551.3236	(97)
Space heating kWh													
	100.2246	68.9249	43.3623	15.5886	3.6919	0.0000	0.0000	0.0000	0.0000	17.6016	59.8688	108.7519	(98a)
Space heating requirement - total per year (kWh/year)												418.0146	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	100.2246	68.9249	43.3623	15.5886	3.6919	0.0000	0.0000	0.0000	0.0000	17.6016	59.8688	108.7519	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												418.0146	
Space heating per m2											(98c) / (4) =	9.6406	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	100.2246	68.9249	43.3623	15.5886	3.6919	0.0000	0.0000	0.0000	0.0000	17.6016	59.8688	108.7519	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	150.3369	103.3873	65.0434	23.3829	5.5379	0.0000	0.0000	0.0000	0.0000	26.4025	89.8032	163.1279	
Space heating requirement													
	150.3369	103.3873	65.0434	23.3829	5.5379	0.0000	0.0000	0.0000	0.0000	26.4025	89.8032	163.1279	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												627.0220	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												6.2702	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3090.2140	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	627.0220	4.4400	27.8398	(340a)
Space heating total			27.8398	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	16.4900	2.5157	(349)
Energy for lighting	124.6784	16.4900	20.5595	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	16.4900	-67.0227	
PV Unit electricity exported	-551.7766	5.5900	-30.8443	
Total			-97.8670	(352)
Total energy cost			190.7457	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7771 (357)
SAP value		87.4025
SAP rating (Section 12)		87 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1042.2668	0.1576	26.3504	(367)
Electrical energy for heat distribution (space & water)	6.2702	0.0000	5.6060	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			155.0998	(373)
Space and water heating			155.0998	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			54.1668	(383)
CO2 emissions per m2			1.2500	(384)
EI value			99.1785	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume						106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)

Adj infilt rate

	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	23.7835	0.6800	0.7000	0.7700	52.0935	(80)

Solar gains	52.0935	90.5491	146.7062	215.9115	254.4951	279.3109	260.9848	228.8358	179.9437	113.3085	63.9852	43.0855	(83)
Total gains	470.0045	506.6636	551.2765	598.8169	616.5683	622.4703	593.0171	563.3481	525.4156	478.1977	452.3927	451.9291	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.9073	0.8704	0.7832	0.6492	0.4920	0.3253	0.2300	0.2544	0.4358	0.6796	0.8538	0.9199	(86)
MIT	20.4892	20.6125	20.7987	20.9287	20.9844	20.9985	20.9998	20.9997	20.9932	20.9260	20.7016	20.4399	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.8929	0.8519	0.7563	0.6145	0.4521	0.2834	0.1857	0.2078	0.3874	0.6381	0.8303	0.9069	(89)
MIT 2	19.6790	19.8255	20.0402	20.1804	20.2349	20.2465	20.2473	20.2473	20.2429	20.1812	19.9343	19.6198	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.0660	20.2014	20.4025	20.5378	20.5929	20.6056	20.6067	20.6066	20.6013	20.5369	20.3008	20.0115	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0660	20.2014	20.4025	20.5378	20.5929	20.6056	20.6067	20.6066	20.6013	20.5369	20.3008	20.0115	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8891	0.8507	0.7620	0.6281	0.4705	0.3033	0.2068	0.2301	0.4103	0.6545	0.8320	0.9024	(94)
Useful gains	417.8877	431.0011	420.0844	376.1181	290.1150	188.8195	122.6533	129.6230	215.5592	312.9642	376.4086	407.8368	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	541.0846	524.8315	468.8937	393.1603	293.6284	189.1192	122.6844	129.6780	216.9544	330.1544	447.8414	542.6760	(97)
Space heating kWh	91.6585	63.0540	36.3141	12.2704	2.6140	0.0000	0.0000	0.0000	0.0000	12.7895	51.4316	100.3204	(98a)
Space heating requirement - total per year (kWh/year)												370.4525	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	91.6585	63.0540	36.3141	12.2704	2.6140	0.0000	0.0000	0.0000	0.0000	12.7895	51.4316	100.3204	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												370.4525	
Space heating per m2										(98c) / (4) =		8.5436	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	91.6585	63.0540	36.3141	12.2704	2.6140	0.0000	0.0000	0.0000	0.0000	12.7895	51.4316	100.3204	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	137.4878	94.5810	54.4711	18.4056	3.9210	0.0000	0.0000	0.0000	0.0000	19.1843	77.1474	150.4806	
Space heating requirement													
	137.4878	94.5810	54.4711	18.4056	3.9210	0.0000	0.0000	0.0000	0.0000	19.1843	77.1474	150.4806	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5669	-24.0727	-38.8745	-48.0493	-52.9789	-51.6524	-50.3986	-46.8694	-39.7890	-30.3128	-18.7591	-13.8902	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4316	-15.8925	-38.3705	-69.5238	-96.2615	-109.4663	-104.0915	-84.3722	-54.5598	-26.6835	-10.2713	-5.6085	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	555.6787	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	5.5568	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)		
mechanical ventilation fans (SFP = 0.1177)	15.2561	(330a)
Total electricity for the above, kWh/year	15.2561	(331)
Electricity for lighting (calculated in Appendix L)	124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2922.3447	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	555.6787	6.5500	36.3970	(340a)
Space heating total			36.3970	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	28.4300	4.3373	(349)
Energy for lighting	124.6784	28.4300	35.4461	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	28.4300	-122.8784	
PV Unit electricity exported	-622.5330	5.8100	-36.1692	
Total			-159.0476	(352)
Total energy cost			236.0696	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1023.2419	0.1580	23.4170	(367)
Electrical energy for heat distribution (space & water)	5.5568	0.0000	5.4960	(372)
Overall CO2 factor for heat network			0.0396	(386)
Total CO2 associated with community systems			152.0564	(373)
Space and water heating			152.0564	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	0.1330	-57.4796	
PV Unit electricity exported	-622.5330	0.1218	-75.7970	
Total			-133.2765	(380)
Total CO2, kg/year			38.8911	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1023.2419	1.5850	234.8652	(467)
Electrical energy for heat distribution (space & water)	5.5568	0.0000	58.6972	(472)
Overall CO2 factor for heat network			0.4232	(486)
Total CO2 associated with community systems			1623.9554	(473)
Space and water heating			1623.9554	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	1.4914	-644.6094	
PV Unit electricity exported	-622.5330	0.4467	-278.0656	
Total			-922.6749	(480)
Total Primary energy kWh/year			915.5959	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Be Green

Current energy efficiency rating:	B 87
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 87
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£40	£40	£0
Community scheme	£355	£355	£0
Space heating	£145	£145	£0
Water heating	£215	£215	£0
Lighting	£35	£35	£0
Generated (PV)	-£159	-£159	£0
Total cost of fuels	£236	£236	£0
Total cost of uses	£236	£236	£0
Delivered energy	67 kWh/m²	67 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.0 tonnes	0.0 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	21 kWh/m²	21 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)

Total net area of external elements Aum(A, m2)	76.5400				(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	15.1610			(33)
Main dwelling					
Party Wall 1	31.3600	0.0000	0.0000	70.0000	2195.2000 (32)
Party Floor 1	43.3600			70.0000	3035.2000 (32d)
Internal TF Wall	68.4500			9.0000	616.0500 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	19.6403	0.6800	0.7000	0.7700	43.0185	(80)

Solar gains	43.0185	84.1534	138.5886	202.1232	247.7096	253.5749	241.4136	207.3707	161.1843	99.8551	53.6391	35.3763	(83)
Total gains	460.9295	500.2679	543.1589	585.0287	609.7829	596.7343	573.4459	541.8830	506.6562	464.7443	442.0465	444.2200	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.9178	0.8816	0.8065	0.6791	0.5233	0.3736	0.2682	0.2966	0.4707	0.7201	0.8735	0.9287	(86)
MIT	20.4411	20.5762	20.7599	20.9098	20.9783	20.9967	20.9995	20.9992	20.9900	20.8989	20.6526	20.3925	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.9048	0.8644	0.7816	0.6454	0.4837	0.3303	0.2224	0.2482	0.4214	0.6810	0.8525	0.9170	(89)
MIT 2	19.6207	19.7824	19.9963	20.1610	20.2294	20.2453	20.2472	20.2470	20.2404	20.1539	19.8775	19.5620	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0125	20.1616	20.3610	20.5186	20.5871	20.6042	20.6065	20.6063	20.5984	20.5097	20.2477	19.9586	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0125	20.1616	20.3610	20.5186	20.5871	20.6042	20.6065	20.6063	20.5984	20.5097	20.2477	19.9586	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9004	0.8623	0.7855	0.6578	0.5017	0.3509	0.2443	0.2713	0.4446	0.6951	0.8525	0.9121	(94)
Useful gains	414.9991	431.3661	426.6509	384.8327	305.9559	209.4025	140.0909	147.0215	225.2448	323.0388	376.8273	405.1517	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	549.7096	533.9329	484.9335	406.4836	310.9181	210.0605	140.1702	147.1590	227.3508	346.6970	459.9785	551.3236	(97)
Space heating kWh	100.2246	68.9249	43.3623	15.5886	3.6919	0.0000	0.0000	0.0000	0.0000	17.6016	59.8688	108.7519	(98a)
Space heating requirement - total per year (kWh/year)												418.0146	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	100.2246	68.9249	43.3623	15.5886	3.6919	0.0000	0.0000	0.0000	0.0000	17.6016	59.8688	108.7519	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												418.0146	
Space heating per m2											(98c) / (4) =	9.6406	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	100.2246	68.9249	43.3623	15.5886	3.6919	0.0000	0.0000	0.0000	0.0000	17.6016	59.8688	108.7519	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	150.3369	103.3873	65.0434	23.3829	5.5379	0.0000	0.0000	0.0000	0.0000	26.4025	89.8032	163.1279	
Space heating requirement													
	150.3369	103.3873	65.0434	23.3829	5.5379	0.0000	0.0000	0.0000	0.0000	26.4025	89.8032	163.1279	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												627.0220	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												6.2702	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)

Appendix Q - special features

Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3090.2140	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	627.0220	4.4400	27.8398	(340a)
Space heating total			27.8398	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	16.4900	2.5157	(349)
Energy for lighting	124.6784	16.4900	20.5595	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	16.4900	-67.0227	
PV Unit electricity exported	-551.7766	5.5900	-30.8443	
Total			-97.8670	(352)
Total energy cost			190.7457	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7771	(357)
SAP value		87.4025	
SAP rating (Section 12)		87	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1042.2668	0.1576	26.3504	(367)
Electrical energy for heat distribution (space & water)	6.2702	0.0000	5.6060	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			155.0998	(373)
Space and water heating			155.0998	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			54.1668	(383)
CO2 emissions per m2			1.2500	(384)
EI value			99.1785	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

Measured/design AP50												3.0000	(17)
Infiltration rate												0.1500	(18)
Number of sides sheltered												3	(19)
Shelter factor								(20) = 1 - [0.075 x (19)] =				0.7750	(20)
Infiltration rate adjusted to include shelter factor								(21) = (18) x (20) =				0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)

Water heating gains (Table 5)

	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)

Total internal gains

	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	23.7835	0.6800	0.7000	0.7700	52.0935	(80)

Solar gains	52.0935	90.5491	146.7062	215.9115	254.4951	279.3109	260.9848	228.8358	179.9437	113.3085	63.9852	43.0855	(83)
Total gains	470.0045	506.6636	551.2765	598.8169	616.5683	622.4703	593.0171	563.3481	525.4156	478.1977	452.3927	451.9291	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.9073	0.8704	0.7832	0.6492	0.4920	0.3253	0.2300	0.2544	0.4358	0.6796	0.8538	0.9199	(86)
MIT	20.4892	20.6125	20.7987	20.9287	20.9844	20.9985	20.9998	20.9997	20.9932	20.9260	20.7016	20.4399	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.8929	0.8519	0.7563	0.6145	0.4521	0.2834	0.1857	0.2078	0.3874	0.6381	0.8303	0.9069	(89)
MIT 2	19.6790	19.8255	20.0402	20.1804	20.2349	20.2465	20.2473	20.2473	20.2429	20.1812	19.9343	19.6198	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.0660	20.2014	20.4025	20.5378	20.5929	20.6056	20.6067	20.6066	20.6013	20.5369	20.3008	20.0115	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0660	20.2014	20.4025	20.5378	20.5929	20.6056	20.6067	20.6066	20.6013	20.5369	20.3008	20.0115	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8891	0.8507	0.7620	0.6281	0.4705	0.3033	0.2068	0.2301	0.4103	0.6545	0.8320	0.9024	(94)
Useful gains	417.8877	431.0011	420.0844	376.1181	290.1150	188.8195	122.6533	129.6230	215.5592	312.9642	376.4086	407.8368	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	541.0846	524.8315	468.8937	393.1603	293.6284	189.1192	122.6844	129.6780	216.9544	330.1544	447.8414	542.6760	(97)
Space heating kWh	91.6585	63.0540	36.3141	12.2704	2.6140	0.0000	0.0000	0.0000	0.0000	12.7895	51.4316	100.3204	(98a)
Space heating requirement - total per year (kWh/year)												370.4525	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	91.6585	63.0540	36.3141	12.2704	2.6140	0.0000	0.0000	0.0000	0.0000	12.7895	51.4316	100.3204	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												370.4525	
Space heating per m2										(98c) / (4) =		8.5436	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement

	91.6585	63.0540	36.3141	12.2704	2.6140	0.0000	0.0000	0.0000	0.0000	12.7895	51.4316	100.3204	(98)

Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50

307a	137.4878	94.5810	54.4711	18.4056	3.9210	0.0000	0.0000	0.0000	0.0000	19.1843	77.1474	150.4806	

Space heating requirement

	137.4878	94.5810	54.4711	18.4056	3.9210	0.0000	0.0000	0.0000	0.0000	19.1843	77.1474	150.4806	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)

Space heating fuel for secondary/supplementary system

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement

	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50

310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	

Water heating fuel

	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)

Cooling System Energy Efficiency Ratio 0.0000 (314)

Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)

Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5669	-24.0727	-38.8745	-48.0493	-52.9789	-51.6524	-50.3986	-46.8694	-39.7890	-30.3128	-18.7591	-13.8902	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4316	-15.8925	-38.3705	-69.5238	-96.2615	-109.4663	-104.0915	-84.3722	-54.5598	-26.6835	-10.2713	-5.6085	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	555.6787	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	5.5568	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)		
mechanical ventilation fans (SFP = 0.1177)	15.2561	(330a)
Total electricity for the above, kWh/year	15.2561	(331)
Electricity for lighting (calculated in Appendix L)	124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2922.3447	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	555.6787	6.5500	36.3970	(340a)
Space heating total			36.3970	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	28.4300	4.3373	(349)
Energy for lighting	124.6784	28.4300	35.4461	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	28.4300	-122.8784	
PV Unit electricity exported	-622.5330	5.8100	-36.1692	
Total			-159.0476	(352)
Total energy cost			236.0696	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1023.2419	0.1580	23.4170	(367)
Electrical energy for heat distribution (space & water)	5.5568	0.0000	5.4960	(372)
Overall CO2 factor for heat network			0.0396	(386)
Total CO2 associated with community systems			152.0564	(373)
Space and water heating			152.0564	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	0.1330	-57.4796	
PV Unit electricity exported	-622.5330	0.1218	-75.7970	
Total			-133.2765	(380)
Total CO2, kg/year			38.8911	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1023.2419	1.5850	234.8652	(467)
Electrical energy for heat distribution (space & water)	5.5568	0.0000	58.6972	(472)
Overall CO2 factor for heat network			0.4232	(486)
Total CO2 associated with community systems			1623.9554	(473)
Space and water heating			1623.9554	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	1.4914	-644.6094	
PV Unit electricity exported	-622.5330	0.4467	-278.0656	
Total			-922.6749	(480)
Total Primary energy kWh/year			915.5959	(483)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	13.34	**TER**	16.55
Environmental	92 A	**% DER < TER**			19.40
CO_2 Emissions (t/year)	0.55	**DFEE**	21.90	**TFEE**	32.86
Compliance Check	See BREL	**% DFEE < TFEE**			33.34
% DPER < TPER	15.26	**DPER**	75.75	**TPER**	89.39

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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			m3 per hour
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000	/ (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			3.0000 (17)
Infiltration rate			0.1500 (18)
Number of sides sheltered			3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)]	=	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20)	=	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.1391	12.7569	14.0957	13.5903	14.0106	13.5270	13.9607	13.9788	13.5484	14.0374	13.6339	14.1338	(61)
Total heat required for water heating calculated for each month	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
									Total per year (kWh/year) = Sum(64)m =			1702.2253	(64)
12Total per year (kWh/year)												1702	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	56.5391	49.8293	52.5270	45.2322	43.1953	38.2165	37.2153	39.0955	39.9677	45.4111	49.3150	55.7994	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0601	78.6737	71.0601	73.4288	71.0601	73.4288	71.0601	71.0601	73.4288	71.0601	73.4288	71.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	75.9934	74.1507	70.6008	62.8225	58.0581	53.0785	50.0206	52.5477	55.5107	61.0364	68.4930	74.9992	(72)
Total internal gains	325.5937	332.7143	318.1497	305.4994	289.2262	275.0249	263.8594	265.0368	273.7696	287.1674	306.1327	318.8607	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	19.6403	0.6800	0.7000	0.7700	43.0185	(80)
Solar gains	43.0185	84.1534	138.5886	202.1232	247.7096	253.5749	241.4136	207.3707	161.1843	99.8551	53.6391	35.3763	(83)
Total gains	368.6122	416.8676	456.7383	507.6226	536.9359	528.5998	505.2730	472.4076	434.9539	387.0225	359.7718	354.2370	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.9627	0.9336	0.8769	0.7522	0.5866	0.4205	0.3042	0.3397	0.5425	0.8094	0.9337	0.9687	(86)
MIT	20.2046	20.3964	20.6297	20.8562	20.9639	20.9944	20.9991	20.9985	20.9811	20.8246	20.4786	20.1519	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)

util rest of house													
	0.9556	0.9220	0.8571	0.7196	0.5442	0.3722	0.2524	0.2846	0.4875	0.7742	0.9201	0.9627	(89)
MIT 2	19.3324	19.5686	19.8493	20.1063	20.2169	20.2438	20.2470	20.2467	20.2340	20.0789	19.6737	19.2667	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.7490	19.9640	20.2220	20.4645	20.5737	20.6023	20.6063	20.6058	20.5908	20.4351	20.0581	19.6895	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.5990	19.8140	20.0720	20.3145	20.4237	20.4523	20.4563	20.4558	20.4408	20.2851	19.9081	19.5395	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9484	0.9144	0.8521	0.7226	0.5543	0.3855	0.2668	0.2999	0.5019	0.7761	0.9130	0.9558	(94)
Useful gains	349.5917	381.1844	389.1837	366.8249	297.6109	203.7559	134.7965	141.6801	218.2917	300.3782	328.4864	338.5758	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	535.2413	521.7719	474.8242	399.3407	305.2025	204.7455	134.9128	141.8932	221.8362	338.8371	448.0983	536.6593	(97)
Space heating kWh	138.1233	94.4748	63.7165	23.4114	5.6482	0.0000	0.0000	0.0000	0.0000	28.6134	86.1205	147.3741	(98a)
Space heating requirement - total per year (kWh/year)												587.4822	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	138.1233	94.4748	63.7165	23.4114	5.6482	0.0000	0.0000	0.0000	0.0000	28.6134	86.1205	147.3741	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												587.4822	
Space heating per m2											(98c) / (4) =	13.5489	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	138.1233	94.4748	63.7165	23.4114	5.6482	0.0000	0.0000	0.0000	0.0000	28.6134	86.1205	147.3741	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	155.1947	106.1514	71.5916	26.3049	6.3463	0.0000	0.0000	0.0000	0.0000	32.1499	96.7647	165.5889	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0453	87.9412	87.7744	87.5404	87.3678	87.3000	87.3000	87.3000	87.3000	87.5838	87.9081	88.0780	(217)
Fuel for water heating, kWh/month	197.1150	174.0114	183.9642	159.2508	152.6728	135.5021	132.1761	138.6584	141.5408	159.9128	172.5650	194.5149	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.5998	7.7676	8.5998	8.3224	8.5998	8.3224	8.5998	8.5998	8.3224	8.5998	8.3224	8.5998	(231)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	660.0924	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	1941.8842	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)		
mechanical ventilation fans (SFP = 0.1177)	15.2561	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	101.2561	(231)
Electricity for lighting (calculated in Appendix L)	124.6784	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2827.9112	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	660.0924	0.2100	138.6194	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1941.8842	0.2100	407.7957	(264)
Space and water heating			546.4151	(265)
Pumps, fans and electric keep-hot	101.2561	0.1387	14.0455	(267)
Energy for lighting	124.6784	0.1443	17.9950	(268)
Total CO2, kg/year			578.4555	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.3400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	660.0924	1.1300	745.9044	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1941.8842	1.1300	2194.3292	(278)
Space and water heating			2940.2336	(279)
Pumps, fans and electric keep-hot	101.2561	1.5128	153.1803	(281)
Energy for lighting	124.6784	1.5338	191.2360	(282)
Total Primary energy kWh/year			3284.6499	(286)
Dwelling Primary energy Rate (DPER)			75.7500	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4383 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.6400	1.1450	7.6031			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.1800	1.7910			(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.1800	2.6550			(29a)
500mm mineral wool	43.3600		43.3600	0.1100	4.7696			(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.6587			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							179.0141	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	4.7800	0.0500	0.2390
E3 Sill	3.8800	0.0500	0.1940

E4 Jamb	17.9200	0.0500	0.8960	
E7 Party floor between dwellings (in blocks of flats)	17.6700	0.0700	1.2369	
E16 Corner (normal)	5.0000	0.0900	0.4500	
E18 Party wall between dwellings	5.0000	0.0600	0.3000	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.5900	0.0000	0.0000	
E14 Flat roof	17.6700	0.0800	1.4136	
P4 Party wall - Roof (insulation at ceiling level)	12.5900	0.1200	1.5108	
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5403 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.1990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	46.0145	45.8869	45.7618	45.1741	45.0641	44.5523	44.5523	44.4575	44.7494	45.0641	45.2866	45.5191	(39)
Average = Sum(39)m / 12 =												45.1735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0612	1.0583	1.0554	1.0418	1.0393	1.0275	1.0275	1.0253	1.0320	1.0393	1.0444	1.0498	(40)
HLP (average)												1.0418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	45.3396	48.8639	45.3249	45.1888	42.0176	42.7373	44.0650	43.9987	47.3242	47.7907	50.9589	(61)
Total heat required for water heating calculated for each month	210.3703	185.6104	196.2416	171.1433	164.5651	146.7839	144.1663	151.1351	154.0155	173.3445	185.8554	208.1498	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	187.8142	165.6616	175.3524	153.8462	148.4448	132.9897	131.2364	137.3854	139.7435	156.5194	166.7945	186.0115	(64)
										Total per year (kWh/year) = Sum(64)m =		1881.7996	(64)
12Total per year (kWh/year)												1882	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	65.7440	57.9749	61.2191	53.1659	50.9898	45.3392	44.4095	46.6171	47.5803	53.7328	57.8542	65.0057	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.0518	76.4502	69.0518	71.3535	69.0518	71.3535	69.0518	69.0518	71.3535	69.0518	71.3535	69.0518	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	88.3656	86.2722	82.2837	73.8415	68.5347	62.9711	59.6902	62.6573	66.0837	72.2215	80.3530	87.3733	(72)
Total internal gains	335.9576	342.6123	327.8242	314.4430	297.6944	282.8422	271.5207	273.1381	282.2674	296.3442	315.9175	329.2264	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	19.6403	0.6300	0.7000	0.7700	39.8554	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	39.8554	77.9656	128.3983	187.2612	229.4957	234.9297	223.6626	192.1229	149.3325	92.5128	49.6950	32.7751	(83)
Total gains	375.8130	420.5779	456.2225	501.7042	527.1901	517.7719	495.1833	465.2610	431.5999	388.8570	365.6125	362.0015	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8575	46.9878	47.1163	47.7293	47.8457	48.3954	48.3954	48.4986	48.1822	47.8457	47.6107	47.3675	
alpha	4.1238	4.1325	4.1411	4.1820	4.1897	4.2264	4.2264	4.2332	4.2121	4.1897	4.1740	4.1578	
util living area													
	0.9725	0.9555	0.9225	0.8400	0.7054	0.5299	0.3911	0.4319	0.6552	0.8745	0.9538	0.9760	(86)
MIT	19.6881	19.9024	20.2088	20.5905	20.8455	20.9646	20.9922	20.9882	20.9148	20.5790	20.0823	19.6569	(87)
Th 2	20.0326	20.0351	20.0374	20.0486	20.0507	20.0605	20.0605	20.0623	20.0567	20.0507	20.0465	20.0420	(88)
util rest of house													
	0.9666	0.9463	0.9063	0.8086	0.6536	0.4594	0.3098	0.3473	0.5838	0.8422	0.9426	0.9708	(89)
MIT 2	18.5259	18.7954	19.1756	19.6374	19.9174	20.0377	20.0572	20.0570	19.9954	19.6374	19.0327	18.4934	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.0810	19.3241	19.6690	20.0926	20.3607	20.4805	20.5038	20.5018	20.4346	20.0871	19.5340	19.0491	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0810	19.3241	19.6690	20.0926	20.3607	20.4805	20.5038	20.5018	20.4346	20.0871	19.5340	19.0491	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9593	0.9380	0.8992	0.8101	0.6713	0.4915	0.3485	0.3874	0.6136	0.8435	0.9353	0.9639	(94)
Useful gains	360.5162	394.4936	410.2187	406.4528	353.8845	254.5034	172.5627	180.2370	264.8251	328.0186	341.9395	348.9461	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	680.1423	661.8789	602.6388	505.6171	390.2858	261.9875	173.9234	182.3560	283.4678	427.5300	563.0936	675.9179	(97)
Space heating kWh													
	237.8018	179.6829	143.1606	71.3983	27.0825	0.0000	0.0000	0.0000	0.0000	74.0365	159.2310	243.2671	(98a)
Space heating requirement - total per year (kWh/year)												1135.6606	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	237.8018	179.6829	143.1606	71.3983	27.0825	0.0000	0.0000	0.0000	0.0000	74.0365	159.2310	243.2671	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1135.6606	
Space heating per m2											(98c) / (4) =	26.1914	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	237.8018	179.6829	143.1606	71.3983	27.0825	0.0000	0.0000	0.0000	0.0000	74.0365	159.2310	243.2671	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	257.3612	194.4620	154.9357	77.2708	29.3101	0.0000	0.0000	0.0000	0.0000	80.1261	172.3279	263.2761	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	187.8142	165.6616	175.3524	153.8462	148.4448	132.9897	131.2364	137.3854	139.7435	156.5194	166.7945	186.0115	(64)
Efficiency of water heater												80.3000	(216)
(217)m	84.8882	84.5559	83.9502	82.8402	81.5167	80.3000	80.3000	80.3000	80.3000	82.8745	84.2821	84.9574	(217)
Fuel for water heating, kWh/month													
	221.2489	195.9195	208.8768	185.7144	182.1035	165.6160	163.4327	171.0902	174.0267	188.8632	197.9004	218.9468	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.3476	11.5102	10.3636	7.5928	5.8649	4.7917	5.3502	6.9544	9.0330	11.8518	13.3866	14.7464	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3196	-12.6515	-19.6021	-23.8221	-27.3050	-26.1047	-25.8068	-23.5584	-19.8837	-15.2375	-9.4737	-7.0906	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2617	-4.9168	-10.0734	-15.5779	-21.0367	-21.2830	-21.0140	-17.5742	-12.6116	-7.1556	-3.0599	-1.7757	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1229.0699	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2273.7392	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												115.7933	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-357.1961	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)

Energy used	0.0000	(237)
Total delivered energy for all uses	3347.4063	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1229.0699	0.2100	258.1047	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2273.7392	0.2100	477.4852	(264)
Space and water heating			735.5899	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	115.7933	0.1443	16.7126	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	0.1330	-29.1103	
PV Unit electricity exported	-138.3404	0.1251	-17.3028	
Total			-46.4132	(269)
Total CO2, kg/year			717.8185	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.5500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1229.0699	1.1300	1388.8490	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2273.7392	1.1300	2569.3253	(278)
Space and water heating			3958.1743	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	115.7933	1.5338	177.6076	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	1.4915	-326.4228	
PV Unit electricity exported	-138.3404	0.4591	-63.5081	
Total			-389.9309	(283)
Total Primary energy kWh/year			3875.9519	(286)
Target Primary Energy Rate (TPER)			89.3900	(287)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	13.34	**TER**	16.55
Environmental	92 A	**% DER < TER**			19.40
CO_2 Emissions (t/year)	0.55	**DFEE**	21.90	**TFEE**	32.86
Compliance Check	See BREL	**% DFEE < TFEE**			33.34
% DPER < TPER	15.26	**DPER**	75.75	**TPER**	89.39

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area		Storey height		Volume	
Main dwelling		(m2)		(m)		(m3)	
Ground floor		43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2622	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		7762.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							179.0141	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		17.4572	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	36.9438	36.8677	36.7932	36.4431	36.3776	36.0727	36.0727	36.0162	36.1901	36.3776	36.5101	36.6486	(39)
Average = Sum(39)m / 12 =												36.4428	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8520	0.8503	0.8486	0.8405	0.8390	0.8319	0.8319	0.8306	0.8346	0.8390	0.8420	0.8452	(40)
HLP (average)												0.8405	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												449.4572	(64a)
Heat gains from water heating, kWh/month	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0601	78.6737	71.0601	73.4288	71.0601	73.4288	71.0601	71.0601	73.4288	71.0601	73.4288	71.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.0895	291.1341	278.7010	271.1858	257.9340	249.9230	240.9368	240.6593	247.6349	254.4733	268.5369	277.0546	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	19.6403	0.6800	0.7000	0.7700	43.0185	(80)

Solar gains	43.0185	84.1534	138.5886	202.1232	247.7096	253.5749	241.4136	207.3707	161.1843	99.8551	53.6391	35.3763	(83)
Total gains	326.1080	375.2875	417.2896	473.3090	505.6436	503.4979	482.3504	448.0301	408.8192	354.3283	322.1760	312.4309	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.3623	58.4827	58.6012	59.1642	59.2707	59.7717	59.7717	59.8654	59.5777	59.2707	59.0556	58.8323	
alpha	4.8908	4.8988	4.9067	4.9443	4.9514	4.9848	4.9848	4.9910	4.9718	4.9514	4.9370	4.9222	
util living area	0.9786	0.9583	0.9148	0.8010	0.6358	0.4534	0.3282	0.3682	0.5892	0.8580	0.9585	0.9822	(86)
MIT	19.9792	20.1978	20.4793	20.7875	20.9421	20.9911	20.9986	20.9975	20.9696	20.7444	20.3172	19.9396	(87)
Th 2	20.2085	20.2100	20.2115	20.2184	20.2197	20.2257	20.2257	20.2269	20.2234	20.2197	20.2171	20.2143	(88)
util rest of house	0.9742	0.9501	0.8989	0.7699	0.5907	0.4004	0.2709	0.3070	0.5299	0.8267	0.9489	0.9785	(89)

MIT 2	19.2829	19.4971	19.7676	20.0531	20.1810	20.2212	20.2253	20.2259	20.2063	20.0237	19.6219	19.2488	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.6155	19.8318	20.1075	20.4039	20.5445	20.5889	20.5946	20.5945	20.5709	20.3679	19.9540	19.5788	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6155	19.8318	20.1075	20.4039	20.5445	20.5889	20.5946	20.5945	20.5709	20.3679	19.9540	19.5788	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9702	0.9456	0.8966	0.7776	0.6098	0.4254	0.2982	0.3362	0.5569	0.8331	0.9452	0.9748	(94)
Useful gains	316.3988	354.8752	374.1523	368.0670	308.3573	214.2081	143.8510	150.6270	227.6810	295.2080	304.5131	304.5609	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	565.8119	550.5012	500.6651	419.2363	321.7425	216.0367	144.0961	151.0683	234.1815	355.3338	469.3010	563.6107	(97)
Space heating kWh	185.5633	131.4607	94.1255	36.8419	9.9586	0.0000	0.0000	0.0000	0.0000	44.7336	118.6473	192.7331	(98a)
Space heating requirement - total per year (kWh/year)												814.0640	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	185.5633	131.4607	94.1255	36.8419	9.9586	0.0000	0.0000	0.0000	0.0000	44.7336	118.6473	192.7331	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												814.0640	
Space heating per m2											(98c) / (4) =	18.7745	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	339.0831	266.9377	273.7231	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9659	0.9843	0.9766	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	327.5254	262.7454	267.3261	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	559.8297	536.6719	497.9536	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	167.2592	203.8013	171.5869	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	41.8148	50.9503	42.8967	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												135.6618	(107)
Energy for space heating												18.7745	(99)
Energy for space cooling												3.1287	(108)
Total												21.9033	(109)
Fabric Energy Efficiency (DFEE)												21.9	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.6400	1.1450	7.6031			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.1800	1.7910			(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.1800	2.6550			(29a)
500mm mineral wool	43.3600		43.3600	0.1100	4.7696			(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.6587			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.0141 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	4.7800	0.0500	0.2390
E3 Sill	3.8800	0.0500	0.1940
E4 Jamb	17.9200	0.0500	0.8960
E7 Party floor between dwellings (in blocks of flats)	17.6700	0.0700	1.2369
E16 Corner (normal)	5.0000	0.0900	0.4500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.5900	0.0000	0.0000
E14 Flat roof	17.6700	0.0800	1.4136
P4 Party wall - Roof (insulation at ceiling level)	12.5900	0.1200	1.5108
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5403 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.1990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	46.0145	45.8869	45.7618	45.1741	45.0641	44.5523	44.5523	44.4575	44.7494	45.0641	45.2866	45.5191	(39)
Average = Sum(39)m / 12 =												45.1735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0612	1.0583	1.0554	1.0418	1.0393	1.0275	1.0275	1.0253	1.0320	1.0393	1.0444	1.0498	(40)
HLP (average)												1.0418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)													
	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							449.4572	(64a)
Heat gains from water heating, kWh/month													
	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	69.0518	76.4502	69.0518	71.3535	69.0518	71.3535	69.0518	69.0518	71.3535	69.0518	71.3535	69.0518	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains													
	281.0812	288.9106	276.6927	269.1105	255.9256	247.8477	238.9285	238.6510	245.5596	252.4649	266.4616	275.0462	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	19.6403	0.6300	0.7000	0.7700	39.8554	(80)

Solar gains	39.8554	77.9656	128.3983	187.2612	229.4957	234.9297	223.6626	192.1229	149.3325	92.5128	49.6950	32.7751	(83)
Total gains	320.9366	366.8763	405.0910	456.3717	485.4213	482.7774	462.5911	430.7739	394.8921	344.9777	316.1566	307.8214	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8575	46.9878	47.1163	47.7293	47.8457	48.3954	48.3954	48.4986	48.1822	47.8457	47.6107	47.3675	
alpha	4.1238	4.1325	4.1411	4.1820	4.1897	4.2264	4.2264	4.2332	4.2121	4.1897	4.1740	4.1578	
util living area													
	0.9839	0.9713	0.9452	0.8722	0.7439	0.5627	0.4172	0.4639	0.6982	0.9082	0.9711	0.9863	(86)
MIT	19.5262	19.7540	20.0850	20.5141	20.8102	20.9558	20.9900	20.9846	20.8916	20.4915	19.9459	19.4946	(87)
Th 2	20.0326	20.0351	20.0374	20.0486	20.0507	20.0605	20.0605	20.0623	20.0567	20.0507	20.0465	20.0420	(88)
util rest of house													
	0.9803	0.9649	0.9328	0.8446	0.6934	0.4897	0.3311	0.3741	0.6269	0.8818	0.9635	0.9832	(89)
MIT 2	18.7000	18.9257	19.2497	19.6620	19.9208	20.0380	20.0572	20.0569	19.9944	19.6525	19.1257	18.6759	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.0946	19.3213	19.6487	20.0690	20.3456	20.4764	20.5028	20.5000	20.4229	20.0532	19.5174	19.0669	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0946	19.3213	19.6487	20.0690	20.3456	20.4764	20.5028	20.5000	20.4229	20.0532	19.5174	19.0669	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9757	0.9591	0.9270	0.8452	0.7100	0.5228	0.3721	0.4167	0.6560	0.8819	0.9583	0.9790	(94)
Useful gains	313.1370	351.8664	375.5045	385.7415	344.6275	252.3984	172.1308	179.4860	259.0434	304.2354	302.9775	301.3667	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	680.7677	661.7509	601.7063	504.5490	389.6051	261.8051	173.8771	182.2749	282.9482	426.0007	562.3435	676.7286	(97)
Space heating kWh													
	273.5173	208.2424	168.2941	85.5414	33.4633	0.0000	0.0000	0.0000	0.0000	90.5934	186.7436	279.2692	(98a)
Space heating requirement - total per year (kWh/year)												1325.6646	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	273.5173	208.2424	168.2941	85.5414	33.4633	0.0000	0.0000	0.0000	0.0000	90.5934	186.7436	279.2692	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1325.6646	
Space heating per m2											(98c) / (4) =	30.5734	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	418.7912	329.6867	337.8767	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8946	0.9397	0.9203	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	374.6578	309.8225	310.9425	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	537.8609	515.7341	479.8847	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	117.5062	153.1982	125.6930	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	29.3766	38.2996	31.4232	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												99.0993	(107)
Energy for space heating												30.5734	(99)
Energy for space cooling												2.2855	(108)
Total												32.8589	(109)
Fabric Energy Efficiency (TFEE)												32.9	(109)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	13.34	**TER**	16.55
Environmental	92 A	**% DER < TER**			19.40
CO_2 Emissions (t/year)	0.55	**DFEE**	21.90	**TFEE**	32.86
Compliance Check	See BREL	**% DFEE < TFEE**			33.34
% DPER < TPER	15.26	**DPER**	75.75	**TPER**	89.39

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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			m3 per hour
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		0 * 10 =	0.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000	/ (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			3.0000 (17)
Infiltration rate			0.1500 (18)
Number of sides sheltered			3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)]	=	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20)	=	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.1391	12.7569	14.0957	13.5903	14.0106	13.5270	13.9607	13.9788	13.5484	14.0374	13.6339	14.1338	(61)
Total heat required for water heating calculated for each month	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
									Total per year (kWh/year) = Sum(64)m =			1702.2253	(64)
12Total per year (kWh/year)												1702	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	56.5391	49.8293	52.5270	45.2322	43.1953	38.2165	37.2153	39.0955	39.9677	45.4111	49.3150	55.7994	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0601	78.6737	71.0601	73.4288	71.0601	73.4288	71.0601	71.0601	73.4288	71.0601	73.4288	71.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	75.9934	74.1507	70.6008	62.8225	58.0581	53.0785	50.0206	52.5477	55.5107	61.0364	68.4930	74.9992	(72)
Total internal gains	325.5937	332.7143	318.1497	305.4994	289.2262	275.0249	263.8594	265.0368	273.7696	287.1674	306.1327	318.8607	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	19.6403	0.6800	0.7000	0.7700	43.0185	(80)
Solar gains	43.0185	84.1534	138.5886	202.1232	247.7096	253.5749	241.4136	207.3707	161.1843	99.8551	53.6391	35.3763	(83)
Total gains	368.6122	416.8676	456.7383	507.6226	536.9359	528.5998	505.2730	472.4076	434.9539	387.0225	359.7718	354.2370	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.9627	0.9336	0.8769	0.7522	0.5866	0.4205	0.3042	0.3397	0.5425	0.8094	0.9337	0.9687	(86)
MIT	20.2046	20.3964	20.6297	20.8562	20.9639	20.9944	20.9991	20.9985	20.9811	20.8246	20.4786	20.1519	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)

util rest of house													
	0.9556	0.9220	0.8571	0.7196	0.5442	0.3722	0.2524	0.2846	0.4875	0.7742	0.9201	0.9627	(89)
MIT 2	19.3324	19.5686	19.8493	20.1063	20.2169	20.2438	20.2470	20.2467	20.2340	20.0789	19.6737	19.2667	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.7490	19.9640	20.2220	20.4645	20.5737	20.6023	20.6063	20.6058	20.5908	20.4351	20.0581	19.6895	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.5990	19.8140	20.0720	20.3145	20.4237	20.4523	20.4563	20.4558	20.4408	20.2851	19.9081	19.5395	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9484	0.9144	0.8521	0.7226	0.5543	0.3855	0.2668	0.2999	0.5019	0.7761	0.9130	0.9558	(94)
Useful gains	349.5917	381.1844	389.1837	366.8249	297.6109	203.7559	134.7965	141.6801	218.2917	300.3782	328.4864	338.5758	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	535.2413	521.7719	474.8242	399.3407	305.2025	204.7455	134.9128	141.8932	221.8362	338.8371	448.0983	536.6593	(97)
Space heating kWh	138.1233	94.4748	63.7165	23.4114	5.6482	0.0000	0.0000	0.0000	0.0000	28.6134	86.1205	147.3741	(98a)
Space heating requirement - total per year (kWh/year)												587.4822	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	138.1233	94.4748	63.7165	23.4114	5.6482	0.0000	0.0000	0.0000	0.0000	28.6134	86.1205	147.3741	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												587.4822	
Space heating per m2											(98c) / (4) =	13.5489	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	138.1233	94.4748	63.7165	23.4114	5.6482	0.0000	0.0000	0.0000	0.0000	28.6134	86.1205	147.3741	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	155.1947	106.1514	71.5916	26.3049	6.3463	0.0000	0.0000	0.0000	0.0000	32.1499	96.7647	165.5889	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0453	87.9412	87.7744	87.5404	87.3678	87.3000	87.3000	87.3000	87.3000	87.5838	87.9081	88.0780	(217)
Fuel for water heating, kWh/month	197.1150	174.0114	183.9642	159.2508	152.6728	135.5021	132.1761	138.6584	141.5408	159.9128	172.5650	194.5149	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.5998	7.7676	8.5998	8.3224	8.5998	8.3224	8.5998	8.5998	8.3224	8.5998	8.3224	8.5998	(231)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	660.0924	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	1941.8842	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)		
mechanical ventilation fans (SFP = 0.1177)	15.2561	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	101.2561	(231)
Electricity for lighting (calculated in Appendix L)	124.6784	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2827.9112	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	660.0924	0.2100	138.6194	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1941.8842	0.2100	407.7957	(264)
Space and water heating			546.4151	(265)
Pumps, fans and electric keep-hot	101.2561	0.1387	14.0455	(267)
Energy for lighting	124.6784	0.1443	17.9950	(268)
Total CO2, kg/year			578.4555	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.3400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	660.0924	1.1300	745.9044	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1941.8842	1.1300	2194.3292	(278)
Space and water heating			2940.2336	(279)
Pumps, fans and electric keep-hot	101.2561	1.5128	153.1803	(281)
Energy for lighting	124.6784	1.5338	191.2360	(282)
Total Primary energy kWh/year			3284.6499	(286)
Dwelling Primary energy Rate (DPER)			75.7500	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4383 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.6400	1.1450	7.6031			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.1800	1.7910			(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.1800	2.6550			(29a)
500mm mineral wool	43.3600		43.3600	0.1100	4.7696			(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.6587			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							179.0141	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	4.7800	0.0500	0.2390
E3 Sill	3.8800	0.0500	0.1940

E4 Jamb	17.9200	0.0500	0.8960	
E7 Party floor between dwellings (in blocks of flats)	17.6700	0.0700	1.2369	
E16 Corner (normal)	5.0000	0.0900	0.4500	
E18 Party wall between dwellings	5.0000	0.0600	0.3000	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.5900	0.0000	0.0000	
E14 Flat roof	17.6700	0.0800	1.4136	
P4 Party wall - Roof (insulation at ceiling level)	12.5900	0.1200	1.5108	
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5403 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.1990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	46.0145	45.8869	45.7618	45.1741	45.0641	44.5523	44.5523	44.4575	44.7494	45.0641	45.2866	45.5191	(39)
Average = Sum(39)m / 12 =												45.1735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0612	1.0583	1.0554	1.0418	1.0393	1.0275	1.0275	1.0253	1.0320	1.0393	1.0444	1.0498	(40)
HLP (average)												1.0418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	45.3396	48.8639	45.3249	45.1888	42.0176	42.7373	44.0650	43.9987	47.3242	47.7907	50.9589	(61)
Total heat required for water heating calculated for each month	210.3703	185.6104	196.2416	171.1433	164.5651	146.7839	144.1663	151.1351	154.0155	173.3445	185.8554	208.1498	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	187.8142	165.6616	175.3524	153.8462	148.4448	132.9897	131.2364	137.3854	139.7435	156.5194	166.7945	186.0115	(64)
										Total per year (kWh/year) = Sum(64)m =		1881.7996	(64)
12Total per year (kWh/year)												1882	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	65.7440	57.9749	61.2191	53.1659	50.9898	45.3392	44.4095	46.6171	47.5803	53.7328	57.8542	65.0057	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.0518	76.4502	69.0518	71.3535	69.0518	71.3535	69.0518	69.0518	71.3535	69.0518	71.3535	69.0518	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	88.3656	86.2722	82.2837	73.8415	68.5347	62.9711	59.6902	62.6573	66.0837	72.2215	80.3530	87.3733	(72)
Total internal gains	335.9576	342.6123	327.8242	314.4430	297.6944	282.8422	271.5207	273.1381	282.2674	296.3442	315.9175	329.2264	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	19.6403	0.6300	0.7000	0.7700	39.8554	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	39.8554	77.9656	128.3983	187.2612	229.4957	234.9297	223.6626	192.1229	149.3325	92.5128	49.6950	32.7751	(83)
Total gains	375.8130	420.5779	456.2225	501.7042	527.1901	517.7719	495.1833	465.2610	431.5999	388.8570	365.6125	362.0015	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8575	46.9878	47.1163	47.7293	47.8457	48.3954	48.3954	48.4986	48.1822	47.8457	47.6107	47.3675	
alpha	4.1238	4.1325	4.1411	4.1820	4.1897	4.2264	4.2264	4.2332	4.2121	4.1897	4.1740	4.1578	
util living area													
	0.9725	0.9555	0.9225	0.8400	0.7054	0.5299	0.3911	0.4319	0.6552	0.8745	0.9538	0.9760	(86)
MIT	19.6881	19.9024	20.2088	20.5905	20.8455	20.9646	20.9922	20.9882	20.9148	20.5790	20.0823	19.6569	(87)
Th 2	20.0326	20.0351	20.0374	20.0486	20.0507	20.0605	20.0605	20.0623	20.0567	20.0507	20.0465	20.0420	(88)
util rest of house													
	0.9666	0.9463	0.9063	0.8086	0.6536	0.4594	0.3098	0.3473	0.5838	0.8422	0.9426	0.9708	(89)
MIT 2	18.5259	18.7954	19.1756	19.6374	19.9174	20.0377	20.0572	20.0570	19.9954	19.6374	19.0327	18.4934	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.0810	19.3241	19.6690	20.0926	20.3607	20.4805	20.5038	20.5018	20.4346	20.0871	19.5340	19.0491	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0810	19.3241	19.6690	20.0926	20.3607	20.4805	20.5038	20.5018	20.4346	20.0871	19.5340	19.0491	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9593	0.9380	0.8992	0.8101	0.6713	0.4915	0.3485	0.3874	0.6136	0.8435	0.9353	0.9639	(94)
Useful gains	360.5162	394.4936	410.2187	406.4528	353.8845	254.5034	172.5627	180.2370	264.8251	328.0186	341.9395	348.9461	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	680.1423	661.8789	602.6388	505.6171	390.2858	261.9875	173.9234	182.3560	283.4678	427.5300	563.0936	675.9179	(97)
Space heating kWh													
	237.8018	179.6829	143.1606	71.3983	27.0825	0.0000	0.0000	0.0000	0.0000	74.0365	159.2310	243.2671	(98a)
Space heating requirement - total per year (kWh/year)												1135.6606	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	237.8018	179.6829	143.1606	71.3983	27.0825	0.0000	0.0000	0.0000	0.0000	74.0365	159.2310	243.2671	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1135.6606	
Space heating per m2											(98c) / (4) =	26.1914	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	237.8018	179.6829	143.1606	71.3983	27.0825	0.0000	0.0000	0.0000	0.0000	74.0365	159.2310	243.2671	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	257.3612	194.4620	154.9357	77.2708	29.3101	0.0000	0.0000	0.0000	0.0000	80.1261	172.3279	263.2761	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	187.8142	165.6616	175.3524	153.8462	148.4448	132.9897	131.2364	137.3854	139.7435	156.5194	166.7945	186.0115	(64)
Efficiency of water heater												80.3000	(216)
(217)m	84.8882	84.5559	83.9502	82.8402	81.5167	80.3000	80.3000	80.3000	80.3000	82.8745	84.2821	84.9574	(217)
Fuel for water heating, kWh/month													
	221.2489	195.9195	208.8768	185.7144	182.1035	165.6160	163.4327	171.0902	174.0267	188.8632	197.9004	218.9468	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.3476	11.5102	10.3636	7.5928	5.8649	4.7917	5.3502	6.9544	9.0330	11.8518	13.3866	14.7464	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3196	-12.6515	-19.6021	-23.8221	-27.3050	-26.1047	-25.8068	-23.5584	-19.8837	-15.2375	-9.4737	-7.0906	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2617	-4.9168	-10.0734	-15.5779	-21.0367	-21.2830	-21.0140	-17.5742	-12.6116	-7.1556	-3.0599	-1.7757	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1229.0699	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2273.7392	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												115.7933	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-357.1961	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)

Energy used	0.0000	(237)
Total delivered energy for all uses	3347.4063	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1229.0699	0.2100	258.1047	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2273.7392	0.2100	477.4852	(264)
Space and water heating			735.5899	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	115.7933	0.1443	16.7126	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	0.1330	-29.1103	
PV Unit electricity exported	-138.3404	0.1251	-17.3028	
Total			-46.4132	(269)
Total CO2, kg/year			717.8185	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.5500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1229.0699	1.1300	1388.8490	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2273.7392	1.1300	2569.3253	(278)
Space and water heating			3958.1743	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	115.7933	1.5338	177.6076	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	1.4915	-326.4228	
PV Unit electricity exported	-138.3404	0.4591	-63.5081	
Total			-389.9309	(283)
Total Primary energy kWh/year			3875.9519	(286)
Target Primary Energy Rate (TPER)			89.3900	(287)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	13.34	**TER**	16.55
Environmental	92 A	**% DER < TER**			19.40
CO_2 Emissions (t/year)	0.55	**DFEE**	21.90	**TFEE**	32.86
Compliance Check	See BREL	**% DFEE < TFEE**			33.34
% DPER < TPER	15.26	**DPER**	75.75	**TPER**	89.39

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

		Area		Storey height		Volume	
Main dwelling		(m2)		(m)		(m3)	
Ground floor		43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		7762.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							179.0141	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.1391	12.7569	14.0957	13.5903	14.0106	13.5270	13.9607	13.9788	13.5484	14.0374	13.6339	14.1338	(61)
Total heat required for water heating calculated for each month	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
										Total per year (kWh/year) = Sum(64)m =		1702.2253	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	56.5391	49.8293	52.5270	45.2322	43.1953	38.2165	37.2153	39.0955	39.9677	45.4111	49.3150	55.7994	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	75.9934	74.1507	70.6008	62.8225	58.0581	53.0785	50.0206	52.5477	55.5107	61.0364	68.4930	74.9992	(72)
Total internal gains	366.2246	364.4230	352.8693	331.1869	310.3437	288.4189	277.2860	279.7720	290.7388	313.1687	336.7041	357.1555	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	19.6403	0.6800	0.7000	0.7700	43.0185	(80)

Solar gains	43.0185	84.1534	138.5886	202.1232	247.7096	253.5749	241.4136	207.3707	161.1843	99.8551	53.6391	35.3763	(83)
Total gains	409.2431	448.5763	491.4579	533.3101	558.0533	541.9938	518.6996	487.1428	451.9231	413.0237	390.3431	392.5318	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.9452	0.9153	0.8493	0.7272	0.5670	0.4105	0.2964	0.3296	0.5238	0.7791	0.9131	0.9538	(86)
MIT	20.3154	20.4706	20.6882	20.8770	20.9690	20.9950	20.9992	20.9987	20.9838	20.8542	20.5497	20.2603	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house													

	0.9356	0.9015	0.8271	0.6940	0.5254	0.3632	0.2459	0.2760	0.4702	0.7420	0.8966	0.9455	(89)
MIT 2	19.4686	19.6576	19.9161	20.1277	20.2213	20.2442	20.2471	20.2468	20.2360	20.1093	19.7581	19.4008	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.8731	20.0459	20.2849	20.4856	20.5784	20.6028	20.6063	20.6059	20.5932	20.4651	20.1362	19.8113	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.7231	19.8959	20.1349	20.3356	20.4284	20.4528	20.4563	20.4559	20.4432	20.3151	19.9862	19.6613	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9278	0.8942	0.8236	0.6980	0.5355	0.3762	0.2599	0.2909	0.4844	0.7456	0.8902	0.9379	(94)
Useful gains	379.7130	401.1367	404.7560	372.2560	298.8502	203.8779	134.8126	141.7137	218.8941	307.9320	347.4741	368.1681	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	539.5827	524.6391	477.0238	400.0795	305.3677	204.7623	134.9153	141.8982	221.9185	339.8860	450.8293	540.9223	(97)
Space heating kWh	118.9431	82.9936	53.7673	20.0330	4.8491	0.0000	0.0000	0.0000	0.0000	23.7738	74.4157	128.5291	(98a)
Space heating requirement - total per year (kWh/year)												507.3045	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	118.9431	82.9936	53.7673	20.0330	4.8491	0.0000	0.0000	0.0000	0.0000	23.7738	74.4157	128.5291	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												507.3045	
Space heating per m2											(98c) / (4) =	11.6998	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	118.9431	82.9936	53.7673	20.0330	4.8491	0.0000	0.0000	0.0000	0.0000	23.7738	74.4157	128.5291	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	133.6439	93.2513	60.4127	22.5089	5.4484	0.0000	0.0000	0.0000	0.0000	26.7121	83.6132	144.4147	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
Efficiency of water heater												87.3000	(216)
(217)m	87.9834	87.8903	87.7185	87.5100	87.3585	87.3000	87.3000	87.3000	87.3000	87.5426	87.8523	88.0207	(217)
Fuel for water heating, kWh/month	197.2537	174.1121	184.0813	159.3061	152.6890	135.5021	132.1761	138.6584	141.5408	159.9880	172.6746	194.6415	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.5998	7.7676	8.5998	8.3224	8.5998	8.3224	8.5998	8.5998	8.3224	8.5998	8.3224	8.5998	(231)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	570.0051	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	1942.6236	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)		
mechanical ventilation fans (SFP = 0.1177)	15.2561	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	101.2561	(231)
Electricity for lighting (calculated in Appendix L)	124.6784	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2738.5633	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	570.0051	3.6400	20.7482	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1942.6236	3.6400	70.7115	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	101.2561	16.4900	16.6971	(249)
Energy for lighting	124.6784	16.4900	20.5595	(250)
Additional standing charges			92.0000	(251)
Total energy cost			220.7163	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8993	(257)
SAP value		85.4231	
SAP rating (Section 12)		85	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	570.0051	0.2100	119.7011	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1942.6236	0.2100	407.9510	(264)
Space and water heating			527.6520	(265)
Pumps, fans and electric keep-hot	101.2561	0.1387	14.0455	(267)
Energy for lighting	124.6784	0.1443	17.9950	(268)
Total CO2, kg/year			559.6925	(272)
CO2 emissions per m2			12.9100	(273)
EI value			91.5121	
EI rating			92	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day)		92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.1391	12.7569	14.0957	13.5903	14.0106	13.5270	13.9607	13.9788	13.5484	14.0374	13.6339	14.1338	(61)
Total heat required for water heating calculated for each month	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
										Total per year (kWh/year) = Sum(64)m =		1702.2253	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	56.5391	49.8293	52.5270	45.2322	43.1953	38.2165	37.2153	39.0955	39.9677	45.4111	49.3150	55.7994	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	75.9934	74.1507	70.6008	62.8225	58.0581	53.0785	50.0206	52.5477	55.5107	61.0364	68.4930	74.9992	(72)
Total internal gains	366.2246	364.4230	352.8693	331.1869	310.3437	288.4189	277.2860	279.7720	290.7388	313.1687	336.7041	357.1555	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	23.7835	0.6800	0.7000	0.7700	52.0935	(80)

Solar gains	52.0935	90.5491	146.7062	215.9115	254.4951	279.3109	260.9848	228.8358	179.9437	113.3085	63.9852	43.0855	(83)
Total gains	418.3181	454.9721	499.5755	547.0984	564.8388	567.7298	538.2708	508.6078	470.6825	426.4771	400.6893	400.2410	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.9369	0.9059	0.8279	0.6966	0.5336	0.3562	0.2533	0.2817	0.4839	0.7389	0.8967	0.9471	(86)
MIT	20.3695	20.5125	20.7358	20.9022	20.9776	20.9976	20.9997	20.9994	20.9891	20.8917	20.6082	20.3129	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.9260	0.8908	0.8034	0.6618	0.4912	0.3105	0.2045	0.2302	0.4311	0.6982	0.8776	0.9377	(89)
MIT 2	19.5352	19.7083	19.9711	20.1542	20.2292	20.2460	20.2473	20.2472	20.2401	20.1483	19.8277	19.4660	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.9337	20.0924	20.3363	20.5114	20.5867	20.6050	20.6066	20.6065	20.5978	20.5034	20.2005	19.8705	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.7837	19.9424	20.1863	20.3614	20.4367	20.4550	20.4566	20.4565	20.4478	20.3534	20.0505	19.7205	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9183	0.8840	0.8013	0.6672	0.5020	0.3231	0.2181	0.2445	0.4453	0.7042	0.8720	0.9300	(94)
Useful gains	384.1452	402.1741	400.2982	365.0253	283.5533	183.4567	117.3954	124.3544	209.6113	300.3067	349.4189	372.2240	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	531.2100	515.7709	461.3303	386.9897	288.1631	183.8488	117.4338	124.4251	211.5864	323.7329	439.0851	532.4960	(97)
Space heating kWh	109.4162	76.3371	45.4079	15.8143	3.4297	0.0000	0.0000	0.0000	0.0000	17.4291	64.5597	119.2424	(98a)
Space heating requirement - total per year (kWh/year)												451.6364	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	109.4162	76.3371	45.4079	15.8143	3.4297	0.0000	0.0000	0.0000	0.0000	17.4291	64.5597	119.2424	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												451.6364	
Space heating per m2											(98c) / (4) =	10.4160	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 89.0000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	109.4162	76.3371	45.4079	15.8143	3.4297	0.0000	0.0000	0.0000	0.0000	17.4291	64.5597	119.2424	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	122.9395	85.7720	51.0201	17.7689	3.8536	0.0000	0.0000	0.0000	19.5833	72.5390	133.9802	(211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
Efficiency of water heater												87.3000	(216)
(217)m	87.9496	87.8585	87.6675	87.4702	87.3418	87.3000	87.3000	87.3000	87.3000	87.4849	87.8007	87.9897	(217)
Fuel for water heating, kWh/month	197.3295	174.1751	184.1884	159.3786	152.7182	135.5021	132.1761	138.6584	141.5408	160.0935	172.7761	194.7099	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.5998	7.7676	8.5998	8.3224	8.5998	8.3224	8.5998	8.5998	8.3224	8.5998	8.3224	8.5998	(231)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 507.4566 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 87.3000

Water heating fuel used 1943.2468 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)

mechanical ventilation fans (SFP = 0.1177) 15.2561 (230a)

central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	101.2561	(231)
Electricity for lighting (calculated in Appendix L)	124.6784	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2676.6379	(238)

10a. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	507.4566	6.5500	33.2384	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1943.2468	6.5500	127.2827	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	101.2561	28.4300	28.7871	(249)
Energy for lighting	124.6784	28.4300	35.4461	(250)
Additional standing charges			104.0000	(251)
Total energy cost			328.7543	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	507.4566	0.2100	106.5659	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1943.2468	0.2100	408.0818	(264)
Space and water heating			514.6477	(265)
Pumps, fans and electric keep-hot	101.2561	0.1387	14.0455	(267)
Energy for lighting	124.6784	0.1443	17.9950	(268)
Total CO2, kg/year			546.6881	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	507.4566	1.1300	573.4259	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1943.2468	1.1300	2195.8689	(278)
Space and water heating			2769.2948	(279)
Pumps, fans and electric keep-hot	101.2561	1.5128	153.1803	(281)
Energy for lighting	124.6784	1.5338	191.2360	(282)
Total Primary energy kWh/year			3113.7110	(286)

SAP 10 EPC IMPROVEMENTS

Rev C - Be Lean

Current energy efficiency rating: B 85
Current environmental impact rating: A 92

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 85
Potential environmental impact rating: A 92

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£64	£64	£0
Mains gas	£265	£265	£0
Space heating	£166	£166	£0
Water heating	£127	£127	£0
Lighting	£35	£35	£0
Total cost of fuels	£329	£329	£0
Total cost of uses	£328	£328	£0
Delivered energy	62 kWh/m²	62 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.5 tonnes	0.5 tonnes	0.0 tonnes
CO2 emissions per m²	13 kg/m²	13 kg/m²	0 kg/m²
Primary energy	72 kWh/m²	72 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600 (1b)	x	2.4500 (2b)	=	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		7762.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							179.0141	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		17.4572	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4982	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths
21.3409 21.0240 20.5777 19.7547 19.1385 18.4553 18.0862 18.5294 19.0120 19.7431 20.5830 21.2688 (42b)
Hot water usage for other uses
29.9733 28.8834 27.7935 26.7035 25.6136 24.5236 24.5236 25.6136 26.7035 27.7935 28.8834 29.9733 (42c)
Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m													
	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.1391	12.7569	14.0957	13.5903	14.0106	13.5270	13.9607	13.9788	13.5484	14.0374	13.6339	14.1338	(61)
Total heat required for water heating calculated for each month													
	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
										Total per year (kWh/year) = Sum(64)m =		1702.2253	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Heat gains from water heating, kWh/month													
	56.5391	49.8293	52.5270	45.2322	43.1953	38.2165	37.2153	39.0955	39.9677	45.4111	49.3150	55.7994	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	75.9934	74.1507	70.6008	62.8225	58.0581	53.0785	50.0206	52.5477	55.5107	61.0364	68.4930	74.9992	(72)
Total internal gains													
	366.2246	364.4230	352.8693	331.1869	310.3437	288.4189	277.2860	279.7720	290.7388	313.1687	336.7041	357.1555	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	19.6403	0.6800	0.7000	0.7700	43.0185	(80)

Solar gains	43.0185	84.1534	138.5886	202.1232	247.7096	253.5749	241.4136	207.3707	161.1843	99.8551	53.6391	35.3763	(83)
Total gains	409.2431	448.5763	491.4579	533.3101	558.0533	541.9938	518.6996	487.1428	451.9231	413.0237	390.3431	392.5318	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area													
	0.9452	0.9153	0.8493	0.7272	0.5670	0.4105	0.2964	0.3296	0.5238	0.7791	0.9131	0.9538	(86)
MIT	20.3154	20.4706	20.6882	20.8770	20.9690	20.9950	20.9992	20.9987	20.9838	20.8542	20.5497	20.2603	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house													
	0.9356	0.9015	0.8271	0.6940	0.5254	0.3632	0.2459	0.2760	0.4702	0.7420	0.8966	0.9455	(89)
MIT 2	19.4686	19.6576	19.9161	20.1277	20.2213	20.2442	20.2471	20.2468	20.2360	20.1093	19.7581	19.4008	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.8731	20.0459	20.2849	20.4856	20.5784	20.6028	20.6063	20.6059	20.5932	20.4651	20.1362	19.8113	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.7231	19.8959	20.1349	20.3356	20.4284	20.4528	20.4563	20.4559	20.4432	20.3151	19.9862	19.6613	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9278	0.8942	0.8236	0.6980	0.5355	0.3762	0.2599	0.2909	0.4844	0.7456	0.8902	0.9379	(94)
Useful gains	379.7130	401.1367	404.7560	372.2560	298.8502	203.8779	134.8126	141.7137	218.8941	307.9320	347.4741	368.1681	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	539.5827	524.6391	477.0238	400.0795	305.3677	204.7623	134.9153	141.8982	221.9185	339.8860	450.8293	540.9223	(97)
Space heating kWh													
	118.9431	82.9936	53.7673	20.0330	4.8491	0.0000	0.0000	0.0000	0.0000	23.7738	74.4157	128.5291	(98a)
Space heating requirement - total per year (kWh/year)												507.3045	
Solar heating kWh													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)											0.0000	
Space heating kWh												
	118.9431	82.9936	53.7673	20.0330	4.8491	0.0000	0.0000	0.0000	0.0000	23.7738	74.4157	128.5291 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)											507.3045	
Space heating per m2										(98c) / (4) =	11.6998	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)											0.0000	(201)
Fraction of space heat from main system(s)											1.0000	(202)
Efficiency of main space heating system 1 (in %)											89.0000	(206)
Efficiency of main space heating system 2 (in %)											0.0000	(207)
Efficiency of secondary/supplementary heating system, %											0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	118.9431	82.9936	53.7673	20.0330	4.8491	0.0000	0.0000	0.0000	0.0000	23.7738	74.4157	128.5291	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	133.6439	93.2513	60.4127	22.5089	5.4484	0.0000	0.0000	0.0000	0.0000	26.7121	83.6132	144.4147	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
Efficiency of water heater												87.3000	(216)
(217)m	87.9834	87.8903	87.7185	87.5100	87.3585	87.3000	87.3000	87.3000	87.3000	87.5426	87.8523	88.0207	(217)
Fuel for water heating, kWh/month													
	197.2537	174.1121	184.0813	159.3061	152.6890	135.5021	132.1761	138.6584	141.5408	159.9880	172.6746	194.6415	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.5998	7.7676	8.5998	8.3224	8.5998	8.3224	8.5998	8.5998	8.3224	8.5998	8.3224	8.5998	(231)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1											570.0051		(211)
Space heating fuel - main system 2											0.0000		(213)
Space heating fuel - secondary											0.0000		(215)
Efficiency of water heater											87.3000		
Water heating fuel used											1942.6236		(219)
Space cooling fuel											0.0000		(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)											15.2561		(230a)
central heating pump											41.0000		(230c)
main heating flue fan											45.0000		(230e)
Total electricity for the above, kWh/year											101.2561		(231)
Electricity for lighting (calculated in Appendix L)											124.6784		(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation											0.0000		(233)
Wind generation											0.0000		(234)
Hydro-electric generation (Appendix N)											0.0000		(235a)
Electricity generated - Micro CHP (Appendix N)											0.0000		(235)
Appendix Q - special features													
Energy saved or generated											-0.0000		(236)
Energy used											0.0000		(237)
Total delivered energy for all uses											2738.5633		(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	570.0051	3.6400	20.7482	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1942.6236	3.6400	70.7115	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	101.2561	16.4900	16.6971	(249)
Energy for lighting	124.6784	16.4900	20.5595	(250)
Additional standing charges			92.0000	(251)
Total energy cost			220.7163	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8993	(257)
SAP value		85.4231	
SAP rating (Section 12)		85	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	570.0051	0.2100	119.7011	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1942.6236	0.2100	407.9510	(264)
Space and water heating			527.6520	(265)
Pumps, fans and electric keep-hot	101.2561	0.1387	14.0455	(267)
Energy for lighting	124.6784	0.1443	17.9950	(268)
Total CO2, kg/year			559.6925	(272)
CO2 emissions per m2			12.9100	(273)
EI value			91.5121	
EI rating			92	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff													
	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers													
	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths													
	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses													
	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m													
	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.1391	12.7569	14.0957	13.5903	14.0106	13.5270	13.9607	13.9788	13.5484	14.0374	13.6339	14.1338	(61)
Total heat required for water heating calculated for each month													
	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
										Total per year (kWh/year) = Sum(64)m =		1702.2253	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	56.5391	49.8293	52.5270	45.2322	43.1953	38.2165	37.2153	39.0955	39.9677	45.4111	49.3150	55.7994	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	75.9934	74.1507	70.6008	62.8225	58.0581	53.0785	50.0206	52.5477	55.5107	61.0364	68.4930	74.9992	(72)
Total internal gains													
	366.2246	364.4230	352.8693	331.1869	310.3437	288.4189	277.2860	279.7720	290.7388	313.1687	336.7041	357.1555	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	23.7835	0.6800	0.7000	0.7700	52.0935	(80)

Solar gains	52.0935	90.5491	146.7062	215.9115	254.4951	279.3109	260.9848	228.8358	179.9437	113.3085	63.9852	43.0855	(83)
Total gains	418.3181	454.9721	499.5755	547.0984	564.8388	567.7298	538.2708	508.6078	470.6825	426.4771	400.6893	400.2410	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area													
	0.9369	0.9059	0.8279	0.6966	0.5336	0.3562	0.2533	0.2817	0.4839	0.7389	0.8967	0.9471	(86)
MIT	20.3695	20.5125	20.7358	20.9022	20.9776	20.9976	20.9997	20.9994	20.9891	20.8917	20.6082	20.3129	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house													
	0.9260	0.8908	0.8034	0.6618	0.4912	0.3105	0.2045	0.2302	0.4311	0.6982	0.8776	0.9377	(89)
MIT 2	19.5352	19.7083	19.9711	20.1542	20.2292	20.2460	20.2473	20.2472	20.2401	20.1483	19.8277	19.4660	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.9337	20.0924	20.3363	20.5114	20.5867	20.6050	20.6066	20.6065	20.5978	20.5034	20.2005	19.8705	(92)

Temperature adjustment												-0.1500	
adjusted MIT	19.7837	19.9424	20.1863	20.3614	20.4367	20.4550	20.4566	20.4565	20.4478	20.3534	20.0505	19.7205	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9183	0.8840	0.8013	0.6672	0.5020	0.3231	0.2181	0.2445	0.4453	0.7042	0.8720	0.9300	(94)
Useful gains	384.1452	402.1741	400.2982	365.0253	283.5533	183.4567	117.3954	124.3544	209.6113	300.3067	349.4189	372.2240	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	531.2100	515.7709	461.3303	386.9897	288.1631	183.8488	117.4338	124.4251	211.5864	323.7329	439.0851	532.4960	(97)
Space heating kWh	109.4162	76.3371	45.4079	15.8143	3.4297	0.0000	0.0000	0.0000	0.0000	17.4291	64.5597	119.2424	(98a)
Space heating requirement - total per year (kWh/year)												451.6364	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	109.4162	76.3371	45.4079	15.8143	3.4297	0.0000	0.0000	0.0000	0.0000	17.4291	64.5597	119.2424	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												451.6364	
Space heating per m2											(98c) / (4) =	10.4160	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	109.4162	76.3371	45.4079	15.8143	3.4297	0.0000	0.0000	0.0000	0.0000	17.4291	64.5597	119.2424	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	122.9395	85.7720	51.0201	17.7689	3.8536	0.0000	0.0000	0.0000	0.0000	19.5833	72.5390	133.9802	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	173.5505	153.0277	161.4734	139.4088	133.3869	118.2933	115.3897	121.0488	123.5651	140.0577	151.6986	171.3247	(64)
Efficiency of water heater												87.3000	(216)
(217)m	87.9496	87.8585	87.6675	87.4702	87.3418	87.3000	87.3000	87.3000	87.3000	87.4849	87.8007	87.9897	(217)
Fuel for water heating, kWh/month	197.3295	174.1751	184.1884	159.3786	152.7182	135.5021	132.1761	138.6584	141.5408	160.0935	172.7761	194.7099	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.5998	7.7676	8.5998	8.3224	8.5998	8.3224	8.5998	8.5998	8.3224	8.5998	8.3224	8.5998	(231)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	507.4566	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	1943.2468	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)		
mechanical ventilation fans (SFP = 0.1177)	15.2561	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	101.2561	(231)
Electricity for lighting (calculated in Appendix L)	124.6784	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2676.6379	(238)

10a. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	507.4566	6.5500	33.2384	(240)

Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1943.2468	6.5500	127.2827	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	101.2561	28.4300	28.7871	(249)
Energy for lighting	124.6784	28.4300	35.4461	(250)
Additional standing charges			104.0000	(251)
Total energy cost			328.7543	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	507.4566	0.2100	106.5659	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1943.2468	0.2100	408.0818	(264)
Space and water heating			514.6477	(265)
Pumps, fans and electric keep-hot	101.2561	0.1387	14.0455	(267)
Energy for lighting	124.6784	0.1443	17.9950	(268)
Total CO2, kg/year			546.6881	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	507.4566	1.1300	573.4259	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1943.2468	1.1300	2195.8689	(278)
Space and water heating			2769.2948	(279)
Pumps, fans and electric keep-hot	101.2561	1.5128	153.1803	(281)
Energy for lighting	124.6784	1.5338	191.2360	(282)
Total Primary energy kWh/year			3113.7110	(286)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.35	**TER**	16.09
Environmental	99 A	**% DER < TER**			91.61
CO_2 Emissions (t/year)	0.04	**DFEE**	21.90	**TFEE**	32.86
Compliance Check	See BREL	**% DFEE < TFEE**			33.34
% DPER < TPER	71.80	**DPER**	24.49	**TPER**	86.87

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
12Total per year (kWh/year)												2188	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0601	78.6737	71.0601	73.4288	71.0601	73.4288	71.0601	71.0601	73.4288	71.0601	73.4288	71.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.2801	384.4058	369.8506	357.2179	340.9558	329.7655	318.6057	319.7771	328.5028	338.8880	357.8362	370.5488	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	19.6403	0.6800	0.7000	0.7700	43.0185	(80)

Solar gains	43.0185	84.1534	138.5886	202.1232	247.7096	253.5749	241.4136	207.3707	161.1843	99.8551	53.6391	35.3763	(83)
Total gains	420.2986	468.5592	508.4392	559.3412	588.6654	583.3403	560.0194	527.1478	489.6871	438.7430	411.4752	405.9252	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292

alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.9398	0.9028	0.8353	0.7026	0.5404	0.3821	0.2746	0.3048	0.4861	0.7494	0.8975	0.9479	(86)
MIT	20.3438	20.5137	20.7137	20.8948	20.9749	20.9964	20.9995	20.9991	20.9884	20.8785	20.5944	20.2962	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.9295	0.8876	0.8122	0.6690	0.5000	0.3378	0.2278	0.2552	0.4355	0.7111	0.8791	0.9387	(89)
MIT 2	19.5032	19.7088	19.9449	20.1459	20.2265	20.2451	20.2472	20.2470	20.2393	20.1338	19.8104	19.4449	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.9047	20.0932	20.3121	20.5036	20.5840	20.6039	20.6065	20.6062	20.5971	20.4895	20.1848	19.8515	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9047	20.0932	20.3121	20.5036	20.5840	20.6039	20.6065	20.6062	20.5971	20.4895	20.1848	19.8515	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9242	0.8842	0.8143	0.6807	0.5183	0.3588	0.2501	0.2789	0.4592	0.7239	0.8774	0.9332	(94)
Useful gains	388.4213	414.2950	414.0272	380.7485	305.0774	209.3208	140.0800	146.9996	224.8671	317.5946	361.0486	378.8125	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	545.9365	531.5426	483.2225	405.9587	310.8096	210.0504	140.1688	147.1562	227.3042	345.9883	457.7791	547.5744	(97)
Space heating kWh	117.1913	78.7904	51.4812	18.1513	4.2647	0.0000	0.0000	0.0000	0.0000	21.1249	69.6459	125.5588	(98a)
Space heating requirement - total per year (kWh/year)												486.2086	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	117.1913	78.7904	51.4812	18.1513	4.2647	0.0000	0.0000	0.0000	0.0000	21.1249	69.6459	125.5588	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												486.2086	
Space heating per m2											(98c) / (4) =	11.2133	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	117.1913	78.7904	51.4812	18.1513	4.2647	0.0000	0.0000	0.0000	0.0000	21.1249	69.6459	125.5588	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	175.7869	118.1856	77.2219	27.2270	6.3971	0.0000	0.0000	0.0000	0.0000	31.6873	104.4689	188.3383	
Space heating requirement	175.7869	118.1856	77.2219	27.2270	6.3971	0.0000	0.0000	0.0000	0.0000	31.6873	104.4689	188.3383	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												729.3129	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												7.2931	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3192.5049	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1069.5443	0.1575	30.6398	(367)
Electrical energy for heat distribution (space & water)	7.2931	0.0000	5.7669	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			159.5500	(373)
Space and water heating			159.5500	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			58.6170	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.3500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1069.5443	1.5832	307.9063	(467)
Electrical energy for heat distribution (space & water)	7.2931	0.0000	61.4362	(472)
Overall CO2 factor for heat network			0.4238	(486)
Total CO2 associated with community systems			1699.7356	(473)
Space and water heating			1699.7356	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	1.4901	-605.6307	
PV Unit electricity exported	-551.7766	0.4464	-246.3315	
Total			-851.9622	(480)
Total Primary energy kWh/year			1062.0888	(483)
Dwelling Primary energy Rate (DPER)			24.4900	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.6400	1.1450	7.6031			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.1800	1.7910			(29a)

Wall to Unheated Com	16.5900	1.8400	14.7500	0.1800	2.6550	(29a)
500mm mineral wool	43.3600		43.3600	0.1100	4.7696	(30)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.6587	(33)
Main dwelling						
Party Wall 1			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.0141 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	4.7800	0.0500	0.2390
E3 Sill	3.8800	0.0500	0.1940
E4 Jamb	17.9200	0.0500	0.8960
E7 Party floor between dwellings (in blocks of flats)	17.6700	0.0700	1.2369
E16 Corner (normal)	5.0000	0.0900	0.4500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.5900	0.0000	0.0000
E14 Flat roof	17.6700	0.0800	1.4136
P4 Party wall - Roof (insulation at ceiling level)	12.5900	0.1200	1.5108
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5403 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 25.1990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	46.0145	45.8869	45.7618	45.1741	45.0641	44.5523	44.5523	44.4575	44.7494	45.0641	45.2866	45.5191	(39)
Average = Sum(39)m / 12 =												45.1735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0612	1.0583	1.0554	1.0418	1.0393	1.0275	1.0275	1.0253	1.0320	1.0393	1.0444	1.0498	(40)
HLP (average)												1.0418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.0518	76.4502	69.0518	71.3535	69.0518	71.3535	69.0518	69.0518	71.3535	69.0518	71.3535	69.0518	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	368.9363	375.8469	361.5069	348.8073	332.6121	318.3548	307.2620	308.4334	317.0921	330.5443	349.4255	362.2051	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	19.6403	0.6300	0.7000	0.7700	39.8554	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	39.8554	77.9656	128.3983	187.2612	229.4957	234.9297	223.6626	192.1229	149.3325	92.5128	49.6950	32.7751	(83)
Total gains	408.7917	453.8125	489.9052	536.0685	562.1078	553.2845	530.9247	500.5563	466.4246	423.0570	399.1205	394.9803	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8575	46.9878	47.1163	47.7293	47.8457	48.3954	48.3954	48.4986	48.1822	47.8457	47.6107	47.3675	
alpha	4.1238	4.1325	4.1411	4.1820	4.1897	4.2264	4.2264	4.2332	4.2121	4.1897	4.1740	4.1578	
util living area	0.9639	0.9439	0.9057	0.8148	0.6747	0.4997	0.3658	0.4030	0.6174	0.8463	0.9397	0.9679	(86)
MIT	19.7811	19.9887	20.2832	20.6408	20.8696	20.9716	20.9939	20.9909	20.9319	20.6378	20.1682	19.7516	(87)
Th 2	20.0326	20.0351	20.0374	20.0486	20.0507	20.0605	20.0605	20.0623	20.0567	20.0507	20.0465	20.0420	(88)
util rest of house	0.9564	0.9327	0.8871	0.7810	0.6224	0.4319	0.2893	0.3234	0.5470	0.8100	0.9257	0.9612	(89)
MIT 2	18.6417	18.9012	19.2638	19.6921	19.9396	20.0424	20.0580	20.0583	20.0086	19.7012	19.1370	18.6117	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.1859	19.4206	19.7507	20.1452	20.3838	20.4862	20.5050	20.5038	20.4496	20.1486	19.6295	19.1561	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1859	19.4206	19.7507	20.1452	20.3838	20.4862	20.5050	20.5038	20.4496	20.1486	19.6295	19.1561	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9483	0.9242	0.8808	0.7847	0.6414	0.4631	0.3257	0.3612	0.5773	0.8141	0.9185	0.9535	(94)
Useful gains	387.6771	419.4251	431.4878	420.6633	360.5559	256.2432	172.9274	180.8171	269.2477	344.4106	366.5953	376.6321	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	684.9669	666.3041	606.3758	507.9927	391.3278	262.2440	173.9782	182.4424	284.1393	430.2985	567.4198	680.7898	(97)
Space heating kWh	221.1836	165.9027	130.1167	62.8771	22.8943	0.0000	0.0000	0.0000	0.0000	63.9006	144.5936	226.2934	(98a)
Space heating requirement - total per year (kWh/year)												1037.7620	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	221.1836	165.9027	130.1167	62.8771	22.8943	0.0000	0.0000	0.0000	0.0000	63.9006	144.5936	226.2934	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1037.7620	
Space heating per m2										(98c) / (4) =		23.9336	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	221.1836	165.9027	130.1167	62.8771	22.8943	0.0000	0.0000	0.0000	0.0000	63.9006	144.5936	226.2934	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	239.6355	179.7429	140.9715	68.1226	24.8042	0.0000	0.0000	0.0000	0.0000	69.2315	156.6561	245.1716	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.4803	84.1076	83.4287	82.2203	80.8865	79.8000	79.8000	79.8000	79.8000	82.2239	83.7773	84.5538	(217)
Fuel for water heating, kWh/month	217.1514	193.0952	207.4627	186.8313	185.2607	170.5061	169.2907	175.3325	176.4869	189.4704	195.8713	214.8307	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.3476	11.5102	10.3636	7.5928	5.8649	4.7917	5.3502	6.9544	9.0330	11.8518	13.3866	14.7464	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3196	-12.6515	-19.6021	-23.8221	-27.3050	-26.1047	-25.8068	-23.5584	-19.8837	-15.2375	-9.4737	-7.0906	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2617	-4.9168	-10.0734	-15.5779	-21.0367	-21.2830	-21.0140	-17.5742	-12.6116	-7.1556	-3.0599	-1.7757	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1124.3359	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2281.5901	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	115.7933	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3250.5231	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1124.3359	0.2100	236.1105	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2281.5901	0.2100	479.1339	(264)
Space and water heating			715.2444	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	115.7933	0.1443	16.7126	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	0.1330	-29.1103	
PV Unit electricity exported	-138.3404	0.1251	-17.3028	
Total			-46.4132	(269)
Total CO2, kg/year			697.4731	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.0900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1124.3359	1.1300	1270.4995	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2281.5901	1.1300	2578.1968	(278)
Space and water heating			3848.6963	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	115.7933	1.5338	177.6076	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	1.4915	-326.4228	
PV Unit electricity exported	-138.3404	0.4591	-63.5081	
Total			-389.9309	(283)
Total Primary energy kWh/year			3766.4739	(286)
Target Primary Energy Rate (TPER)			86.8700	(287)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.35	**TER**	16.09
Environmental	99 A	**% DER < TER**			91.61
CO_2 Emissions (t/year)	0.04	**DFEE**	21.90	**TFEE**	32.86
Compliance Check	See BREL	**% DFEE < TFEE**			33.34
% DPER < TPER	71.80	**DPER**	24.49	**TPER**	86.87

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area		Storey height		Volume	
Main dwelling		(m2)		(m)		(m3)	
Ground floor		43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2622	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		7762.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							179.0141	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		17.4572	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	36.9438	36.8677	36.7932	36.4431	36.3776	36.0727	36.0727	36.0162	36.1901	36.3776	36.5101	36.6486	(39)
Average = Sum(39)m / 12 =												36.4428	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8520	0.8503	0.8486	0.8405	0.8390	0.8319	0.8319	0.8306	0.8346	0.8390	0.8420	0.8452	(40)
HLP (average)												0.8405	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												449.4572	(64a)
Heat gains from water heating, kWh/month	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0601	78.6737	71.0601	73.4288	71.0601	73.4288	71.0601	71.0601	73.4288	71.0601	73.4288	71.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.0895	291.1341	278.7010	271.1858	257.9340	249.9230	240.9368	240.6593	247.6349	254.4733	268.5369	277.0546	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	19.6403	0.6800	0.7000	0.7700	43.0185	(80)

Solar gains	43.0185	84.1534	138.5886	202.1232	247.7096	253.5749	241.4136	207.3707	161.1843	99.8551	53.6391	35.3763	(83)
Total gains	326.1080	375.2875	417.2896	473.3090	505.6436	503.4979	482.3504	448.0301	408.8192	354.3283	322.1760	312.4309	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.3623	58.4827	58.6012	59.1642	59.2707	59.7717	59.7717	59.8654	59.5777	59.2707	59.0556	58.8323	
alpha	4.8908	4.8988	4.9067	4.9443	4.9514	4.9848	4.9848	4.9910	4.9718	4.9514	4.9370	4.9222	
util living area	0.9786	0.9583	0.9148	0.8010	0.6358	0.4534	0.3282	0.3682	0.5892	0.8580	0.9585	0.9822	(86)
MIT	19.9792	20.1978	20.4793	20.7875	20.9421	20.9911	20.9986	20.9975	20.9696	20.7444	20.3172	19.9396	(87)
Th 2	20.2085	20.2100	20.2115	20.2184	20.2197	20.2257	20.2257	20.2269	20.2234	20.2197	20.2171	20.2143	(88)
util rest of house	0.9742	0.9501	0.8989	0.7699	0.5907	0.4004	0.2709	0.3070	0.5299	0.8267	0.9489	0.9785	(89)

MIT 2	19.2829	19.4971	19.7676	20.0531	20.1810	20.2212	20.2253	20.2259	20.2063	20.0237	19.6219	19.2488	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.6155	19.8318	20.1075	20.4039	20.5445	20.5889	20.5946	20.5945	20.5709	20.3679	19.9540	19.5788	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6155	19.8318	20.1075	20.4039	20.5445	20.5889	20.5946	20.5945	20.5709	20.3679	19.9540	19.5788	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9702	0.9456	0.8966	0.7776	0.6098	0.4254	0.2982	0.3362	0.5569	0.8331	0.9452	0.9748	(94)
Useful gains	316.3988	354.8752	374.1523	368.0670	308.3573	214.2081	143.8510	150.6270	227.6810	295.2080	304.5131	304.5609	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	565.8119	550.5012	500.6651	419.2363	321.7425	216.0367	144.0961	151.0683	234.1815	355.3338	469.3010	563.6107	(97)
Space heating kWh	185.5633	131.4607	94.1255	36.8419	9.9586	0.0000	0.0000	0.0000	0.0000	44.7336	118.6473	192.7331	(98a)
Space heating requirement - total per year (kWh/year)												814.0640	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	185.5633	131.4607	94.1255	36.8419	9.9586	0.0000	0.0000	0.0000	0.0000	44.7336	118.6473	192.7331	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												814.0640	
Space heating per m2											(98c) / (4) =	18.7745	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	339.0831	266.9377	273.7231	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9659	0.9843	0.9766	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	327.5254	262.7454	267.3261	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	559.8297	536.6719	497.9536	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	167.2592	203.8013	171.5869	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	41.8148	50.9503	42.8967	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												135.6618	(107)
Energy for space heating												18.7745	(99)
Energy for space cooling												3.1287	(108)
Total												21.9033	(109)
Fabric Energy Efficiency (DFEE)												21.9	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.6400	1.1450	7.6031			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.1800	1.7910			(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.1800	2.6550			(29a)
500mm mineral wool	43.3600		43.3600	0.1100	4.7696			(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.6587			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.0141 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	4.7800	0.0500	0.2390
E3 Sill	3.8800	0.0500	0.1940
E4 Jamb	17.9200	0.0500	0.8960
E7 Party floor between dwellings (in blocks of flats)	17.6700	0.0700	1.2369
E16 Corner (normal)	5.0000	0.0900	0.4500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.5900	0.0000	0.0000
E14 Flat roof	17.6700	0.0800	1.4136
P4 Party wall - Roof (insulation at ceiling level)	12.5900	0.1200	1.5108
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5403 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.1990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	46.0145	45.8869	45.7618	45.1741	45.0641	44.5523	44.5523	44.4575	44.7494	45.0641	45.2866	45.5191	(39)
Average = Sum(39)m / 12 =												45.1735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0612	1.0583	1.0554	1.0418	1.0393	1.0275	1.0275	1.0253	1.0320	1.0393	1.0444	1.0498	(40)
HLP (average)												1.0418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)													
	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							449.4572	(64a)
Heat gains from water heating, kWh/month													
	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	69.0518	76.4502	69.0518	71.3535	69.0518	71.3535	69.0518	69.0518	71.3535	69.0518	71.3535	69.0518	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains													
	281.0812	288.9106	276.6927	269.1105	255.9256	247.8477	238.9285	238.6510	245.5596	252.4649	266.4616	275.0462	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	19.6403	0.6300	0.7000	0.7700	39.8554	(80)

Solar gains	39.8554	77.9656	128.3983	187.2612	229.4957	234.9297	223.6626	192.1229	149.3325	92.5128	49.6950	32.7751	(83)
Total gains	320.9366	366.8763	405.0910	456.3717	485.4213	482.7774	462.5911	430.7739	394.8921	344.9777	316.1566	307.8214	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8575	46.9878	47.1163	47.7293	47.8457	48.3954	48.3954	48.4986	48.1822	47.8457	47.6107	47.3675	
alpha	4.1238	4.1325	4.1411	4.1820	4.1897	4.2264	4.2264	4.2332	4.2121	4.1897	4.1740	4.1578	
util living area													
	0.9839	0.9713	0.9452	0.8722	0.7439	0.5627	0.4172	0.4639	0.6982	0.9082	0.9711	0.9863	(86)
MIT	19.5262	19.7540	20.0850	20.5141	20.8102	20.9558	20.9900	20.9846	20.8916	20.4915	19.9459	19.4946	(87)
Th 2	20.0326	20.0351	20.0374	20.0486	20.0507	20.0605	20.0605	20.0623	20.0567	20.0507	20.0465	20.0420	(88)
util rest of house													
	0.9803	0.9649	0.9328	0.8446	0.6934	0.4897	0.3311	0.3741	0.6269	0.8818	0.9635	0.9832	(89)
MIT 2	18.7000	18.9257	19.2497	19.6620	19.9208	20.0380	20.0572	20.0569	19.9944	19.6525	19.1257	18.6759	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.0946	19.3213	19.6487	20.0690	20.3456	20.4764	20.5028	20.5000	20.4229	20.0532	19.5174	19.0669	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0946	19.3213	19.6487	20.0690	20.3456	20.4764	20.5028	20.5000	20.4229	20.0532	19.5174	19.0669	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9757	0.9591	0.9270	0.8452	0.7100	0.5228	0.3721	0.4167	0.6560	0.8819	0.9583	0.9790	(94)
Useful gains	313.1370	351.8664	375.5045	385.7415	344.6275	252.3984	172.1308	179.4860	259.0434	304.2354	302.9775	301.3667	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	680.7677	661.7509	601.7063	504.5490	389.6051	261.8051	173.8771	182.2749	282.9482	426.0007	562.3435	676.7286	(97)
Space heating kWh													
	273.5173	208.2424	168.2941	85.5414	33.4633	0.0000	0.0000	0.0000	0.0000	90.5934	186.7436	279.2692	(98a)
Space heating requirement - total per year (kWh/year)												1325.6646	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	273.5173	208.2424	168.2941	85.5414	33.4633	0.0000	0.0000	0.0000	0.0000	90.5934	186.7436	279.2692	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1325.6646	
Space heating per m2											(98c) / (4) =	30.5734	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	418.7912	329.6867	337.8767	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8946	0.9397	0.9203	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	374.6578	309.8225	310.9425	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	537.8609	515.7341	479.8847	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	117.5062	153.1982	125.6930	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	29.3766	38.2996	31.4232	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												99.0993	(107)
Energy for space heating												30.5734	(99)
Energy for space cooling												2.2855	(108)
Total												32.8589	(109)
Fabric Energy Efficiency (TFEE)												32.9	(109)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.35	**TER**	16.09
Environmental	99 A	**% DER < TER**			91.61
CO_2 Emissions (t/year)	0.04	**DFEE**	21.90	**TFEE**	32.86
Compliance Check	See BREL	**% DFEE < TFEE**			33.34
% DPER < TPER	71.80	**DPER**	24.49	**TPER**	86.87

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
12Total per year (kWh/year)												2188	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0601	78.6737	71.0601	73.4288	71.0601	73.4288	71.0601	71.0601	73.4288	71.0601	73.4288	71.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.2801	384.4058	369.8506	357.2179	340.9558	329.7655	318.6057	319.7771	328.5028	338.8880	357.8362	370.5488	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	19.6403	0.6800	0.7000	0.7700	43.0185	(80)

Solar gains	43.0185	84.1534	138.5886	202.1232	247.7096	253.5749	241.4136	207.3707	161.1843	99.8551	53.6391	35.3763	(83)
Total gains	420.2986	468.5592	508.4392	559.3412	588.6654	583.3403	560.0194	527.1478	489.6871	438.7430	411.4752	405.9252	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292

alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.9398	0.9028	0.8353	0.7026	0.5404	0.3821	0.2746	0.3048	0.4861	0.7494	0.8975	0.9479	(86)
MIT	20.3438	20.5137	20.7137	20.8948	20.9749	20.9964	20.9995	20.9991	20.9884	20.8785	20.5944	20.2962	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.9295	0.8876	0.8122	0.6690	0.5000	0.3378	0.2278	0.2552	0.4355	0.7111	0.8791	0.9387	(89)
MIT 2	19.5032	19.7088	19.9449	20.1459	20.2265	20.2451	20.2472	20.2470	20.2393	20.1338	19.8104	19.4449	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.9047	20.0932	20.3121	20.5036	20.5840	20.6039	20.6065	20.6062	20.5971	20.4895	20.1848	19.8515	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9047	20.0932	20.3121	20.5036	20.5840	20.6039	20.6065	20.6062	20.5971	20.4895	20.1848	19.8515	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9242	0.8842	0.8143	0.6807	0.5183	0.3588	0.2501	0.2789	0.4592	0.7239	0.8774	0.9332	(94)
Useful gains	388.4213	414.2950	414.0272	380.7485	305.0774	209.3208	140.0800	146.9996	224.8671	317.5946	361.0486	378.8125	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	545.9365	531.5426	483.2225	405.9587	310.8096	210.0504	140.1688	147.1562	227.3042	345.9883	457.7791	547.5744	(97)
Space heating kWh	117.1913	78.7904	51.4812	18.1513	4.2647	0.0000	0.0000	0.0000	0.0000	21.1249	69.6459	125.5588	(98a)
Space heating requirement - total per year (kWh/year)												486.2086	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	117.1913	78.7904	51.4812	18.1513	4.2647	0.0000	0.0000	0.0000	0.0000	21.1249	69.6459	125.5588	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												486.2086	
Space heating per m2											(98c) / (4) =	11.2133	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	117.1913	78.7904	51.4812	18.1513	4.2647	0.0000	0.0000	0.0000	0.0000	21.1249	69.6459	125.5588	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	175.7869	118.1856	77.2219	27.2270	6.3971	0.0000	0.0000	0.0000	0.0000	31.6873	104.4689	188.3383	
Space heating requirement	175.7869	118.1856	77.2219	27.2270	6.3971	0.0000	0.0000	0.0000	0.0000	31.6873	104.4689	188.3383	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												729.3129	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												7.2931	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3192.5049	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1069.5443	0.1575	30.6398	(367)
Electrical energy for heat distribution (space & water)	7.2931	0.0000	5.7669	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			159.5500	(373)
Space and water heating			159.5500	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			58.6170	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.3500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1069.5443	1.5832	307.9063	(467)
Electrical energy for heat distribution (space & water)	7.2931	0.0000	61.4362	(472)
Overall CO2 factor for heat network			0.4238	(486)
Total CO2 associated with community systems			1699.7356	(473)
Space and water heating			1699.7356	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	1.4901	-605.6307	
PV Unit electricity exported	-551.7766	0.4464	-246.3315	
Total			-851.9622	(480)
Total Primary energy kWh/year			1062.0888	(483)
Dwelling Primary energy Rate (DPER)			24.4900	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.6400	1.1450	7.6031			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.1800	1.7910			(29a)

Wall to Unheated Com	16.5900	1.8400	14.7500	0.1800	2.6550	(29a)
500mm mineral wool	43.3600		43.3600	0.1100	4.7696	(30)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.6587	(33)
Main dwelling						
Party Wall 1			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.0141 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	4.7800	0.0500	0.2390
E3 Sill	3.8800	0.0500	0.1940
E4 Jamb	17.9200	0.0500	0.8960
E7 Party floor between dwellings (in blocks of flats)	17.6700	0.0700	1.2369
E16 Corner (normal)	5.0000	0.0900	0.4500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.5900	0.0000	0.0000
E14 Flat roof	17.6700	0.0800	1.4136
P4 Party wall - Roof (insulation at ceiling level)	12.5900	0.1200	1.5108
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5403 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 25.1990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	46.0145	45.8869	45.7618	45.1741	45.0641	44.5523	44.5523	44.4575	44.7494	45.0641	45.2866	45.5191	(39)
Average = Sum(39)m / 12 =												45.1735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0612	1.0583	1.0554	1.0418	1.0393	1.0275	1.0275	1.0253	1.0320	1.0393	1.0444	1.0498	(40)
HLP (average)												1.0418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.0518	76.4502	69.0518	71.3535	69.0518	71.3535	69.0518	69.0518	71.3535	69.0518	71.3535	69.0518	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	368.9363	375.8469	361.5069	348.8073	332.6121	318.3548	307.2620	308.4334	317.0921	330.5443	349.4255	362.2051	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	19.6403	0.6300	0.7000	0.7700	39.8554	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	39.8554	77.9656	128.3983	187.2612	229.4957	234.9297	223.6626	192.1229	149.3325	92.5128	49.6950	32.7751	(83)
Total gains	408.7917	453.8125	489.9052	536.0685	562.1078	553.2845	530.9247	500.5563	466.4246	423.0570	399.1205	394.9803	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8575	46.9878	47.1163	47.7293	47.8457	48.3954	48.3954	48.4986	48.1822	47.8457	47.6107	47.3675	
alpha	4.1238	4.1325	4.1411	4.1820	4.1897	4.2264	4.2264	4.2332	4.2121	4.1897	4.1740	4.1578	
util living area	0.9639	0.9439	0.9057	0.8148	0.6747	0.4997	0.3658	0.4030	0.6174	0.8463	0.9397	0.9679	(86)
MIT	19.7811	19.9887	20.2832	20.6408	20.8696	20.9716	20.9939	20.9909	20.9319	20.6378	20.1682	19.7516	(87)
Th 2	20.0326	20.0351	20.0374	20.0486	20.0507	20.0605	20.0605	20.0623	20.0567	20.0507	20.0465	20.0420	(88)
util rest of house	0.9564	0.9327	0.8871	0.7810	0.6224	0.4319	0.2893	0.3234	0.5470	0.8100	0.9257	0.9612	(89)
MIT 2	18.6417	18.9012	19.2638	19.6921	19.9396	20.0424	20.0580	20.0583	20.0086	19.7012	19.1370	18.6117	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.1859	19.4206	19.7507	20.1452	20.3838	20.4862	20.5050	20.5038	20.4496	20.1486	19.6295	19.1561	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1859	19.4206	19.7507	20.1452	20.3838	20.4862	20.5050	20.5038	20.4496	20.1486	19.6295	19.1561	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9483	0.9242	0.8808	0.7847	0.6414	0.4631	0.3257	0.3612	0.5773	0.8141	0.9185	0.9535	(94)
Useful gains	387.6771	419.4251	431.4878	420.6633	360.5559	256.2432	172.9274	180.8171	269.2477	344.4106	366.5953	376.6321	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	684.9669	666.3041	606.3758	507.9927	391.3278	262.2440	173.9782	182.4424	284.1393	430.2985	567.4198	680.7898	(97)
Space heating kWh	221.1836	165.9027	130.1167	62.8771	22.8943	0.0000	0.0000	0.0000	0.0000	63.9006	144.5936	226.2934	(98a)
Space heating requirement - total per year (kWh/year)												1037.7620	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	221.1836	165.9027	130.1167	62.8771	22.8943	0.0000	0.0000	0.0000	0.0000	63.9006	144.5936	226.2934	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1037.7620	
Space heating per m2										(98c) / (4) =		23.9336	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	221.1836	165.9027	130.1167	62.8771	22.8943	0.0000	0.0000	0.0000	0.0000	63.9006	144.5936	226.2934	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	239.6355	179.7429	140.9715	68.1226	24.8042	0.0000	0.0000	0.0000	0.0000	69.2315	156.6561	245.1716	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.4803	84.1076	83.4287	82.2203	80.8865	79.8000	79.8000	79.8000	79.8000	82.2239	83.7773	84.5538	(217)
Fuel for water heating, kWh/month	217.1514	193.0952	207.4627	186.8313	185.2607	170.5061	169.2907	175.3325	176.4869	189.4704	195.8713	214.8307	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.3476	11.5102	10.3636	7.5928	5.8649	4.7917	5.3502	6.9544	9.0330	11.8518	13.3866	14.7464	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3196	-12.6515	-19.6021	-23.8221	-27.3050	-26.1047	-25.8068	-23.5584	-19.8837	-15.2375	-9.4737	-7.0906	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2617	-4.9168	-10.0734	-15.5779	-21.0367	-21.2830	-21.0140	-17.5742	-12.6116	-7.1556	-3.0599	-1.7757	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1124.3359	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2281.5901	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	115.7933	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3250.5231	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1124.3359	0.2100	236.1105	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2281.5901	0.2100	479.1339	(264)
Space and water heating			715.2444	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	115.7933	0.1443	16.7126	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	0.1330	-29.1103	
PV Unit electricity exported	-138.3404	0.1251	-17.3028	
Total			-46.4132	(269)
Total CO2, kg/year			697.4731	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.0900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1124.3359	1.1300	1270.4995	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2281.5901	1.1300	2578.1968	(278)
Space and water heating			3848.6963	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	115.7933	1.5338	177.6076	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	1.4915	-326.4228	
PV Unit electricity exported	-138.3404	0.4591	-63.5081	
Total			-389.9309	(283)
Total Primary energy kWh/year			3766.4739	(286)
Target Primary Energy Rate (TPER)			86.8700	(287)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.35	**TER**	16.09
Environmental	99 A	**% DER < TER**			91.61
CO_2 Emissions (t/year)	0.04	**DFEE**	21.90	**TFEE**	32.86
Compliance Check	See BREL	**% DFEE < TFEE**			33.34
% DPER < TPER	71.80	**DPER**	24.49	**TPER**	86.87

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600 (1b)	x	2.4500 (2b)	=	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	19.6403	0.6800	0.7000	0.7700	43.0185	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	43.0185	84.1534	138.5886	202.1232	247.7096	253.5749	241.4136	207.3707	161.1843	99.8551	53.6391	35.3763	(83)
Total gains	460.9295	500.2679	543.1589	585.0287	609.7829	596.7343	573.4459	541.8830	506.6562	464.7443	442.0465	444.2200	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086

util living area													
	0.9178	0.8816	0.8065	0.6791	0.5233	0.3736	0.2682	0.2966	0.4707	0.7201	0.8735	0.9287	(86)
MIT	20.4411	20.5762	20.7599	20.9098	20.9783	20.9967	20.9995	20.9992	20.9900	20.8989	20.6526	20.3925	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house													
	0.9048	0.8644	0.7816	0.6454	0.4837	0.3303	0.2224	0.2482	0.4214	0.6810	0.8525	0.9170	(89)
MIT 2	19.6207	19.7824	19.9963	20.1610	20.2294	20.2453	20.2472	20.2470	20.2404	20.1539	19.8775	19.5620	(90)
Living area fraction											fLA = Living area / (4) =	0.4776	(91)
MIT	20.0125	20.1616	20.3610	20.5186	20.5871	20.6042	20.6065	20.6063	20.5984	20.5097	20.2477	19.9586	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0125	20.1616	20.3610	20.5186	20.5871	20.6042	20.6065	20.6063	20.5984	20.5097	20.2477	19.9586	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9004	0.8623	0.7855	0.6578	0.5017	0.3509	0.2443	0.2713	0.4446	0.6951	0.8525	0.9121	(94)
Useful gains	414.9991	431.3661	426.6509	384.8327	305.9559	209.4025	140.0909	147.0215	225.2448	323.0388	376.8273	405.1517	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	549.7096	533.9329	484.9335	406.4836	310.9181	210.0605	140.1702	147.1590	227.3508	346.6970	459.9785	551.3236	(97)
Space heating kWh													
	100.2246	68.9249	43.3623	15.5886	3.6919	0.0000	0.0000	0.0000	0.0000	17.6016	59.8688	108.7519	(98a)
Space heating requirement - total per year (kWh/year)												418.0146	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	100.2246	68.9249	43.3623	15.5886	3.6919	0.0000	0.0000	0.0000	0.0000	17.6016	59.8688	108.7519	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												418.0146	
Space heating per m2											(98c) / (4) =	9.6406	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	100.2246	68.9249	43.3623	15.5886	3.6919	0.0000	0.0000	0.0000	0.0000	17.6016	59.8688	108.7519	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	150.3369	103.3873	65.0434	23.3829	5.5379	0.0000	0.0000	0.0000	0.0000	26.4025	89.8032	163.1279	
Space heating requirement													
	150.3369	103.3873	65.0434	23.3829	5.5379	0.0000	0.0000	0.0000	0.0000	26.4025	89.8032	163.1279	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												627.0220	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												6.2702	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3090.2140	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	627.0220	4.4400	27.8398	(340a)
Space heating total			27.8398	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	16.4900	2.5157	(349)
Energy for lighting	124.6784	16.4900	20.5595	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	16.4900	-67.0227	
PV Unit electricity exported	-551.7766	5.5900	-30.8443	
Total			-97.8670	(352)
Total energy cost			190.7457	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7771 (357)
SAP value		87.4025
SAP rating (Section 12)		87 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1042.2668	0.1576	26.3504	(367)
Electrical energy for heat distribution (space & water)	6.2702	0.0000	5.6060	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			155.0998	(373)
Space and water heating			155.0998	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			54.1668	(383)
CO2 emissions per m2			1.2500	(384)
EI value			99.1785	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume						106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)

Adj infilt rate

	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	23.7835	0.6800	0.7000	0.7700	52.0935	(80)

Solar gains	52.0935	90.5491	146.7062	215.9115	254.4951	279.3109	260.9848	228.8358	179.9437	113.3085	63.9852	43.0855	(83)
Total gains	470.0045	506.6636	551.2765	598.8169	616.5683	622.4703	593.0171	563.3481	525.4156	478.1977	452.3927	451.9291	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area													
	0.9073	0.8704	0.7832	0.6492	0.4920	0.3253	0.2300	0.2544	0.4358	0.6796	0.8538	0.9199	(86)
MIT	20.4892	20.6125	20.7987	20.9287	20.9844	20.9985	20.9998	20.9997	20.9932	20.9260	20.7016	20.4399	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house													
	0.8929	0.8519	0.7563	0.6145	0.4521	0.2834	0.1857	0.2078	0.3874	0.6381	0.8303	0.9069	(89)
MIT 2	19.6790	19.8255	20.0402	20.1804	20.2349	20.2465	20.2473	20.2473	20.2429	20.1812	19.9343	19.6198	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0660	20.2014	20.4025	20.5378	20.5929	20.6056	20.6067	20.6066	20.6013	20.5369	20.3008	20.0115	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0660	20.2014	20.4025	20.5378	20.5929	20.6056	20.6067	20.6066	20.6013	20.5369	20.3008	20.0115	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8891	0.8507	0.7620	0.6281	0.4705	0.3033	0.2068	0.2301	0.4103	0.6545	0.8320	0.9024	(94)
Useful gains	417.8877	431.0011	420.0844	376.1181	290.1150	188.8195	122.6533	129.6230	215.5592	312.9642	376.4086	407.8368	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	541.0846	524.8315	468.8937	393.1603	293.6284	189.1192	122.6844	129.6780	216.9544	330.1544	447.8414	542.6760	(97)
Space heating kWh													
	91.6585	63.0540	36.3141	12.2704	2.6140	0.0000	0.0000	0.0000	0.0000	12.7895	51.4316	100.3204	(98a)
Space heating requirement - total per year (kWh/year)												370.4525	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	91.6585	63.0540	36.3141	12.2704	2.6140	0.0000	0.0000	0.0000	0.0000	12.7895	51.4316	100.3204	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												370.4525	
Space heating per m2											(98c) / (4) =	8.5436	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	91.6585	63.0540	36.3141	12.2704	2.6140	0.0000	0.0000	0.0000	0.0000	12.7895	51.4316	100.3204	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	137.4878	94.5810	54.4711	18.4056	3.9210	0.0000	0.0000	0.0000	0.0000	19.1843	77.1474	150.4806	
Space heating requirement													
	137.4878	94.5810	54.4711	18.4056	3.9210	0.0000	0.0000	0.0000	0.0000	19.1843	77.1474	150.4806	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5669	-24.0727	-38.8745	-48.0493	-52.9789	-51.6524	-50.3986	-46.8694	-39.7890	-30.3128	-18.7591	-13.8902	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4316	-15.8925	-38.3705	-69.5238	-96.2615	-109.4663	-104.0915	-84.3722	-54.5598	-26.6835	-10.2713	-5.6085	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	555.6787	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	5.5568	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)		
mechanical ventilation fans (SFP = 0.1177)	15.2561	(330a)
Total electricity for the above, kWh/year	15.2561	(331)
Electricity for lighting (calculated in Appendix L)	124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2922.3447	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	555.6787	6.5500	36.3970	(340a)
Space heating total			36.3970	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	28.4300	4.3373	(349)
Energy for lighting	124.6784	28.4300	35.4461	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	28.4300	-122.8784	
PV Unit electricity exported	-622.5330	5.8100	-36.1692	
Total			-159.0476	(352)
Total energy cost			236.0696	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1023.2419	0.1580	23.4170	(367)
Electrical energy for heat distribution (space & water)	5.5568	0.0000	5.4960	(372)
Overall CO2 factor for heat network			0.0396	(386)
Total CO2 associated with community systems			152.0564	(373)
Space and water heating			152.0564	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	0.1330	-57.4796	
PV Unit electricity exported	-622.5330	0.1218	-75.7970	
Total			-133.2765	(380)
Total CO2, kg/year			38.8911	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1023.2419	1.5850	234.8652	(467)
Electrical energy for heat distribution (space & water)	5.5568	0.0000	58.6972	(472)
Overall CO2 factor for heat network			0.4232	(486)
Total CO2 associated with community systems			1623.9554	(473)
Space and water heating			1623.9554	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	1.4914	-644.6094	
PV Unit electricity exported	-622.5330	0.4467	-278.0656	
Total			-922.6749	(480)
Total Primary energy kWh/year			915.5959	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - East

Current energy efficiency rating:	B 87
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 87
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£40	£40	£0
Community scheme	£355	£355	£0
Space heating	£145	£145	£0
Water heating	£215	£215	£0
Lighting	£35	£35	£0
Generated (PV)	-£159	-£159	£0
Total cost of fuels	£236	£236	£0
Total cost of uses	£236	£236	£0
Delivered energy	67 kWh/m²	67 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.0 tonnes	0.0 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	21 kWh/m²	21 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)

Total net area of external elements Aum(A, m2)	76.5400				(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	15.1610			(33)
Main dwelling					
Party Wall 1	31.3600	0.0000	0.0000	70.0000	2195.2000 (32)
Party Floor 1	43.3600			70.0000	3035.2000 (32d)
Internal TF Wall	68.4500			9.0000	616.0500 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	19.6403	0.6800	0.7000	0.7700	43.0185	(80)

Solar gains	43.0185	84.1534	138.5886	202.1232	247.7096	253.5749	241.4136	207.3707	161.1843	99.8551	53.6391	35.3763	(83)
Total gains	460.9295	500.2679	543.1589	585.0287	609.7829	596.7343	573.4459	541.8830	506.6562	464.7443	442.0465	444.2200	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.9178	0.8816	0.8065	0.6791	0.5233	0.3736	0.2682	0.2966	0.4707	0.7201	0.8735	0.9287	(86)
MIT	20.4411	20.5762	20.7599	20.9098	20.9783	20.9967	20.9995	20.9992	20.9900	20.8989	20.6526	20.3925	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.9048	0.8644	0.7816	0.6454	0.4837	0.3303	0.2224	0.2482	0.4214	0.6810	0.8525	0.9170	(89)
MIT 2	19.6207	19.7824	19.9963	20.1610	20.2294	20.2453	20.2472	20.2470	20.2404	20.1539	19.8775	19.5620	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0125	20.1616	20.3610	20.5186	20.5871	20.6042	20.6065	20.6063	20.5984	20.5097	20.2477	19.9586	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0125	20.1616	20.3610	20.5186	20.5871	20.6042	20.6065	20.6063	20.5984	20.5097	20.2477	19.9586	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9004	0.8623	0.7855	0.6578	0.5017	0.3509	0.2443	0.2713	0.4446	0.6951	0.8525	0.9121	(94)
Useful gains	414.9991	431.3661	426.6509	384.8327	305.9559	209.4025	140.0909	147.0215	225.2448	323.0388	376.8273	405.1517	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	549.7096	533.9329	484.9335	406.4836	310.9181	210.0605	140.1702	147.1590	227.3508	346.6970	459.9785	551.3236	(97)
Space heating kWh	100.2246	68.9249	43.3623	15.5886	3.6919	0.0000	0.0000	0.0000	0.0000	17.6016	59.8688	108.7519	(98a)
Space heating requirement - total per year (kWh/year)												418.0146	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	100.2246	68.9249	43.3623	15.5886	3.6919	0.0000	0.0000	0.0000	0.0000	17.6016	59.8688	108.7519	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												418.0146	
Space heating per m2											(98c) / (4) =	9.6406	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	100.2246	68.9249	43.3623	15.5886	3.6919	0.0000	0.0000	0.0000	0.0000	17.6016	59.8688	108.7519	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	150.3369	103.3873	65.0434	23.3829	5.5379	0.0000	0.0000	0.0000	0.0000	26.4025	89.8032	163.1279	
Space heating requirement													
	150.3369	103.3873	65.0434	23.3829	5.5379	0.0000	0.0000	0.0000	0.0000	26.4025	89.8032	163.1279	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												627.0220	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												6.2702	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)

Appendix Q - special features

Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3090.2140	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	627.0220	4.4400	27.8398	(340a)
Space heating total			27.8398	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	16.4900	2.5157	(349)
Energy for lighting	124.6784	16.4900	20.5595	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	16.4900	-67.0227	
PV Unit electricity exported	-551.7766	5.5900	-30.8443	
Total			-97.8670	(352)
Total energy cost			190.7457	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7771	(357)
SAP value		87.4025	
SAP rating (Section 12)		87	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1042.2668	0.1576	26.3504	(367)
Electrical energy for heat distribution (space & water)	6.2702	0.0000	5.6060	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			155.0998	(373)
Space and water heating			155.0998	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			54.1668	(383)
CO2 emissions per m2			1.2500	(384)
EI value			99.1785	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

Measured/design AP50												3.0000	(17)
Infiltration rate												0.1500	(18)
Number of sides sheltered												3	(19)
Shelter factor								(20) = 1 - [0.075 x (19)] =				0.7750	(20)
Infiltration rate adjusted to include shelter factor								(21) = (18) x (20) =				0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)

Water heating gains (Table 5)

	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)

Total internal gains

	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	6.6400	23.7835	0.6800	0.7000	0.7700	52.0935	(80)

Solar gains	52.0935	90.5491	146.7062	215.9115	254.4951	279.3109	260.9848	228.8358	179.9437	113.3085	63.9852	43.0855	(83)
Total gains	470.0045	506.6636	551.2765	598.8169	616.5683	622.4703	593.0171	563.3481	525.4156	478.1977	452.3927	451.9291	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.9073	0.8704	0.7832	0.6492	0.4920	0.3253	0.2300	0.2544	0.4358	0.6796	0.8538	0.9199	(86)
MIT	20.4892	20.6125	20.7987	20.9287	20.9844	20.9985	20.9998	20.9997	20.9932	20.9260	20.7016	20.4399	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.8929	0.8519	0.7563	0.6145	0.4521	0.2834	0.1857	0.2078	0.3874	0.6381	0.8303	0.9069	(89)
MIT 2	19.6790	19.8255	20.0402	20.1804	20.2349	20.2465	20.2473	20.2473	20.2429	20.1812	19.9343	19.6198	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.0660	20.2014	20.4025	20.5378	20.5929	20.6056	20.6067	20.6066	20.6013	20.5369	20.3008	20.0115	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0660	20.2014	20.4025	20.5378	20.5929	20.6056	20.6067	20.6066	20.6013	20.5369	20.3008	20.0115	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8891	0.8507	0.7620	0.6281	0.4705	0.3033	0.2068	0.2301	0.4103	0.6545	0.8320	0.9024	(94)
Useful gains	417.8877	431.0011	420.0844	376.1181	290.1150	188.8195	122.6533	129.6230	215.5592	312.9642	376.4086	407.8368	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	541.0846	524.8315	468.8937	393.1603	293.6284	189.1192	122.6844	129.6780	216.9544	330.1544	447.8414	542.6760	(97)
Space heating kWh	91.6585	63.0540	36.3141	12.2704	2.6140	0.0000	0.0000	0.0000	0.0000	12.7895	51.4316	100.3204	(98a)
Space heating requirement - total per year (kWh/year)												370.4525	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	91.6585	63.0540	36.3141	12.2704	2.6140	0.0000	0.0000	0.0000	0.0000	12.7895	51.4316	100.3204	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												370.4525	
Space heating per m2										(98c) / (4) =		8.5436	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement

	91.6585	63.0540	36.3141	12.2704	2.6140	0.0000	0.0000	0.0000	0.0000	12.7895	51.4316	100.3204	(98)

Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50

307a	137.4878	94.5810	54.4711	18.4056	3.9210	0.0000	0.0000	0.0000	0.0000	19.1843	77.1474	150.4806	

Space heating requirement

	137.4878	94.5810	54.4711	18.4056	3.9210	0.0000	0.0000	0.0000	0.0000	19.1843	77.1474	150.4806	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)

Space heating fuel for secondary/supplementary system

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement

	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50

310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	

Water heating fuel

	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)

Cooling System Energy Efficiency Ratio 0.0000 (314)

Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)

Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5669	-24.0727	-38.8745	-48.0493	-52.9789	-51.6524	-50.3986	-46.8694	-39.7890	-30.3128	-18.7591	-13.8902	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4316	-15.8925	-38.3705	-69.5238	-96.2615	-109.4663	-104.0915	-84.3722	-54.5598	-26.6835	-10.2713	-5.6085	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	555.6787	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	5.5568	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)		
mechanical ventilation fans (SFP = 0.1177)	15.2561	(330a)
Total electricity for the above, kWh/year	15.2561	(331)
Electricity for lighting (calculated in Appendix L)	124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2922.3447	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	555.6787	6.5500	36.3970	(340a)
Space heating total			36.3970	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	28.4300	4.3373	(349)
Energy for lighting	124.6784	28.4300	35.4461	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	28.4300	-122.8784	
PV Unit electricity exported	-622.5330	5.8100	-36.1692	
Total			-159.0476	(352)
Total energy cost			236.0696	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1023.2419	0.1580	23.4170	(367)
Electrical energy for heat distribution (space & water)	5.5568	0.0000	5.4960	(372)
Overall CO2 factor for heat network			0.0396	(386)
Total CO2 associated with community systems			152.0564	(373)
Space and water heating			152.0564	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	0.1330	-57.4796	
PV Unit electricity exported	-622.5330	0.1218	-75.7970	
Total			-133.2765	(380)
Total CO2, kg/year			38.8911	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1023.2419	1.5850	234.8652	(467)
Electrical energy for heat distribution (space & water)	5.5568	0.0000	58.6972	(472)
Overall CO2 factor for heat network			0.4232	(486)
Total CO2 associated with community systems			1623.9554	(473)
Space and water heating			1623.9554	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	1.4914	-644.6094	
PV Unit electricity exported	-622.5330	0.4467	-278.0656	
Total			-922.6749	(480)
Total Primary energy kWh/year			915.5959	(483)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.17	**TER**	15.31
Environmental	99 A	**% DER < TER**			92.36
CO_2 Emissions (t/year)	0.03	**DFEE**	17.86	**TFEE**	28.52
Compliance Check	See BREL	**% DFEE < TFEE**			37.38
% DPER < TPER	72.57	**DPER**	22.68	**TPER**	82.69

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
12Total per year (kWh/year)												2188	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0601	78.6737	71.0601	73.4288	71.0601	73.4288	71.0601	71.0601	73.4288	71.0601	73.4288	71.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.2801	384.4058	369.8506	357.2179	340.9558	329.7655	318.6057	319.7771	328.5028	338.8880	357.8362	370.5488	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.6400	46.7521	0.6800	0.7000	0.7700	102.4021	(78)

Solar gains	102.4021	167.7083	213.6307	241.4490	251.6048	242.1354	236.5810	229.7530	223.1625	180.8892	121.3815	88.4849	(83)
Total gains	479.6822	552.1141	583.4813	598.6669	592.5606	571.9009	555.1868	549.5300	551.6652	519.7771	479.2176	459.0337	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292

alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086		
util living area	0.9067	0.8445	0.7728	0.6670	0.5372	0.3895	0.2770	0.2925	0.4340	0.6617	0.8424	0.9205	(86)
MIT	20.4822	20.6637	20.8044	20.9168	20.9756	20.9961	20.9994	20.9993	20.9931	20.9310	20.7135	20.4271	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.8925	0.8244	0.7464	0.6333	0.4969	0.3445	0.2297	0.2448	0.3879	0.6223	0.8187	0.9079	(89)
MIT 2	19.6698	19.8836	20.0452	20.1680	20.2271	20.2449	20.2472	20.2470	20.2426	20.1849	19.9465	19.6037	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0578	20.2562	20.4078	20.5256	20.5846	20.6037	20.6065	20.6063	20.6011	20.5413	20.3128	19.9970	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0578	20.2562	20.4078	20.5256	20.5846	20.6037	20.6065	20.6063	20.6011	20.5413	20.3128	19.9970	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8886	0.8247	0.7522	0.6460	0.5151	0.3659	0.2523	0.2676	0.4097	0.6380	0.8209	0.9032	(94)
Useful gains	426.2246	455.3127	438.8993	386.7453	305.2506	209.2425	140.0757	147.0316	225.9897	331.6335	393.3736	414.6135	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	551.2943	537.2449	486.5715	406.7280	310.8310	210.0408	140.1683	147.1602	227.4424	347.7998	462.2572	552.6651	(97)
Space heating kWh	93.0518	55.0585	35.4681	14.3875	4.1518	0.0000	0.0000	0.0000	0.0000	12.0277	49.5962	102.7104	(98a)
Space heating requirement - total per year (kWh/year)												366.4522	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	93.0518	55.0585	35.4681	14.3875	4.1518	0.0000	0.0000	0.0000	0.0000	12.0277	49.5962	102.7104	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												366.4522	
Space heating per m2										(98c) / (4) =		8.4514	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	93.0518	55.0585	35.4681	14.3875	4.1518	0.0000	0.0000	0.0000	0.0000	12.0277	49.5962	102.7104	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	139.5778	82.5877	53.2022	21.5813	6.2277	0.0000	0.0000	0.0000	0.0000	18.0416	74.3943	154.0656	
Space heating requirement	139.5778	82.5877	53.2022	21.5813	6.2277	0.0000	0.0000	0.0000	0.0000	18.0416	74.3943	154.0656	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												549.6782	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												5.4968	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3012.8703	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1021.6418	0.1579	23.1502	(367)
Electrical energy for heat distribution (space & water)	5.4968	0.0000	5.4860	(372)
Overall CO2 factor for heat network			0.0396	(386)
Total CO2 associated with community systems			151.7796	(373)
Space and water heating			151.7796	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			50.8466	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.1700	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1021.6418	1.5846	232.2744	(467)
Electrical energy for heat distribution (space & water)	5.4968	0.0000	58.6000	(472)
Overall CO2 factor for heat network			0.4232	(486)
Total CO2 associated with community systems			1621.2675	(473)
Space and water heating			1621.2675	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	1.4901	-605.6307	
PV Unit electricity exported	-551.7766	0.4464	-246.3315	
Total			-851.9622	(480)
Total Primary energy kWh/year			983.6207	(483)
Dwelling Primary energy Rate (DPER)			22.6800	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.6400	1.1450	7.6031			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.1800	1.7910			(29a)

Wall to Unheated Com	16.5900	1.8400	14.7500	0.1800	2.6550	(29a)
500mm mineral wool	43.3600		43.3600	0.1100	4.7696	(30)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.6587	(33)
Main dwelling						
Party Wall 1			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.0141 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	4.7800	0.0500	0.2390
E3 Sill	3.8800	0.0500	0.1940
E4 Jamb	17.9200	0.0500	0.8960
E7 Party floor between dwellings (in blocks of flats)	17.6700	0.0700	1.2369
E16 Corner (normal)	5.0000	0.0900	0.4500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.5900	0.0000	0.0000
E14 Flat roof	17.6700	0.0800	1.4136
P4 Party wall - Roof (insulation at ceiling level)	12.5900	0.1200	1.5108
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5403 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 25.1990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	46.0145	45.8869	45.7618	45.1741	45.0641	44.5523	44.5523	44.4575	44.7494	45.0641	45.2866	45.5191	(39)
Average = Sum(39)m / 12 =												45.1735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0612	1.0583	1.0554	1.0418	1.0393	1.0275	1.0275	1.0253	1.0320	1.0393	1.0444	1.0498	(40)
HLP (average)												1.0418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.0518	76.4502	69.0518	71.3535	69.0518	71.3535	69.0518	69.0518	71.3535	69.0518	71.3535	69.0518	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	368.9363	375.8469	361.5069	348.8073	332.6121	318.3548	307.2620	308.4334	317.0921	330.5443	349.4255	362.2051	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.6400	46.7521	0.6300	0.7000	0.7700	94.8726	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	94.8726	155.3768	197.9225	223.6954	233.1045	224.3313	219.1854	212.8594	206.7534	167.5885	112.4564	81.9786	(83)
Total gains	463.8089	531.2238	559.4294	572.5027	565.7165	542.6862	526.4474	521.2927	523.8456	498.1328	461.8819	444.1838	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8575	46.9878	47.1163	47.7293	47.8457	48.3954	48.3954	48.4986	48.1822	47.8457	47.6107	47.3675	
alpha	4.1238	4.1325	4.1411	4.1820	4.1897	4.2264	4.2264	4.2332	4.2121	4.1897	4.1740	4.1578	
util living area	0.9466	0.9119	0.8675	0.7879	0.6716	0.5084	0.3688	0.3877	0.5615	0.7819	0.9084	0.9534	(86)
MIT	19.9275	20.1713	20.4189	20.6875	20.8718	20.9697	20.9938	20.9922	20.9521	20.7409	20.3139	19.8860	(87)
Th 2	20.0326	20.0351	20.0374	20.0486	20.0507	20.0605	20.0605	20.0623	20.0567	20.0507	20.0465	20.0420	(88)
util rest of house	0.9362	0.8961	0.8442	0.7521	0.6193	0.4398	0.2917	0.3108	0.4939	0.7394	0.8894	0.9442	(89)
MIT 2	18.8223	19.1216	19.4216	19.7421	19.9417	20.0412	20.0579	20.0589	20.0237	19.8090	19.3103	18.7781	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.3502	19.6230	19.8980	20.1936	20.3859	20.4846	20.5049	20.5046	20.4672	20.2541	19.7896	19.3072	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3502	19.6230	19.8980	20.1936	20.3859	20.4846	20.5049	20.5046	20.4672	20.2541	19.7896	19.3072	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9275	0.8884	0.8405	0.7579	0.6384	0.4713	0.3284	0.3474	0.5240	0.7491	0.8836	0.9357	(94)
Useful gains	430.1696	471.9243	470.2151	433.9064	361.1778	255.7706	172.8877	181.0819	274.4949	373.1591	408.0984	415.6354	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	692.5266	675.5920	613.1140	510.1797	391.4243	262.1744	173.9722	182.4818	284.9265	435.0531	574.6695	687.6685	(97)
Space heating kWh	195.1936	136.8648	106.3168	54.9167	22.5034	0.0000	0.0000	0.0000	0.0000	46.0491	119.9312	202.3926	(98a)
Space heating requirement - total per year (kWh/year)												884.1681	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	195.1936	136.8648	106.3168	54.9167	22.5034	0.0000	0.0000	0.0000	0.0000	46.0491	119.9312	202.3926	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												884.1681	
Space heating per m2										(98c) / (4) =		20.3913	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	195.1936	136.8648	106.3168	54.9167	22.5034	0.0000	0.0000	0.0000	0.0000	46.0491	119.9312	202.3926	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	211.4773	148.2825	115.1861	59.4981	24.3807	0.0000	0.0000	0.0000	0.0000	49.8907	129.9363	219.2769	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.1992	83.6785	83.0010	81.9884	80.8701	79.8000	79.8000	79.8000	79.8000	81.6889	83.3678	84.3029	(217)
Fuel for water heating, kWh/month	217.8765	194.0852	208.5317	187.3598	185.2981	170.5061	169.2907	175.3325	176.4869	190.7114	196.8333	215.4701	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.3476	11.5102	10.3636	7.5928	5.8649	4.7917	5.3502	6.9544	9.0330	11.8518	13.3866	14.7464	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3196	-12.6515	-19.6021	-23.8221	-27.3050	-26.1047	-25.8068	-23.5584	-19.8837	-15.2375	-9.4737	-7.0906	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2617	-4.9168	-10.0734	-15.5779	-21.0367	-21.2830	-21.0140	-17.5742	-12.6116	-7.1556	-3.0599	-1.7757	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												957.9286	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2287.7823	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	115.7933	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3090.3082	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	957.9286	0.2100	201.1650	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2287.7823	0.2100	480.4343	(264)
Space and water heating			681.5993	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	115.7933	0.1443	16.7126	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	0.1330	-29.1103	
PV Unit electricity exported	-138.3404	0.1251	-17.3028	
Total			-46.4132	(269)
Total CO2, kg/year			663.8279	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.3100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	957.9286	1.1300	1082.4593	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2287.7823	1.1300	2585.1940	(278)
Space and water heating			3667.6534	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	115.7933	1.5338	177.6076	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	1.4915	-326.4228	
PV Unit electricity exported	-138.3404	0.4591	-63.5081	
Total			-389.9309	(283)
Total Primary energy kWh/year			3585.4310	(286)
Target Primary Energy Rate (TPER)			82.6900	(287)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.17	**TER**	15.31
Environmental	99 A	**% DER < TER**			92.36
CO_2 Emissions (t/year)	0.03	**DFEE**	17.86	**TFEE**	28.52
Compliance Check	See BREL	**% DFEE < TFEE**			37.38
% DPER < TPER	72.57	**DPER**	22.68	**TPER**	82.69

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		2 * 10 =	20.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		20.0000 / (5) =	0.1883	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.3383	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2622	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		7762.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							179.0141	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		17.4572	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	36.9438	36.8677	36.7932	36.4431	36.3776	36.0727	36.0727	36.0162	36.1901	36.3776	36.5101	36.6486	(39)
Average = Sum(39)m / 12 =												36.4428	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8520	0.8503	0.8486	0.8405	0.8390	0.8319	0.8319	0.8306	0.8346	0.8390	0.8420	0.8452	(40)
HLP (average)												0.8405	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)											Total = Sum(45)m =	781.1490	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
										Total per year (kWh/year) = Sum(64)m =	663.9767	(64)
12Total per year (kWh/year)											664	(64)

Electric shower(s)

39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	449.4572	(64a)

Heat gains from water heating, kWh/month

27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0601	78.6737	71.0601	73.4288	71.0601	73.4288	71.0601	71.0601	73.4288	71.0601	73.4288	71.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.0895	291.1341	278.7010	271.1858	257.9340	249.9230	240.9368	240.6593	247.6349	254.4733	268.5369	277.0546	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.6400	46.7521	0.6800	0.7000	0.7700	102.4021	(78)

Solar gains	102.4021	167.7083	213.6307	241.4490	251.6048	242.1354	236.5810	229.7530	223.1625	180.8892	121.3815	88.4849	(83)
Total gains	385.4916	458.8425	492.3317	512.6348	509.5388	492.0584	477.5178	470.4123	470.7973	435.3624	389.9184	365.5394	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.3623	58.4827	58.6012	59.1642	59.2707	59.7717	59.7717	59.8654	59.5777	59.2707	59.0556	58.8323	
alpha	4.8908	4.8988	4.9067	4.9443	4.9514	4.9848	4.9848	4.9910	4.9718	4.9514	4.9370	4.9222	
util living area	0.9599	0.9177	0.8622	0.7636	0.6318	0.4634	0.3315	0.3509	0.5195	0.7687	0.9203	0.9673	(86)
MIT	20.1536	20.4084	20.6261	20.8298	20.9436	20.9902	20.9985	20.9980	20.9823	20.8499	20.4891	20.1000	(87)
Th 2	20.2085	20.2100	20.2115	20.2184	20.2197	20.2257	20.2257	20.2269	20.2234	20.2197	20.2171	20.2143	(88)
util rest of house	0.9523	0.9038	0.8407	0.7306	0.5868	0.4095	0.2736	0.2925	0.4648	0.7303	0.9045	0.9610	(89)

MIT 2	19.4522	19.6965	19.9006	20.0880	20.1821	20.2207	20.2252	20.2261	20.2138	20.1096	19.7833	19.4052 (90)
Living area fraction										fLA = Living area / (4) =		0.4776 (91)
MIT	19.7872	20.0366	20.2471	20.4423	20.5458	20.5883	20.5946	20.5948	20.5809	20.4632	20.1204	19.7371 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7872	20.0366	20.2471	20.4423	20.5458	20.5883	20.5946	20.5948	20.5809	20.4632	20.1204	19.7371 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9476	0.9005	0.8417	0.7404	0.6060	0.4349	0.3012	0.3204	0.4902	0.7428	0.9023	0.9564	(94)
Useful gains	365.2885	413.1862	414.4015	379.5770	308.7649	213.9969	143.8379	150.7258	230.8017	323.3799	351.8207	349.6156	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	572.1564	558.0508	505.8006	420.6380	321.7901	216.0123	144.0945	151.0802	234.5433	358.7986	475.3761	569.4130	(97)
Space heating kWh	153.9097	97.3490	68.0009	29.5639	9.6908	0.0000	0.0000	0.0000	0.0000	26.3516	88.9599	163.5293	(98a)
Space heating requirement - total per year (kWh/year)												637.3551	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	153.9097	97.3490	68.0009	29.5639	9.6908	0.0000	0.0000	0.0000	0.0000	26.3516	88.9599	163.5293	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												637.3551	
Space heating per m2											(98c) / (4) =	14.6991	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	339.0831	266.9377	273.7231	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9627	0.9836	0.9809	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	326.4322	262.5604	268.5062	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	546.4589	531.0234	524.1147	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	158.4193	199.7364	190.1727	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	39.6048	49.9341	47.5432	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												137.0821	(107)
Energy for space heating												14.6991	(99)
Energy for space cooling												3.1615	(108)
Total												17.8606	(109)
Fabric Energy Efficiency (DFEE)												17.9	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.6400	1.1450	7.6031			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.1800	1.7910			(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.1800	2.6550			(29a)
500mm mineral wool	43.3600		43.3600	0.1100	4.7696			(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.6587			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.0141 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	4.7800	0.0500	0.2390
E3 Sill	3.8800	0.0500	0.1940
E4 Jamb	17.9200	0.0500	0.8960
E7 Party floor between dwellings (in blocks of flats)	17.6700	0.0700	1.2369
E16 Corner (normal)	5.0000	0.0900	0.4500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.5900	0.0000	0.0000
E14 Flat roof	17.6700	0.0800	1.4136
P4 Party wall - Roof (insulation at ceiling level)	12.5900	0.1200	1.5108
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5403 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.1990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	46.0145	45.8869	45.7618	45.1741	45.0641	44.5523	44.5523	44.4575	44.7494	45.0641	45.2866	45.5191	(39)
Average = Sum(39)m / 12 =												45.1735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0612	1.0583	1.0554	1.0418	1.0393	1.0275	1.0275	1.0253	1.0320	1.0393	1.0444	1.0498	(40)
HLP (average)												1.0418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)													
	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							449.4572	(64a)
Heat gains from water heating, kWh/month													
	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	69.0518	76.4502	69.0518	71.3535	69.0518	71.3535	69.0518	69.0518	71.3535	69.0518	71.3535	69.0518	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains													
	281.0812	288.9106	276.6927	269.1105	255.9256	247.8477	238.9285	238.6510	245.5596	252.4649	266.4616	275.0462	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.6400	46.7521	0.6300	0.7000	0.7700	94.8726	(78)

Solar gains	94.8726	155.3768	197.9225	223.6954	233.1045	224.3313	219.1854	212.8594	206.7534	167.5885	112.4564	81.9786	(83)
Total gains	375.9537	444.2875	474.6152	492.8059	489.0301	472.1790	458.1138	451.5104	452.3131	420.0534	378.9180	357.0249	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8575	46.9878	47.1163	47.7293	47.8457	48.3954	48.3954	48.4986	48.1822	47.8457	47.6107	47.3675	
alpha	4.1238	4.1325	4.1411	4.1820	4.1897	4.2264	4.2264	4.2332	4.2121	4.1897	4.1740	4.1578	
util living area													
	0.9725	0.9474	0.9135	0.8464	0.7405	0.5733	0.4211	0.4441	0.6324	0.8488	0.9484	0.9771	(86)
MIT	19.6885	19.9644	20.2501	20.5764	20.8135	20.9526	20.9897	20.9869	20.9255	20.6330	20.1171	19.6423	(87)
Th 2	20.0326	20.0351	20.0374	20.0486	20.0507	20.0605	20.0605	20.0623	20.0567	20.0507	20.0465	20.0420	(88)
util rest of house													
	0.9666	0.9367	0.8959	0.8157	0.6899	0.4996	0.3343	0.3575	0.5615	0.8128	0.9361	0.9721	(89)
MIT 2	18.8588	19.1283	19.4041	19.7161	19.9233	20.0363	20.0571	20.0577	20.0154	19.7743	19.2895	18.8209	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.2551	19.5276	19.8082	20.1270	20.3485	20.4739	20.5025	20.5015	20.4501	20.1844	19.6847	19.2132	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2551	19.5276	19.8082	20.1270	20.3485	20.4739	20.5025	20.5015	20.4501	20.1844	19.6847	19.2132	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9607	0.9302	0.8912	0.8184	0.7066	0.5329	0.3756	0.3986	0.5921	0.8184	0.9306	0.9667	(94)
Useful gains	361.1887	413.2552	422.9879	403.3302	345.5530	251.6047	172.0579	179.9831	267.8001	343.7641	352.6240	345.1431	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	688.1531	671.2169	609.0056	507.1704	389.7367	261.6972	173.8668	182.3441	284.1620	431.9143	569.9195	683.3889	(97)
Space heating kWh													
	243.2615	173.3502	138.3972	74.7650	32.8727	0.0000	0.0000	0.0000	0.0000	65.5838	156.4528	251.6549	(98a)
Space heating requirement - total per year (kWh/year)												1136.3380	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	243.2615	173.3502	138.3972	74.7650	32.8727	0.0000	0.0000	0.0000	0.0000	65.5838	156.4528	251.6549	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1136.3380	
Space heating per m2											(98c) / (4) =	26.2071	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	418.7912	329.6867	337.8767	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8880	0.9379	0.9309	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	371.8766	309.2045	314.5193	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	525.4733	510.5009	504.1221	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	110.5896	149.7645	141.0645	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	27.6474	37.4411	35.2661	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												100.3546	(107)
Energy for space heating												26.2071	(99)
Energy for space cooling												2.3145	(108)
Total												28.5215	(109)
Fabric Energy Efficiency (TFEE)												28.5	(109)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.17	**TER**	15.31
Environmental	99 A	**% DER < TER**			92.36
CO_2 Emissions (t/year)	0.03	**DFEE**	17.86	**TFEE**	28.52
Compliance Check	See BREL	**% DFEE < TFEE**			37.38
% DPER < TPER	72.57	**DPER**	22.68	**TPER**	82.69

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
12Total per year (kWh/year)												2188	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0601	78.6737	71.0601	73.4288	71.0601	73.4288	71.0601	71.0601	73.4288	71.0601	73.4288	71.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.2801	384.4058	369.8506	357.2179	340.9558	329.7655	318.6057	319.7771	328.5028	338.8880	357.8362	370.5488	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.6400	46.7521	0.6800	0.7000	0.7700	102.4021	(78)

Solar gains	102.4021	167.7083	213.6307	241.4490	251.6048	242.1354	236.5810	229.7530	223.1625	180.8892	121.3815	88.4849	(83)
Total gains	479.6822	552.1141	583.4813	598.6669	592.5606	571.9009	555.1868	549.5300	551.6652	519.7771	479.2176	459.0337	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292

alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086		
util living area	0.9067	0.8445	0.7728	0.6670	0.5372	0.3895	0.2770	0.2925	0.4340	0.6617	0.8424	0.9205	(86)
MIT	20.4822	20.6637	20.8044	20.9168	20.9756	20.9961	20.9994	20.9993	20.9931	20.9310	20.7135	20.4271	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.8925	0.8244	0.7464	0.6333	0.4969	0.3445	0.2297	0.2448	0.3879	0.6223	0.8187	0.9079	(89)
MIT 2	19.6698	19.8836	20.0452	20.1680	20.2271	20.2449	20.2472	20.2470	20.2426	20.1849	19.9465	19.6037	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0578	20.2562	20.4078	20.5256	20.5846	20.6037	20.6065	20.6063	20.6011	20.5413	20.3128	19.9970	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0578	20.2562	20.4078	20.5256	20.5846	20.6037	20.6065	20.6063	20.6011	20.5413	20.3128	19.9970	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8886	0.8247	0.7522	0.6460	0.5151	0.3659	0.2523	0.2676	0.4097	0.6380	0.8209	0.9032	(94)
Useful gains	426.2246	455.3127	438.8993	386.7453	305.2506	209.2425	140.0757	147.0316	225.9897	331.6335	393.3736	414.6135	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	551.2943	537.2449	486.5715	406.7280	310.8310	210.0408	140.1683	147.1602	227.4424	347.7998	462.2572	552.6651	(97)
Space heating kWh	93.0518	55.0585	35.4681	14.3875	4.1518	0.0000	0.0000	0.0000	0.0000	12.0277	49.5962	102.7104	(98a)
Space heating requirement - total per year (kWh/year)												366.4522	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	93.0518	55.0585	35.4681	14.3875	4.1518	0.0000	0.0000	0.0000	0.0000	12.0277	49.5962	102.7104	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												366.4522	
Space heating per m2										(98c) / (4) =		8.4514	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	93.0518	55.0585	35.4681	14.3875	4.1518	0.0000	0.0000	0.0000	0.0000	12.0277	49.5962	102.7104	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	139.5778	82.5877	53.2022	21.5813	6.2277	0.0000	0.0000	0.0000	0.0000	18.0416	74.3943	154.0656	
Space heating requirement	139.5778	82.5877	53.2022	21.5813	6.2277	0.0000	0.0000	0.0000	0.0000	18.0416	74.3943	154.0656	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												549.6782	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												5.4968	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3012.8703	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1021.6418	0.1579	23.1502	(367)
Electrical energy for heat distribution (space & water)	5.4968	0.0000	5.4860	(372)
Overall CO2 factor for heat network			0.0396	(386)
Total CO2 associated with community systems			151.7796	(373)
Space and water heating			151.7796	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			50.8466	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.1700	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1021.6418	1.5846	232.2744	(467)
Electrical energy for heat distribution (space & water)	5.4968	0.0000	58.6000	(472)
Overall CO2 factor for heat network			0.4232	(486)
Total CO2 associated with community systems			1621.2675	(473)
Space and water heating			1621.2675	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	1.4901	-605.6307	
PV Unit electricity exported	-551.7766	0.4464	-246.3315	
Total			-851.9622	(480)
Total Primary energy kWh/year			983.6207	(483)
Dwelling Primary energy Rate (DPER)			22.6800	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.6400	1.1450	7.6031			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.1800	1.7910			(29a)

Wall to Unheated Com	16.5900	1.8400	14.7500	0.1800	2.6550	(29a)
500mm mineral wool	43.3600		43.3600	0.1100	4.7696	(30)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.6587	(33)
Main dwelling						
Party Wall 1			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.0141 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	4.7800	0.0500	0.2390
E3 Sill	3.8800	0.0500	0.1940
E4 Jamb	17.9200	0.0500	0.8960
E7 Party floor between dwellings (in blocks of flats)	17.6700	0.0700	1.2369
E16 Corner (normal)	5.0000	0.0900	0.4500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.5900	0.0000	0.0000
E14 Flat roof	17.6700	0.0800	1.4136
P4 Party wall - Roof (insulation at ceiling level)	12.5900	0.1200	1.5108
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5403 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 25.1990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	46.0145	45.8869	45.7618	45.1741	45.0641	44.5523	44.5523	44.4575	44.7494	45.0641	45.2866	45.5191	(39)
Average = Sum(39)m / 12 =												45.1735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0612	1.0583	1.0554	1.0418	1.0393	1.0275	1.0275	1.0253	1.0320	1.0393	1.0444	1.0498	(40)
HLP (average)												1.0418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.0518	76.4502	69.0518	71.3535	69.0518	71.3535	69.0518	69.0518	71.3535	69.0518	71.3535	69.0518	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	368.9363	375.8469	361.5069	348.8073	332.6121	318.3548	307.2620	308.4334	317.0921	330.5443	349.4255	362.2051	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.6400	46.7521	0.6300	0.7000	0.7700	94.8726	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	94.8726	155.3768	197.9225	223.6954	233.1045	224.3313	219.1854	212.8594	206.7534	167.5885	112.4564	81.9786	(83)
Total gains	463.8089	531.2238	559.4294	572.5027	565.7165	542.6862	526.4474	521.2927	523.8456	498.1328	461.8819	444.1838	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8575	46.9878	47.1163	47.7293	47.8457	48.3954	48.3954	48.4986	48.1822	47.8457	47.6107	47.3675	
alpha	4.1238	4.1325	4.1411	4.1820	4.1897	4.2264	4.2264	4.2332	4.2121	4.1897	4.1740	4.1578	
util living area	0.9466	0.9119	0.8675	0.7879	0.6716	0.5084	0.3688	0.3877	0.5615	0.7819	0.9084	0.9534	(86)
MIT	19.9275	20.1713	20.4189	20.6875	20.8718	20.9697	20.9938	20.9922	20.9521	20.7409	20.3139	19.8860	(87)
Th 2	20.0326	20.0351	20.0374	20.0486	20.0507	20.0605	20.0605	20.0623	20.0567	20.0507	20.0465	20.0420	(88)
util rest of house	0.9362	0.8961	0.8442	0.7521	0.6193	0.4398	0.2917	0.3108	0.4939	0.7394	0.8894	0.9442	(89)
MIT 2	18.8223	19.1216	19.4216	19.7421	19.9417	20.0412	20.0579	20.0589	20.0237	19.8090	19.3103	18.7781	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.3502	19.6230	19.8980	20.1936	20.3859	20.4846	20.5049	20.5046	20.4672	20.2541	19.7896	19.3072	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3502	19.6230	19.8980	20.1936	20.3859	20.4846	20.5049	20.5046	20.4672	20.2541	19.7896	19.3072	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9275	0.8884	0.8405	0.7579	0.6384	0.4713	0.3284	0.3474	0.5240	0.7491	0.8836	0.9357	(94)
Useful gains	430.1696	471.9243	470.2151	433.9064	361.1778	255.7706	172.8877	181.0819	274.4949	373.1591	408.0984	415.6354	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	692.5266	675.5920	613.1140	510.1797	391.4243	262.1744	173.9722	182.4818	284.9265	435.0531	574.6695	687.6685	(97)
Space heating kWh	195.1936	136.8648	106.3168	54.9167	22.5034	0.0000	0.0000	0.0000	0.0000	46.0491	119.9312	202.3926	(98a)
Space heating requirement - total per year (kWh/year)												884.1681	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	195.1936	136.8648	106.3168	54.9167	22.5034	0.0000	0.0000	0.0000	0.0000	46.0491	119.9312	202.3926	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												884.1681	
Space heating per m2										(98c) / (4) =		20.3913	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	195.1936	136.8648	106.3168	54.9167	22.5034	0.0000	0.0000	0.0000	0.0000	46.0491	119.9312	202.3926	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	211.4773	148.2825	115.1861	59.4981	24.3807	0.0000	0.0000	0.0000	0.0000	49.8907	129.9363	219.2769	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.1992	83.6785	83.0010	81.9884	80.8701	79.8000	79.8000	79.8000	79.8000	81.6889	83.3678	84.3029	(217)
Fuel for water heating, kWh/month	217.8765	194.0852	208.5317	187.3598	185.2981	170.5061	169.2907	175.3325	176.4869	190.7114	196.8333	215.4701	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.3476	11.5102	10.3636	7.5928	5.8649	4.7917	5.3502	6.9544	9.0330	11.8518	13.3866	14.7464	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3196	-12.6515	-19.6021	-23.8221	-27.3050	-26.1047	-25.8068	-23.5584	-19.8837	-15.2375	-9.4737	-7.0906	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2617	-4.9168	-10.0734	-15.5779	-21.0367	-21.2830	-21.0140	-17.5742	-12.6116	-7.1556	-3.0599	-1.7757	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												957.9286	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2287.7823	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	115.7933	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3090.3082	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	957.9286	0.2100	201.1650	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2287.7823	0.2100	480.4343	(264)
Space and water heating			681.5993	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	115.7933	0.1443	16.7126	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	0.1330	-29.1103	
PV Unit electricity exported	-138.3404	0.1251	-17.3028	
Total			-46.4132	(269)
Total CO2, kg/year			663.8279	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.3100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	957.9286	1.1300	1082.4593	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2287.7823	1.1300	2585.1940	(278)
Space and water heating			3667.6534	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	115.7933	1.5338	177.6076	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	1.4915	-326.4228	
PV Unit electricity exported	-138.3404	0.4591	-63.5081	
Total			-389.9309	(283)
Total Primary energy kWh/year			3585.4310	(286)
Target Primary Energy Rate (TPER)			82.6900	(287)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.17	**TER**	15.31
Environmental	99 A	**% DER < TER**			92.36
CO_2 Emissions (t/year)	0.03	**DFEE**	17.86	**TFEE**	28.52
Compliance Check	See BREL	**% DFEE < TFEE**			37.38
% DPER < TPER	72.57	**DPER**	22.68	**TPER**	82.69

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		7762.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							179.0141	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.6400	46.7521	0.6800	0.7000	0.7700	102.4021	(78)
Solar gains	102.4021	167.7083	213.6307	241.4490	251.6048	242.1354	236.5810	229.7530	223.1625	180.8892	121.3815	88.4849	(83)
Total gains	520.3131	583.8228	618.2009	624.3545	613.6781	585.2949	568.6134	564.2652	568.6344	545.7784	509.7890	497.3285	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086

util living area													
	0.8807	0.8209	0.7441	0.6450	0.5202	0.3808	0.2705	0.2849	0.4214	0.6361	0.8160	0.8975	(86)
MIT	20.5630	20.7088	20.8361	20.9284	20.9788	20.9965	20.9995	20.9993	20.9939	20.9422	20.7561	20.5098	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house													
	0.8640	0.7994	0.7169	0.6114	0.4809	0.3367	0.2243	0.2384	0.3766	0.5970	0.7905	0.8825	(89)
MIT 2	19.7653	19.9349	20.0794	20.1795	20.2298	20.2451	20.2472	20.2471	20.2432	20.1954	19.9939	19.7023	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.1463	20.3046	20.4408	20.5372	20.5876	20.6040	20.6065	20.6064	20.6018	20.5521	20.3579	20.0880	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1463	20.3046	20.4408	20.5372	20.5876	20.6040	20.6065	20.6064	20.6018	20.5521	20.3579	20.0880	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8616	0.8011	0.7241	0.6245	0.4988	0.3577	0.2464	0.2606	0.3978	0.6131	0.7944	0.8791	(94)
Useful gains	448.3174	467.7080	447.6419	389.9271	306.1027	209.3333	140.0871	147.0490	226.1977	334.6231	404.9808	437.1841	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	554.3909	538.9361	487.7257	407.1326	310.9363	210.0520	140.1697	147.1624	227.4679	348.1786	463.8352	555.8479	(97)
Space heating kWh													
	78.9187	47.8653	29.8223	12.3880	3.5962	0.0000	0.0000	0.0000	0.0000	10.0853	42.3751	88.2859	(98a)
Space heating requirement - total per year (kWh/year)												313.3367	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	78.9187	47.8653	29.8223	12.3880	3.5962	0.0000	0.0000	0.0000	0.0000	10.0853	42.3751	88.2859	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												313.3367	
Space heating per m2											(98c) / (4) =	7.2264	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	78.9187	47.8653	29.8223	12.3880	3.5962	0.0000	0.0000	0.0000	0.0000	10.0853	42.3751	88.2859	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	118.3780	71.7979	44.7335	18.5819	5.3942	0.0000	0.0000	0.0000	0.0000	15.1279	63.5627	132.4288	
Space heating requirement													
	118.3780	71.7979	44.7335	18.5819	5.3942	0.0000	0.0000	0.0000	0.0000	15.1279	63.5627	132.4288	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												470.0050	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												4.7001	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2933.1971	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	470.0050	4.4400	20.8682	(340a)
Space heating total			20.8682	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	16.4900	2.5157	(349)
Energy for lighting	124.6784	16.4900	20.5595	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	16.4900	-67.0227	
PV Unit electricity exported	-551.7766	5.5900	-30.8443	
Total			-97.8670	(352)
Total energy cost			183.7741	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7487 (357)
SAP value		87.8629
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1000.3956	0.1580	19.7968	(367)
Electrical energy for heat distribution (space & water)	4.7001	0.0000	5.3603	(372)
Overall CO2 factor for heat network			0.0395	(386)
Total CO2 associated with community systems			148.3005	(373)
Space and water heating			148.3005	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			47.3675	(383)
CO2 emissions per m2			1.0900	(384)
EI value			99.2817	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	43.3600 (1b)	x 2.4500 (2b)	= 106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)

Adj infilt rate

	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.6400	54.0600	0.6800	0.7000	0.7700	118.4089	(78)

Solar gains	118.4089	171.8756	215.4502	247.4591	250.4735	259.8247	248.5627	244.2082	237.8190	195.4000	138.1354	103.0088	(83)
Total gains	536.3199	587.9902	620.0205	630.3645	612.5468	602.9842	580.5950	578.7205	583.2909	560.2892	526.5429	511.8524	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area													
	0.8632	0.8094	0.7248	0.6223	0.4951	0.3357	0.2349	0.2477	0.3938	0.5968	0.7877	0.8822	(86)
MIT	20.6157	20.7336	20.8598	20.9410	20.9840	20.9982	20.9998	20.9997	20.9957	20.9585	20.8005	20.5641	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house													
	0.8447	0.7868	0.6961	0.5879	0.4549	0.2925	0.1896	0.2023	0.3496	0.5567	0.7599	0.8654	(89)
MIT 2	19.8275	19.9636	20.1057	20.1923	20.2345	20.2463	20.2473	20.2473	20.2446	20.2113	20.0435	19.7671	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.2040	20.3314	20.4659	20.5499	20.5925	20.6055	20.6067	20.6067	20.6034	20.5682	20.4051	20.1478	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2040	20.3314	20.4659	20.5499	20.5925	20.6055	20.6067	20.6067	20.6034	20.5682	20.4051	20.1478	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8436	0.7895	0.7047	0.6020	0.4734	0.3131	0.2112	0.2240	0.3706	0.5740	0.7660	0.8631	(94)
Useful gains	452.4494	464.1976	436.9079	379.4585	290.0027	188.7649	122.6495	129.6307	216.1524	321.6227	403.3292	441.7616	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	545.9125	529.3777	471.1111	393.5825	293.6146	189.1124	122.6839	129.6790	217.0273	331.2488	451.4894	547.4453	(97)
Space heating kWh													
	69.5365	43.8010	25.4472	10.1693	2.6872	0.0000	0.0000	0.0000	0.0000	7.1619	34.6753	78.6287	(98a)
Space heating requirement - total per year (kWh/year)												272.1072	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	69.5365	43.8010	25.4472	10.1693	2.6872	0.0000	0.0000	0.0000	0.0000	7.1619	34.6753	78.6287	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												272.1072	
Space heating per m2											(98c) / (4) =	6.2755	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	69.5365	43.8010	25.4472	10.1693	2.6872	0.0000	0.0000	0.0000	0.0000	7.1619	34.6753	78.6287	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	104.3048	65.7015	38.1707	15.2539	4.0309	0.0000	0.0000	0.0000	0.0000	10.7428	52.0130	117.9431	
Space heating requirement													
	104.3048	65.7015	38.1707	15.2539	4.0309	0.0000	0.0000	0.0000	0.0000	10.7428	52.0130	117.9431	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5669	-24.0727	-38.8745	-48.0493	-52.9789	-51.6524	-50.3986	-46.8694	-39.7890	-30.3128	-18.7591	-13.8902	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4316	-15.8925	-38.3705	-69.5238	-96.2615	-109.4663	-104.0915	-84.3722	-54.5598	-26.6835	-10.2713	-5.6085	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	408.1607	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	4.0816	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)		
mechanical ventilation fans (SFP = 0.1177)	15.2561	(330a)
Total electricity for the above, kWh/year	15.2561	(331)
Electricity for lighting (calculated in Appendix L)	124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2774.8267	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	408.1607	6.5500	26.7345	(340a)
Space heating total			26.7345	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	28.4300	4.3373	(349)
Energy for lighting	124.6784	28.4300	35.4461	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	28.4300	-122.8784	
PV Unit electricity exported	-622.5330	5.8100	-36.1692	
Total			-159.0476	(352)
Total energy cost			226.4072	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	983.9038	0.1583	17.2286	(367)
Electrical energy for heat distribution (space & water)	4.0816	0.0000	5.2639	(372)
Overall CO2 factor for heat network			0.0395	(386)
Total CO2 associated with community systems			145.6359	(373)
Space and water heating			145.6359	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	0.1330	-57.4796	
PV Unit electricity exported	-622.5330	0.1218	-75.7970	
Total			-133.2765	(380)
Total CO2, kg/year			32.4706	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	983.9038	1.5859	172.6179	(467)
Electrical energy for heat distribution (space & water)	4.0816	0.0000	56.3629	(472)
Overall CO2 factor for heat network			0.4226	(486)
Total CO2 associated with community systems			1559.3738	(473)
Space and water heating			1559.3738	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	1.4914	-644.6094	
PV Unit electricity exported	-622.5330	0.4467	-278.0656	
Total			-922.6749	(480)
Total Primary energy kWh/year			851.0143	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - North

Current energy efficiency rating:	B 88
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£40	£40	£0
Community scheme	£346	£346	£0
Space heating	£135	£135	£0
Water heating	£215	£215	£0
Lighting	£35	£35	£0
Generated (PV)	-£159	-£159	£0
Total cost of fuels	£227	£227	£0
Total cost of uses	£226	£226	£0
Delivered energy	64 kWh/m²	64 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.0 tonnes	0.0 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	20 kWh/m²	20 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)

Total net area of external elements Aum(A, m2)	76.5400				(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	15.1610			(33)
Main dwelling					
Party Wall 1	31.3600	0.0000	0.0000	70.0000	2195.2000 (32)
Party Floor 1	43.3600			70.0000	3035.2000 (32d)
Internal TF Wall	68.4500			9.0000	616.0500 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.6400	46.7521	0.6800	0.7000	0.7700	102.4021	(78)

Solar gains	102.4021	167.7083	213.6307	241.4490	251.6048	242.1354	236.5810	229.7530	223.1625	180.8892	121.3815	88.4849	(83)
Total gains	520.3131	583.8228	618.2009	624.3545	613.6781	585.2949	568.6134	564.2652	568.6344	545.7784	509.7890	497.3285	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.8807	0.8209	0.7441	0.6450	0.5202	0.3808	0.2705	0.2849	0.4214	0.6361	0.8160	0.8975	(86)
MIT	20.5630	20.7088	20.8361	20.9284	20.9788	20.9965	20.9995	20.9993	20.9939	20.9422	20.7561	20.5098	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.8640	0.7994	0.7169	0.6114	0.4809	0.3367	0.2243	0.2384	0.3766	0.5970	0.7905	0.8825	(89)
MIT 2	19.7653	19.9349	20.0794	20.1795	20.2298	20.2451	20.2472	20.2471	20.2432	20.1954	19.9939	19.7023	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.1463	20.3046	20.4408	20.5372	20.5876	20.6040	20.6065	20.6064	20.6018	20.5521	20.3579	20.0880	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1463	20.3046	20.4408	20.5372	20.5876	20.6040	20.6065	20.6064	20.6018	20.5521	20.3579	20.0880	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8616	0.8011	0.7241	0.6245	0.4988	0.3577	0.2464	0.2606	0.3978	0.6131	0.7944	0.8791	(94)
Useful gains	448.3174	467.7080	447.6419	389.9271	306.1027	209.3333	140.0871	147.0490	226.1977	334.6231	404.9808	437.1841	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	554.3909	538.9361	487.7257	407.1326	310.9363	210.0520	140.1697	147.1624	227.4679	348.1786	463.8352	555.8479	(97)
Space heating kWh	78.9187	47.8653	29.8223	12.3880	3.5962	0.0000	0.0000	0.0000	0.0000	10.0853	42.3751	88.2859	(98a)
Space heating requirement - total per year (kWh/year)												313.3367	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	78.9187	47.8653	29.8223	12.3880	3.5962	0.0000	0.0000	0.0000	0.0000	10.0853	42.3751	88.2859	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												313.3367	
Space heating per m2										(98c) / (4) =		7.2264	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement

78.9187	47.8653	29.8223	12.3880	3.5962	0.0000	0.0000	0.0000	0.0000	10.0853	42.3751	88.2859	(98)

Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50

307a 118.3780	71.7979	44.7335	18.5819	5.3942	0.0000	0.0000	0.0000	0.0000	15.1279	63.5627	132.4288	
Space heating requirement												
118.3780	71.7979	44.7335	18.5819	5.3942	0.0000	0.0000	0.0000	0.0000	15.1279	63.5627	132.4288	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating
Annual water heating requirement

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50

310a 322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel												
322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)

Cooling System Energy Efficiency Ratio 0.0000 (314)

Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)

Electricity generated by PVs (Appendix M) (negative quantity)

(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)

Electricity generated by PVs (Appendix M) (negative quantity)

(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year
Space heating fuel - community heating 470.0050 (307)
Space heating fuel - secondary 0.0000 (309)
Water heating fuel - community heating 3281.4784 (310)
Efficiency of water heater 0.0000 (311)
Electricity used for heat distribution 4.7001 (313)
Space cooling fuel 0.0000 (321)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)
mechanical ventilation fans (SFP = 0.1177) 15.2561 (330a)
Total electricity for the above, kWh/year 15.2561 (331)
Electricity for lighting (calculated in Appendix L) 124.6784 (332)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation -958.2209 (333)
Wind generation 0.0000 (334)
Hydro-electric generation (Appendix N) 0.0000 (335a)
Electricity generated - Micro CHP (Appendix N) 0.0000 (335)

Appendix Q - special features

Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2933.1971	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	470.0050	4.4400	20.8682	(340a)
Space heating total			20.8682	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	16.4900	2.5157	(349)
Energy for lighting	124.6784	16.4900	20.5595	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	16.4900	-67.0227	
PV Unit electricity exported	-551.7766	5.5900	-30.8443	
Total			-97.8670	(352)
Total energy cost			183.7741	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7487	(357)
SAP value		87.8629	
SAP rating (Section 12)		88	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1000.3956	0.1580	19.7968	(367)
Electrical energy for heat distribution (space & water)	4.7001	0.0000	5.3603	(372)
Overall CO2 factor for heat network			0.0395	(386)
Total CO2 associated with community systems			148.3005	(373)
Space and water heating			148.3005	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			47.3675	(383)
CO2 emissions per m2			1.0900	(384)
EI value			99.2817	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

Measured/design AP50												3.0000	(17)
Infiltration rate												0.1500	(18)
Number of sides sheltered												3	(19)
Shelter factor								(20) = 1 - [0.075 x (19)] =				0.7750	(20)
Infiltration rate adjusted to include shelter factor								(21) = (18) x (20) =				0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	6.6400	54.0600	0.6800	0.7000	0.7700	118.4089	(78)

Solar gains	118.4089	171.8756	215.4502	247.4591	250.4735	259.8247	248.5627	244.2082	237.8190	195.4000	138.1354	103.0088	(83)
Total gains	536.3199	587.9902	620.0205	630.3645	612.5468	602.9842	580.5950	578.7205	583.2909	560.2892	526.5429	511.8524	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area													
	0.8632	0.8094	0.7248	0.6223	0.4951	0.3357	0.2349	0.2477	0.3938	0.5968	0.7877	0.8822	(86)
MIT	20.6157	20.7336	20.8598	20.9410	20.9840	20.9982	20.9998	20.9997	20.9957	20.9585	20.8005	20.5641	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house													
	0.8447	0.7868	0.6961	0.5879	0.4549	0.2925	0.1896	0.2023	0.3496	0.5567	0.7599	0.8654	(89)
MIT 2	19.8275	19.9636	20.1057	20.1923	20.2345	20.2463	20.2473	20.2473	20.2446	20.2113	20.0435	19.7671	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.2040	20.3314	20.4659	20.5499	20.5925	20.6055	20.6067	20.6067	20.6034	20.5682	20.4051	20.1478	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2040	20.3314	20.4659	20.5499	20.5925	20.6055	20.6067	20.6067	20.6034	20.5682	20.4051	20.1478	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8436	0.7895	0.7047	0.6020	0.4734	0.3131	0.2112	0.2240	0.3706	0.5740	0.7660	0.8631	(94)
Useful gains	452.4494	464.1976	436.9079	379.4585	290.0027	188.7649	122.6495	129.6307	216.1524	321.6227	403.3292	441.7616	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	545.9125	529.3777	471.1111	393.5825	293.6146	189.1124	122.6839	129.6790	217.0273	331.2488	451.4894	547.4453	(97)
Space heating kWh													
	69.5365	43.8010	25.4472	10.1693	2.6872	0.0000	0.0000	0.0000	0.0000	7.1619	34.6753	78.6287	(98a)
Space heating requirement - total per year (kWh/year)												272.1072	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	69.5365	43.8010	25.4472	10.1693	2.6872	0.0000	0.0000	0.0000	0.0000	7.1619	34.6753	78.6287	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												272.1072	
Space heating per m2										(98c) / (4) =		6.2755	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement													
	69.5365	43.8010	25.4472	10.1693	2.6872	0.0000	0.0000	0.0000	0.0000	7.1619	34.6753	78.6287	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	104.3048	65.7015	38.1707	15.2539	4.0309	0.0000	0.0000	0.0000	0.0000	10.7428	52.0130	117.9431	
Space heating requirement													
	104.3048	65.7015	38.1707	15.2539	4.0309	0.0000	0.0000	0.0000	0.0000	10.7428	52.0130	117.9431	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)

Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5669	-24.0727	-38.8745	-48.0493	-52.9789	-51.6524	-50.3986	-46.8694	-39.7890	-30.3128	-18.7591	-13.8902	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4316	-15.8925	-38.3705	-69.5238	-96.2615	-109.4663	-104.0915	-84.3722	-54.5598	-26.6835	-10.2713	-5.6085	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	408.1607	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	4.0816	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)		
mechanical ventilation fans (SFP = 0.1177)	15.2561	(330a)
Total electricity for the above, kWh/year	15.2561	(331)
Electricity for lighting (calculated in Appendix L)	124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2774.8267	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	408.1607	6.5500	26.7345	(340a)
Space heating total			26.7345	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	28.4300	4.3373	(349)
Energy for lighting	124.6784	28.4300	35.4461	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	28.4300	-122.8784	
PV Unit electricity exported	-622.5330	5.8100	-36.1692	
Total			-159.0476	(352)
Total energy cost			226.4072	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	983.9038	0.1583	17.2286	(367)
Electrical energy for heat distribution (space & water)	4.0816	0.0000	5.2639	(372)
Overall CO2 factor for heat network			0.0395	(386)
Total CO2 associated with community systems			145.6359	(373)
Space and water heating			145.6359	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	0.1330	-57.4796	
PV Unit electricity exported	-622.5330	0.1218	-75.7970	
Total			-133.2765	(380)
Total CO2, kg/year			32.4706	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	983.9038	1.5859	172.6179	(467)
Electrical energy for heat distribution (space & water)	4.0816	0.0000	56.3629	(472)
Overall CO2 factor for heat network			0.4226	(486)
Total CO2 associated with community systems			1559.3738	(473)
Space and water heating			1559.3738	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	1.4914	-644.6094	
PV Unit electricity exported	-622.5330	0.4467	-278.0656	
Total			-922.6749	(480)
Total Primary energy kWh/year			851.0143	(483)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.23	**TER**	15.57
Environmental	99 A	**% DER < TER**			92.10
CO_2 Emissions (t/year)	0.03	**DFEE**	19.33	**TFEE**	30.07
Compliance Check	See BREL	**% DFEE < TFEE**			35.72
% DPER < TPER	72.32	**DPER**	23.27	**TPER**	84.07

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross (m2)	Openings (m2)	NetArea (m2)	U-value (W/m2K)	A x U (W/K)	K-value (kJ/m2K)	A x K (kJ/K)	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
12Total per year (kWh/year)												2188	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0601	78.6737	71.0601	73.4288	71.0601	73.4288	71.0601	71.0601	73.4288	71.0601	73.4288	71.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.2801	384.4058	369.8506	357.2179	340.9558	329.7655	318.6057	319.7771	328.5028	338.8880	357.8362	370.5488	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	6.6400	36.7938	0.6800	0.7000	0.7700	80.5904	(79)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	80.5904	137.2753	187.8260	232.7255	260.6720	258.7869	249.4982	228.6489	203.3758	151.7184	96.5287	68.9686	(83)
Total gains	457.8704	521.6811	557.6766	589.9434	601.6278	588.5524	568.1040	548.4260	531.8786	490.6064	454.3649	439.5174	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292

alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.9196	0.8666	0.7943	0.6747	0.5298	0.3787	0.2707	0.2931	0.4494	0.6920	0.8633	0.9312	(86)
MIT	20.4341	20.6145	20.7770	20.9124	20.9770	20.9965	20.9995	20.9992	20.9919	20.9156	20.6740	20.3812	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.9068	0.8481	0.7688	0.6410	0.4899	0.3349	0.2245	0.2453	0.4020	0.6526	0.8414	0.9199	(89)
MIT 2	19.6124	19.8270	20.0151	20.1636	20.2283	20.2452	20.2472	20.2470	20.2418	20.1702	19.9018	19.5483	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0049	20.2031	20.3790	20.5212	20.5859	20.6040	20.6065	20.6063	20.6000	20.5262	20.2706	19.9461	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0049	20.2031	20.3790	20.5212	20.5859	20.6040	20.6065	20.6063	20.6000	20.5262	20.2706	19.9461	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9022	0.8469	0.7735	0.6535	0.5080	0.3557	0.2466	0.2681	0.4243	0.6676	0.8421	0.9148	(94)
Useful gains	413.1056	441.8354	431.3418	385.5411	305.6337	209.3538	140.0867	147.0302	225.7015	327.5147	382.6218	402.0628	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	549.4417	535.3875	485.5636	406.5742	310.8783	210.0545	140.1697	147.1601	227.4070	347.2738	460.7800	550.8849	(97)
Space heating kWh	101.4341	62.8670	40.3410	15.1438	3.9020	0.0000	0.0000	0.0000	0.0000	14.7008	56.2739	110.7237	(98a)
Space heating requirement - total per year (kWh/year)												405.3863	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	101.4341	62.8670	40.3410	15.1438	3.9020	0.0000	0.0000	0.0000	0.0000	14.7008	56.2739	110.7237	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												405.3863	
Space heating per m2											(98c) / (4) =	9.3493	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	101.4341	62.8670	40.3410	15.1438	3.9020	0.0000	0.0000	0.0000	0.0000	14.7008	56.2739	110.7237	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	152.1511	94.3005	60.5115	22.7158	5.8530	0.0000	0.0000	0.0000	0.0000	22.0511	84.4109	166.0856	
Space heating requirement	152.1511	94.3005	60.5115	22.7158	5.8530	0.0000	0.0000	0.0000	0.0000	22.0511	84.4109	166.0856	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												608.0794	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												6.0808	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3071.2715	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1037.2154	0.1578	25.5960	(367)
Electrical energy for heat distribution (space & water)	6.0808	0.0000	5.5777	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			154.3171	(373)
Space and water heating			154.3171	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			53.3841	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.2300	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1037.2154	1.5843	256.9028	(467)
Electrical energy for heat distribution (space & water)	6.0808	0.0000	59.5236	(472)
Overall CO2 factor for heat network			0.4234	(486)
Total CO2 associated with community systems			1646.8194	(473)
Space and water heating			1646.8194	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	1.4901	-605.6307	
PV Unit electricity exported	-551.7766	0.4464	-246.3315	
Total			-851.9622	(480)
Total Primary energy kWh/year			1009.1726	(483)
Dwelling Primary energy Rate (DPER)			23.2700	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.6400	1.1450	7.6031			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.1800	1.7910			(29a)

Wall to Unheated Com	16.5900	1.8400	14.7500	0.1800	2.6550	(29a)
500mm mineral wool	43.3600		43.3600	0.1100	4.7696	(30)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.6587	(33)
Main dwelling						
Party Wall 1			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.0141 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	4.7800	0.0500	0.2390
E3 Sill	3.8800	0.0500	0.1940
E4 Jamb	17.9200	0.0500	0.8960
E7 Party floor between dwellings (in blocks of flats)	17.6700	0.0700	1.2369
E16 Corner (normal)	5.0000	0.0900	0.4500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.5900	0.0000	0.0000
E14 Flat roof	17.6700	0.0800	1.4136
P4 Party wall - Roof (insulation at ceiling level)	12.5900	0.1200	1.5108
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5403 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 25.1990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	46.0145	45.8869	45.7618	45.1741	45.0641	44.5523	44.5523	44.4575	44.7494	45.0641	45.2866	45.5191	(39)
Average = Sum(39)m / 12 =												45.1735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0612	1.0583	1.0554	1.0418	1.0393	1.0275	1.0275	1.0253	1.0320	1.0393	1.0444	1.0498	(40)
HLP (average)												1.0418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.0518	76.4502	69.0518	71.3535	69.0518	71.3535	69.0518	69.0518	71.3535	69.0518	71.3535	69.0518	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	368.9363	375.8469	361.5069	348.8073	332.6121	318.3548	307.2620	308.4334	317.0921	330.5443	349.4255	362.2051	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	6.6400	36.7938	0.6300	0.7000	0.7700	74.6646	(79)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	74.6646	127.1815	174.0153	215.6133	241.5049	239.7585	231.1528	211.8365	188.4217	140.5626	89.4310	63.8974	(83)
Total gains	443.6010	503.0284	535.5222	564.4206	574.1170	558.1133	538.4148	520.2699	505.5138	471.1069	438.8565	426.1025	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8575	46.9878	47.1163	47.7293	47.8457	48.3954	48.3954	48.4986	48.1822	47.8457	47.6107	47.3675	
alpha	4.1238	4.1325	4.1411	4.1820	4.1897	4.2264	4.2264	4.2332	4.2121	4.1897	4.1740	4.1578	
util living area	0.9533	0.9243	0.8811	0.7939	0.6645	0.4958	0.3608	0.3885	0.5785	0.8052	0.9205	0.9591	(86)
MIT	19.8750	20.1078	20.3750	20.6777	20.8769	20.9724	20.9943	20.9921	20.9465	20.7076	20.2628	19.8376	(87)
Th 2	20.0326	20.0351	20.0374	20.0486	20.0507	20.0605	20.0605	20.0623	20.0567	20.0507	20.0465	20.0420	(88)
util rest of house	0.9441	0.9101	0.8593	0.7585	0.6122	0.4284	0.2853	0.3114	0.5099	0.7646	0.9033	0.9508	(89)
MIT 2	18.7579	19.0456	19.3709	19.7316	19.9463	20.0430	20.0581	20.0588	20.0196	19.7748	19.2501	18.7184	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.2915	19.5530	19.8505	20.1835	20.3908	20.4869	20.5052	20.5046	20.4623	20.2203	19.7338	19.2530	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2915	19.5530	19.8505	20.1835	20.3908	20.4869	20.5052	20.5046	20.4623	20.2203	19.7338	19.2530	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9355	0.9020	0.8546	0.7638	0.6315	0.4595	0.3213	0.3480	0.5401	0.7724	0.8968	0.9426	(94)
Useful gains	414.9854	453.7144	457.6679	431.1217	362.5803	256.4469	172.9905	181.0699	273.0472	363.8662	393.5851	401.6357	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	689.8249	672.3785	610.9424	509.7221	391.6415	262.2739	173.9877	182.4800	284.7104	433.5321	572.1416	685.1984	(97)
Space heating kWh	204.4806	146.9423	114.0362	56.5923	21.6215	0.0000	0.0000	0.0000	0.0000	51.8315	128.5606	210.9706	(98a)
Space heating requirement - total per year (kWh/year)												935.0357	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	204.4806	146.9423	114.0362	56.5923	21.6215	0.0000	0.0000	0.0000	0.0000	51.8315	128.5606	210.9706	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												935.0357	
Space heating per m2										(98c) / (4) =		21.5645	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	204.4806	146.9423	114.0362	56.5923	21.6215	0.0000	0.0000	0.0000	0.0000	51.8315	128.5606	210.9706	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	221.5391	159.2007	123.5495	61.3134	23.4253	0.0000	0.0000	0.0000	0.0000	56.1554	139.2856	228.5706	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.3038	83.8361	83.1470	82.0385	80.8330	79.8000	79.8000	79.8000	79.8000	81.8715	83.5185	84.3963	(217)
Fuel for water heating, kWh/month	217.6062	193.7206	208.1655	187.2452	185.3832	170.5061	169.2907	175.3325	176.4869	190.2860	196.4783	215.2317	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.3476	11.5102	10.3636	7.5928	5.8649	4.7917	5.3502	6.9544	9.0330	11.8518	13.3866	14.7464	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3196	-12.6515	-19.6021	-23.8221	-27.3050	-26.1047	-25.8068	-23.5584	-19.8837	-15.2375	-9.4737	-7.0906	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2617	-4.9168	-10.0734	-15.5779	-21.0367	-21.2830	-21.0140	-17.5742	-12.6116	-7.1556	-3.0599	-1.7757	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1013.0397	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2285.7331	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	115.7933	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3143.3700	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1013.0397	0.2100	212.7383	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2285.7331	0.2100	480.0039	(264)
Space and water heating			692.7423	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	115.7933	0.1443	16.7126	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	0.1330	-29.1103	
PV Unit electricity exported	-138.3404	0.1251	-17.3028	
Total			-46.4132	(269)
Total CO2, kg/year			674.9709	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.5700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1013.0397	1.1300	1144.7349	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2285.7331	1.1300	2582.8784	(278)
Space and water heating			3727.6133	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	115.7933	1.5338	177.6076	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	1.4915	-326.4228	
PV Unit electricity exported	-138.3404	0.4591	-63.5081	
Total			-389.9309	(283)
Total Primary energy kWh/year			3645.3908	(286)
Target Primary Energy Rate (TPER)			84.0700	(287)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.23	**TER**	15.57
Environmental	99 A	**% DER < TER**			92.10
CO_2 Emissions (t/year)	0.03	**DFEE**	19.33	**TFEE**	30.07
Compliance Check	See BREL	**% DFEE < TFEE**			35.72
% DPER < TPER	72.32	**DPER**	23.27	**TPER**	84.07

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		2 * 10 =	20.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		20.0000 / (5) =	0.1883 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			3.0000 (17)
Infiltration rate			0.3383 (18)
Number of sides sheltered			3 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2622 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		7762.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							179.0141	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		17.4572	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	36.9438	36.8677	36.7932	36.4431	36.3776	36.0727	36.0727	36.0162	36.1901	36.3776	36.5101	36.6486	(39)
Average = Sum(39)m / 12 =												36.4428	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8520	0.8503	0.8486	0.8405	0.8390	0.8319	0.8319	0.8306	0.8346	0.8390	0.8420	0.8452	(40)
HLP (average)												0.8405	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)											Total = Sum(45)m =	781.1490	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
										Total per year (kWh/year) = Sum(64)m =	663.9767	(64)

12Total per year (kWh/year) 664 (64)

Electric shower(s)

39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	449.4572	(64a)

Heat gains from water heating, kWh/month

27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0601	78.6737	71.0601	73.4288	71.0601	73.4288	71.0601	71.0601	73.4288	71.0601	73.4288	71.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.0895	291.1341	278.7010	271.1858	257.9340	249.9230	240.9368	240.6593	247.6349	254.4733	268.5369	277.0546	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	6.6400	36.7938	0.6800	0.7000	0.7700	80.5904	(79)

Solar gains	80.5904	137.2753	187.8260	232.7255	260.6720	258.7869	249.4982	228.6489	203.3758	151.7184	96.5287	68.9686	(83)
Total gains	363.6799	428.4094	466.5270	503.9113	518.6059	508.7099	490.4350	469.3083	451.0107	406.1917	365.0656	346.0231	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.3623	58.4827	58.6012	59.1642	59.2707	59.7717	59.7717	59.8654	59.5777	59.2707	59.0556	58.8323	
alpha	4.8908	4.8988	4.9067	4.9443	4.9514	4.9848	4.9848	4.9910	4.9718	4.9514	4.9370	4.9222	
util living area	0.9676	0.9340	0.8812	0.7719	0.6227	0.4490	0.3228	0.3518	0.5402	0.8011	0.9357	0.9734	(86)
MIT	20.0914	20.3367	20.5801	20.8212	20.9470	20.9915	20.9987	20.9980	20.9791	20.8180	20.4299	20.0425	(87)
Th 2	20.2085	20.2100	20.2115	20.2184	20.2197	20.2257	20.2257	20.2269	20.2234	20.2197	20.2171	20.2143	(88)
util rest of house	0.9613	0.9223	0.8615	0.7392	0.5779	0.3965	0.2664	0.2932	0.4839	0.7645	0.9222	0.9681	(89)

MIT 2	19.3922	19.6293	19.8595	20.0810	20.1845	20.2214	20.2253	20.2261	20.2119	20.0842	19.7283	19.3494	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.7262	19.9672	20.2037	20.4345	20.5487	20.5892	20.5947	20.5948	20.5783	20.4347	20.0634	19.6804	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7262	19.9672	20.2037	20.4345	20.5487	20.5892	20.5947	20.5948	20.5783	20.4347	20.0634	19.6804	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9567	0.9183	0.8613	0.7486	0.5971	0.4213	0.2934	0.3212	0.5100	0.7751	0.9193	0.9639	(94)
Useful gains	347.9365	393.3926	401.7995	377.2383	309.6675	214.2967	143.8714	150.7215	230.0095	314.8594	335.5884	333.5152	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	569.9023	555.4939	504.2025	420.3546	321.8954	216.0469	144.0985	151.0797	234.4517	357.7623	473.2960	567.3368	(97)
Space heating kWh													
	165.1425	108.9321	76.1878	31.0438	9.0976	0.0000	0.0000	0.0000	0.0000	31.9197	99.1494	173.9632	(98a)
Space heating requirement - total per year (kWh/year)												695.4361	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	165.1425	108.9321	76.1878	31.0438	9.0976	0.0000	0.0000	0.0000	0.0000	31.9197	99.1494	173.9632	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												695.4361	
Space heating per m2											(98c) / (4) =	16.0387	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	339.0831	266.9377	273.7231	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9673	0.9854	0.9808	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	327.9877	263.0350	268.4542	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	565.9218	546.1214	522.8242	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	171.3125	210.6163	189.2513	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	42.8281	52.6541	47.3128	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												142.7950	(107)
Energy for space heating												16.0387	(99)
Energy for space cooling												3.2932	(108)
Total												19.3319	(109)
Fabric Energy Efficiency (DFEE)												19.3	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.6400	1.1450	7.6031			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.1800	1.7910			(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.1800	2.6550			(29a)
500mm mineral wool	43.3600		43.3600	0.1100	4.7696			(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.6587			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.0141 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	4.7800	0.0500	0.2390
E3 Sill	3.8800	0.0500	0.1940
E4 Jamb	17.9200	0.0500	0.8960
E7 Party floor between dwellings (in blocks of flats)	17.6700	0.0700	1.2369
E16 Corner (normal)	5.0000	0.0900	0.4500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.5900	0.0000	0.0000
E14 Flat roof	17.6700	0.0800	1.4136
P4 Party wall - Roof (insulation at ceiling level)	12.5900	0.1200	1.5108
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5403 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.1990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	46.0145	45.8869	45.7618	45.1741	45.0641	44.5523	44.5523	44.4575	44.7494	45.0641	45.2866	45.5191	(39)
Average = Sum(39)m / 12 =												45.1735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0612	1.0583	1.0554	1.0418	1.0393	1.0275	1.0275	1.0253	1.0320	1.0393	1.0444	1.0498	(40)
HLP (average)												1.0418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)													
	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							449.4572	(64a)
Heat gains from water heating, kWh/month													
	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	69.0518	76.4502	69.0518	71.3535	69.0518	71.3535	69.0518	69.0518	71.3535	69.0518	71.3535	69.0518	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains													
	281.0812	288.9106	276.6927	269.1105	255.9256	247.8477	238.9285	238.6510	245.5596	252.4649	266.4616	275.0462	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	6.6400	36.7938	0.6300	0.7000	0.7700	74.6646	(79)

Solar gains	74.6646	127.1815	174.0153	215.6133	241.5049	239.7585	231.1528	211.8365	188.4217	140.5626	89.4310	63.8974	(83)
Total gains	355.7458	416.0921	450.7079	484.7238	497.4305	487.6062	470.0812	450.4875	433.9813	393.0276	355.8927	338.9436	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8575	46.9878	47.1163	47.7293	47.8457	48.3954	48.3954	48.4986	48.1822	47.8457	47.6107	47.3675	
alpha	4.1238	4.1325	4.1411	4.1820	4.1897	4.2264	4.2264	4.2332	4.2121	4.1897	4.1740	4.1578	
util living area													
	0.9771	0.9570	0.9251	0.8522	0.7327	0.5580	0.4109	0.4451	0.6526	0.8711	0.9576	0.9808	(86)
MIT	19.6299	19.8904	20.1960	20.5633	20.8211	20.9572	20.9906	20.9868	20.9161	20.5866	20.0563	19.5888	(87)
Th 2	20.0326	20.0351	20.0374	20.0486	20.0507	20.0605	20.0605	20.0623	20.0567	20.0507	20.0465	20.0420	(88)
util rest of house													
	0.9721	0.9480	0.9093	0.8221	0.6817	0.4853	0.3260	0.3583	0.5812	0.8383	0.9471	0.9766	(89)
MIT 2	18.8016	19.0575	19.3539	19.7048	19.9289	20.0387	20.0574	20.0577	20.0097	19.7351	19.2317	18.7684	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.1972	19.4553	19.7561	20.1148	20.3551	20.4774	20.5031	20.5015	20.4427	20.1418	19.6256	19.1603	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1972	19.4553	19.7561	20.1148	20.3551	20.4774	20.5031	20.5015	20.4427	20.1418	19.6256	19.1603	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9667	0.9415	0.9041	0.8244	0.6989	0.5183	0.3664	0.3995	0.6115	0.8418	0.9415	0.9716	(94)
Useful gains	343.8898	391.7534	407.4702	399.6161	347.6408	252.7390	172.2460	179.9608	265.3958	330.8386	335.0808	329.3215	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	685.4893	667.8982	606.6243	506.6189	390.0331	261.8514	173.8933	182.3410	283.8306	429.9938	567.2403	680.9773	(97)
Space heating kWh													
	254.1501	185.5692	148.1706	77.0420	31.5399	0.0000	0.0000	0.0000	0.0000	73.7715	167.1548	261.6319	(98a)
Space heating requirement - total per year (kWh/year)												1199.0300	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	254.1501	185.5692	148.1706	77.0420	31.5399	0.0000	0.0000	0.0000	0.0000	73.7715	167.1548	261.6319	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1199.0300	
Space heating per m2											(98c) / (4) =	27.6529	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	418.7912	329.6867	337.8767	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8975	0.9427	0.9304	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	375.8650	310.8091	314.3560	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	543.5050	524.4888	502.9266	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	120.7008	158.9777	140.2965	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	30.1752	39.7444	35.0741	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												104.9937	(107)
Energy for space heating												27.6529	(99)
Energy for space cooling												2.4214	(108)
Total												30.0743	(109)
Fabric Energy Efficiency (TFEE)												30.1	(109)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.23	**TER**	15.57
Environmental	99 A	**% DER < TER**			92.10
CO_2 Emissions (t/year)	0.03	**DFEE**	19.33	**TFEE**	30.07
Compliance Check	See BREL	**% DFEE < TFEE**			35.72
% DPER < TPER	72.32	**DPER**	23.27	**TPER**	84.07

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross (m2)	Openings (m2)	NetArea (m2)	U-value (W/m2K)	A x U (W/K)	K-value (kJ/m2K)	A x K (kJ/K)	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
12Total per year (kWh/year)												2188	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0601	78.6737	71.0601	73.4288	71.0601	73.4288	71.0601	71.0601	73.4288	71.0601	73.4288	71.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.2801	384.4058	369.8506	357.2179	340.9558	329.7655	318.6057	319.7771	328.5028	338.8880	357.8362	370.5488	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	6.6400	36.7938	0.6800	0.7000	0.7700	80.5904	(79)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	80.5904	137.2753	187.8260	232.7255	260.6720	258.7869	249.4982	228.6489	203.3758	151.7184	96.5287	68.9686	(83)
Total gains	457.8704	521.6811	557.6766	589.9434	601.6278	588.5524	568.1040	548.4260	531.8786	490.6064	454.3649	439.5174	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292

alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.9196	0.8666	0.7943	0.6747	0.5298	0.3787	0.2707	0.2931	0.4494	0.6920	0.8633	0.9312	(86)
MIT	20.4341	20.6145	20.7770	20.9124	20.9770	20.9965	20.9995	20.9992	20.9919	20.9156	20.6740	20.3812	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.9068	0.8481	0.7688	0.6410	0.4899	0.3349	0.2245	0.2453	0.4020	0.6526	0.8414	0.9199	(89)
MIT 2	19.6124	19.8270	20.0151	20.1636	20.2283	20.2452	20.2472	20.2470	20.2418	20.1702	19.9018	19.5483	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0049	20.2031	20.3790	20.5212	20.5859	20.6040	20.6065	20.6063	20.6000	20.5262	20.2706	19.9461	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0049	20.2031	20.3790	20.5212	20.5859	20.6040	20.6065	20.6063	20.6000	20.5262	20.2706	19.9461	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9022	0.8469	0.7735	0.6535	0.5080	0.3557	0.2466	0.2681	0.4243	0.6676	0.8421	0.9148	(94)
Useful gains	413.1056	441.8354	431.3418	385.5411	305.6337	209.3538	140.0867	147.0302	225.7015	327.5147	382.6218	402.0628	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	549.4417	535.3875	485.5636	406.5742	310.8783	210.0545	140.1697	147.1601	227.4070	347.2738	460.7800	550.8849	(97)
Space heating kWh	101.4341	62.8670	40.3410	15.1438	3.9020	0.0000	0.0000	0.0000	0.0000	14.7008	56.2739	110.7237	(98a)
Space heating requirement - total per year (kWh/year)												405.3863	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	101.4341	62.8670	40.3410	15.1438	3.9020	0.0000	0.0000	0.0000	0.0000	14.7008	56.2739	110.7237	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												405.3863	
Space heating per m2											(98c) / (4) =	9.3493	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	101.4341	62.8670	40.3410	15.1438	3.9020	0.0000	0.0000	0.0000	0.0000	14.7008	56.2739	110.7237	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	152.1511	94.3005	60.5115	22.7158	5.8530	0.0000	0.0000	0.0000	0.0000	22.0511	84.4109	166.0856	
Space heating requirement	152.1511	94.3005	60.5115	22.7158	5.8530	0.0000	0.0000	0.0000	0.0000	22.0511	84.4109	166.0856	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												608.0794	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												6.0808	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3071.2715	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1037.2154	0.1578	25.5960	(367)
Electrical energy for heat distribution (space & water)	6.0808	0.0000	5.5777	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			154.3171	(373)
Space and water heating			154.3171	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			53.3841	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.2300	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1037.2154	1.5843	256.9028	(467)
Electrical energy for heat distribution (space & water)	6.0808	0.0000	59.5236	(472)
Overall CO2 factor for heat network			0.4234	(486)
Total CO2 associated with community systems			1646.8194	(473)
Space and water heating			1646.8194	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	1.4901	-605.6307	
PV Unit electricity exported	-551.7766	0.4464	-246.3315	
Total			-851.9622	(480)
Total Primary energy kWh/year			1009.1726	(483)
Dwelling Primary energy Rate (DPER)			23.2700	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.6400	1.1450	7.6031			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.1800	1.7910			(29a)

Wall to Unheated Com	16.5900	1.8400	14.7500	0.1800	2.6550	(29a)
500mm mineral wool	43.3600		43.3600	0.1100	4.7696	(30)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.6587	(33)
Main dwelling						
Party Wall 1			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.0141 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	4.7800	0.0500	0.2390
E3 Sill	3.8800	0.0500	0.1940
E4 Jamb	17.9200	0.0500	0.8960
E7 Party floor between dwellings (in blocks of flats)	17.6700	0.0700	1.2369
E16 Corner (normal)	5.0000	0.0900	0.4500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.5900	0.0000	0.0000
E14 Flat roof	17.6700	0.0800	1.4136
P4 Party wall - Roof (insulation at ceiling level)	12.5900	0.1200	1.5108
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5403 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 25.1990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	46.0145	45.8869	45.7618	45.1741	45.0641	44.5523	44.5523	44.4575	44.7494	45.0641	45.2866	45.5191	(39)
Average = Sum(39)m / 12 =												45.1735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0612	1.0583	1.0554	1.0418	1.0393	1.0275	1.0275	1.0253	1.0320	1.0393	1.0444	1.0498	(40)
HLP (average)												1.0418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.0518	76.4502	69.0518	71.3535	69.0518	71.3535	69.0518	69.0518	71.3535	69.0518	71.3535	69.0518	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	368.9363	375.8469	361.5069	348.8073	332.6121	318.3548	307.2620	308.4334	317.0921	330.5443	349.4255	362.2051	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	6.6400	36.7938	0.6300	0.7000	0.7700	74.6646	(79)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	74.6646	127.1815	174.0153	215.6133	241.5049	239.7585	231.1528	211.8365	188.4217	140.5626	89.4310	63.8974	(83)
Total gains	443.6010	503.0284	535.5222	564.4206	574.1170	558.1133	538.4148	520.2699	505.5138	471.1069	438.8565	426.1025	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8575	46.9878	47.1163	47.7293	47.8457	48.3954	48.3954	48.4986	48.1822	47.8457	47.6107	47.3675	
alpha	4.1238	4.1325	4.1411	4.1820	4.1897	4.2264	4.2264	4.2332	4.2121	4.1897	4.1740	4.1578	
util living area	0.9533	0.9243	0.8811	0.7939	0.6645	0.4958	0.3608	0.3885	0.5785	0.8052	0.9205	0.9591	(86)
MIT	19.8750	20.1078	20.3750	20.6777	20.8769	20.9724	20.9943	20.9921	20.9465	20.7076	20.2628	19.8376	(87)
Th 2	20.0326	20.0351	20.0374	20.0486	20.0507	20.0605	20.0605	20.0623	20.0567	20.0507	20.0465	20.0420	(88)
util rest of house	0.9441	0.9101	0.8593	0.7585	0.6122	0.4284	0.2853	0.3114	0.5099	0.7646	0.9033	0.9508	(89)
MIT 2	18.7579	19.0456	19.3709	19.7316	19.9463	20.0430	20.0581	20.0588	20.0196	19.7748	19.2501	18.7184	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.2915	19.5530	19.8505	20.1835	20.3908	20.4869	20.5052	20.5046	20.4623	20.2203	19.7338	19.2530	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2915	19.5530	19.8505	20.1835	20.3908	20.4869	20.5052	20.5046	20.4623	20.2203	19.7338	19.2530	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9355	0.9020	0.8546	0.7638	0.6315	0.4595	0.3213	0.3480	0.5401	0.7724	0.8968	0.9426	(94)
Useful gains	414.9854	453.7144	457.6679	431.1217	362.5803	256.4469	172.9905	181.0699	273.0472	363.8662	393.5851	401.6357	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	689.8249	672.3785	610.9424	509.7221	391.6415	262.2739	173.9877	182.4800	284.7104	433.5321	572.1416	685.1984	(97)
Space heating kWh	204.4806	146.9423	114.0362	56.5923	21.6215	0.0000	0.0000	0.0000	0.0000	51.8315	128.5606	210.9706	(98a)
Space heating requirement - total per year (kWh/year)												935.0357	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	204.4806	146.9423	114.0362	56.5923	21.6215	0.0000	0.0000	0.0000	0.0000	51.8315	128.5606	210.9706	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												935.0357	
Space heating per m2										(98c) / (4) =		21.5645	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	204.4806	146.9423	114.0362	56.5923	21.6215	0.0000	0.0000	0.0000	0.0000	51.8315	128.5606	210.9706	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	221.5391	159.2007	123.5495	61.3134	23.4253	0.0000	0.0000	0.0000	0.0000	56.1554	139.2856	228.5706	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.3038	83.8361	83.1470	82.0385	80.8330	79.8000	79.8000	79.8000	79.8000	81.8715	83.5185	84.3963	(217)
Fuel for water heating, kWh/month	217.6062	193.7206	208.1655	187.2452	185.3832	170.5061	169.2907	175.3325	176.4869	190.2860	196.4783	215.2317	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.3476	11.5102	10.3636	7.5928	5.8649	4.7917	5.3502	6.9544	9.0330	11.8518	13.3866	14.7464	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3196	-12.6515	-19.6021	-23.8221	-27.3050	-26.1047	-25.8068	-23.5584	-19.8837	-15.2375	-9.4737	-7.0906	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2617	-4.9168	-10.0734	-15.5779	-21.0367	-21.2830	-21.0140	-17.5742	-12.6116	-7.1556	-3.0599	-1.7757	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1013.0397	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2285.7331	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	115.7933	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3143.3700	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1013.0397	0.2100	212.7383	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2285.7331	0.2100	480.0039	(264)
Space and water heating			692.7423	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	115.7933	0.1443	16.7126	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	0.1330	-29.1103	
PV Unit electricity exported	-138.3404	0.1251	-17.3028	
Total			-46.4132	(269)
Total CO2, kg/year			674.9709	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.5700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1013.0397	1.1300	1144.7349	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2285.7331	1.1300	2582.8784	(278)
Space and water heating			3727.6133	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	115.7933	1.5338	177.6076	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	1.4915	-326.4228	
PV Unit electricity exported	-138.3404	0.4591	-63.5081	
Total			-389.9309	(283)
Total Primary energy kWh/year			3645.3908	(286)
Target Primary Energy Rate (TPER)			84.0700	(287)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.23	**TER**	15.57
Environmental	99 A	**% DER < TER**			92.10
CO_2 Emissions (t/year)	0.03	**DFEE**	19.33	**TFEE**	30.07
Compliance Check	See BREL	**% DFEE < TFEE**			35.72
% DPER < TPER	72.32	**DPER**	23.27	**TPER**	84.07

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	6.6400	36.7938	0.6800	0.7000	0.7700	80.5904	(79)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	80.5904	137.2753	187.8260	232.7255	260.6720	258.7869	249.4982	228.6489	203.3758	151.7184	96.5287	68.9686	(83)
Total gains	498.5013	553.3898	592.3963	615.6310	622.7452	601.9464	581.5305	563.1612	548.8478	516.6076	484.9362	477.8122	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086

util living area													
	0.8949	0.8436	0.7654	0.6523	0.5132	0.3705	0.2645	0.2854	0.4361	0.6649	0.8375	0.9095	(86)
MIT	20.5210	20.6657	20.8131	20.9247	20.9801	20.9969	20.9996	20.9993	20.9929	20.9295	20.7220	20.4689	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house													
	0.8795	0.8234	0.7387	0.6187	0.4742	0.3275	0.2194	0.2389	0.3899	0.6255	0.8134	0.8957	(89)
MIT 2	19.7158	19.8858	20.0546	20.1758	20.2309	20.2454	20.2472	20.2471	20.2425	20.1835	19.9559	19.6537	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.1004	20.2583	20.4169	20.5335	20.5887	20.6043	20.6065	20.6064	20.6009	20.5398	20.3218	20.0431	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1004	20.2583	20.4169	20.5335	20.5887	20.6043	20.6065	20.6064	20.6009	20.5398	20.3218	20.0431	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8763	0.8237	0.7449	0.6317	0.4921	0.3479	0.2409	0.2611	0.4117	0.6412	0.8159	0.8916	(94)
Useful gains	436.8328	455.8429	441.2927	388.9042	306.4278	209.4317	140.0968	147.0478	225.9519	331.2280	395.6765	426.0207	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	552.7853	537.3176	486.8888	407.0028	310.9764	210.0641	140.1710	147.1623	227.4377	347.7482	462.5717	554.2771	(97)
Space heating kWh													
	86.2686	54.7510	33.9235	13.0310	3.3841	0.0000	0.0000	0.0000	0.0000	12.2911	48.1646	95.4228	(98a)
Space heating requirement - total per year (kWh/year)												347.2367	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	86.2686	54.7510	33.9235	13.0310	3.3841	0.0000	0.0000	0.0000	0.0000	12.2911	48.1646	95.4228	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												347.2367	
Space heating per m2											(98c) / (4) =	8.0082	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	86.2686	54.7510	33.9235	13.0310	3.3841	0.0000	0.0000	0.0000	0.0000	12.2911	48.1646	95.4228	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	129.4029	82.1265	50.8853	19.5465	5.0761	0.0000	0.0000	0.0000	0.0000	18.4366	72.2469	143.1342	
Space heating requirement													
	129.4029	82.1265	50.8853	19.5465	5.0761	0.0000	0.0000	0.0000	0.0000	18.4366	72.2469	143.1342	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												520.8550	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												5.2085	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2984.0471	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	520.8550	4.4400	23.1260	(340a)
Space heating total			23.1260	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	16.4900	2.5157	(349)
Energy for lighting	124.6784	16.4900	20.5595	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	16.4900	-67.0227	
PV Unit electricity exported	-551.7766	5.5900	-30.8443	
Total			-97.8670	(352)
Total energy cost			186.0318	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7579 (357)
SAP value		87.7138
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1013.9556	0.1579	21.9283	(367)
Electrical energy for heat distribution (space & water)	5.2085	0.0000	5.4402	(372)
Overall CO2 factor for heat network			0.0396	(386)
Total CO2 associated with community systems			150.5119	(373)
Space and water heating			150.5119	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			49.5789	(383)
CO2 emissions per m2			1.1400	(384)
EI value			99.2481	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	43.3600 (1b)	x 2.4500 (2b)	= 106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)

Adj infilt rate

	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	6.6400	42.9509	0.6800	0.7000	0.7700	94.0764	(79)

Solar gains	94.0764	142.4047	192.4255	242.6763	263.5772	281.5841	266.0190	247.1729	220.3982	166.1261	110.9823	80.9973	(83)
Total gains	511.9874	558.5192	596.9958	625.5817	625.6505	624.7436	598.0513	581.6852	565.8701	531.0153	499.3898	489.8410	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area													
	0.8800	0.8319	0.7440	0.6263	0.4853	0.3241	0.2281	0.2464	0.4056	0.6247	0.8121	0.8966	(86)
MIT	20.5728	20.6945	20.8418	20.9393	20.9853	20.9985	20.9998	20.9997	20.9951	20.9492	20.7686	20.5214	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house													
	0.8630	0.8106	0.7158	0.5919	0.4458	0.2823	0.1841	0.2013	0.3602	0.5838	0.7856	0.8812	(89)
MIT 2	19.7775	19.9195	20.0866	20.1907	20.2356	20.2465	20.2473	20.2473	20.2442	20.2028	20.0087	19.7168	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.1574	20.2896	20.4473	20.5482	20.5937	20.6057	20.6067	20.6067	20.6028	20.5593	20.3717	20.1011	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1574	20.2896	20.4473	20.5482	20.5937	20.6057	20.6067	20.6067	20.6028	20.5593	20.3717	20.1011	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8608	0.8119	0.7235	0.6058	0.4641	0.3022	0.2051	0.2229	0.3817	0.6010	0.7902	0.8780	(94)
Useful gains	440.7008	453.4394	431.9389	378.9954	290.3557	188.8253	122.6548	129.6320	216.0065	319.1457	394.6230	430.0784	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	544.2816	527.9181	470.4615	393.5242	293.6580	189.1199	122.6846	129.6792	217.0094	330.9381	450.3214	545.8110	(97)
Space heating kWh													
	77.0641	50.0497	28.6608	10.4607	2.4569	0.0000	0.0000	0.0000	0.0000	8.7736	40.1028	86.1051	(98a)
Space heating requirement - total per year (kWh/year)												303.6736	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	77.0641	50.0497	28.6608	10.4607	2.4569	0.0000	0.0000	0.0000	0.0000	8.7736	40.1028	86.1051	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												303.6736	
Space heating per m2											(98c) / (4) =	7.0035	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	77.0641	50.0497	28.6608	10.4607	2.4569	0.0000	0.0000	0.0000	0.0000	8.7736	40.1028	86.1051	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	115.5961	75.0745	42.9912	15.6911	3.6853	0.0000	0.0000	0.0000	0.0000	13.1603	60.1543	129.1576	
Space heating requirement													
	115.5961	75.0745	42.9912	15.6911	3.6853	0.0000	0.0000	0.0000	0.0000	13.1603	60.1543	129.1576	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5669	-24.0727	-38.8745	-48.0493	-52.9789	-51.6524	-50.3986	-46.8694	-39.7890	-30.3128	-18.7591	-13.8902	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4316	-15.8925	-38.3705	-69.5238	-96.2615	-109.4663	-104.0915	-84.3722	-54.5598	-26.6835	-10.2713	-5.6085	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year												
Space heating fuel - community heating											455.5104	(307)
Space heating fuel - secondary											0.0000	(309)
Water heating fuel - community heating											3281.4784	(310)
Efficiency of water heater											0.0000	(311)
Electricity used for heat distribution											4.5551	(313)
Space cooling fuel											0.0000	(321)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)												
mechanical ventilation fans (SFP = 0.1177)											15.2561	(330a)
Total electricity for the above, kWh/year											15.2561	(331)
Electricity for lighting (calculated in Appendix L)											124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											-1054.7470	(333)
Wind generation											0.0000	(334)
Hydro-electric generation (Appendix N)											0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)											0.0000	(335)
Appendix Q - special features												
Energy saved or generated											-0.0000	(336)
Energy used											0.0000	(337)
Total delivered energy for all uses											2822.1764	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	455.5104	6.5500	29.8359	(340a)
Space heating total			29.8359	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	28.4300	4.3373	(349)
Energy for lighting	124.6784	28.4300	35.4461	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	28.4300	-122.8784	
PV Unit electricity exported	-622.5330	5.8100	-36.1692	
Total			-159.0476	(352)
Total energy cost			229.5086	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	996.5303	0.1583	19.2234	(367)
Electrical energy for heat distribution (space & water)	4.5551	0.0000	5.3388	(372)
Overall CO2 factor for heat network			0.0395	(386)
Total CO2 associated with community systems			147.7056	(373)
Space and water heating			147.7056	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	0.1330	-57.4796	
PV Unit electricity exported	-622.5330	0.1218	-75.7970	
Total			-133.2765	(380)
Total CO2, kg/year			34.5402	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	996.5303	1.5858	192.6289	(467)
Electrical energy for heat distribution (space & water)	4.5551	0.0000	57.1133	(472)
Overall CO2 factor for heat network			0.4228	(486)
Total CO2 associated with community systems			1580.1353	(473)
Space and water heating			1580.1353	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	1.4914	-644.6094	
PV Unit electricity exported	-622.5330	0.4467	-278.0656	
Total			-922.6749	(480)
Total Primary energy kWh/year			871.7758	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Northeast

Current energy efficiency rating:	B 88
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£40	£40	£0
Community scheme	£349	£349	£0
Space heating	£138	£138	£0
Water heating	£215	£215	£0
Lighting	£35	£35	£0
Generated (PV)	-£159	-£159	£0
Total cost of fuels	£230	£230	£0
Total cost of uses	£229	£229	£0
Delivered energy	65 kWh/m²	65 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.0 tonnes	0.0 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	20 kWh/m²	20 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)

Total net area of external elements Aum(A, m2)	76.5400				(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	15.1610			(33)
Main dwelling					
Party Wall 1	31.3600	0.0000	0.0000	70.0000	2195.2000 (32)
Party Floor 1	43.3600			70.0000	3035.2000 (32d)
Internal TF Wall	68.4500			9.0000	616.0500 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	6.6400	36.7938	0.6800	0.7000	0.7700	80.5904	(79)

Solar gains	80.5904	137.2753	187.8260	232.7255	260.6720	258.7869	249.4982	228.6489	203.3758	151.7184	96.5287	68.9686	(83)
Total gains	498.5013	553.3898	592.3963	615.6310	622.7452	601.9464	581.5305	563.1612	548.8478	516.6076	484.9362	477.8122	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.8949	0.8436	0.7654	0.6523	0.5132	0.3705	0.2645	0.2854	0.4361	0.6649	0.8375	0.9095	(86)
MIT	20.5210	20.6657	20.8131	20.9247	20.9801	20.9969	20.9996	20.9993	20.9929	20.9295	20.7220	20.4689	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.8795	0.8234	0.7387	0.6187	0.4742	0.3275	0.2194	0.2389	0.3899	0.6255	0.8134	0.8957	(89)
MIT 2	19.7158	19.8858	20.0546	20.1758	20.2309	20.2454	20.2472	20.2471	20.2425	20.1835	19.9559	19.6537	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.1004	20.2583	20.4169	20.5335	20.5887	20.6043	20.6065	20.6064	20.6009	20.5398	20.3218	20.0431	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1004	20.2583	20.4169	20.5335	20.5887	20.6043	20.6065	20.6064	20.6009	20.5398	20.3218	20.0431	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8763	0.8237	0.7449	0.6317	0.4921	0.3479	0.2409	0.2611	0.4117	0.6412	0.8159	0.8916	(94)
Useful gains	436.8328	455.8429	441.2927	388.9042	306.4278	209.4317	140.0968	147.0478	225.9519	331.2280	395.6765	426.0207	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	552.7853	537.3176	486.8888	407.0028	310.9764	210.0641	140.1710	147.1623	227.4377	347.7482	462.5717	554.2771	(97)
Space heating kWh	86.2686	54.7510	33.9235	13.0310	3.3841	0.0000	0.0000	0.0000	0.0000	12.2911	48.1646	95.4228	(98a)
Space heating requirement - total per year (kWh/year)												347.2367	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	86.2686	54.7510	33.9235	13.0310	3.3841	0.0000	0.0000	0.0000	12.2911	48.1646		95.4228	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												347.2367	
Space heating per m2											(98c) / (4) =	8.0082	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	86.2686	54.7510	33.9235	13.0310	3.3841	0.0000	0.0000	0.0000	0.0000	12.2911	48.1646	95.4228	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	129.4029	82.1265	50.8853	19.5465	5.0761	0.0000	0.0000	0.0000	0.0000	18.4366	72.2469	143.1342	
Space heating requirement													
	129.4029	82.1265	50.8853	19.5465	5.0761	0.0000	0.0000	0.0000	0.0000	18.4366	72.2469	143.1342	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												520.8550	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												5.2085	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)

Appendix Q - special features

Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2984.0471	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	520.8550	4.4400	23.1260	(340a)
Space heating total			23.1260	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	16.4900	2.5157	(349)
Energy for lighting	124.6784	16.4900	20.5595	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	16.4900	-67.0227	
PV Unit electricity exported	-551.7766	5.5900	-30.8443	
Total			-97.8670	(352)
Total energy cost			186.0318	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7579	(357)
SAP value		87.7138	
SAP rating (Section 12)		88	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1013.9556	0.1579	21.9283	(367)
Electrical energy for heat distribution (space & water)	5.2085	0.0000	5.4402	(372)
Overall CO2 factor for heat network			0.0396	(386)
Total CO2 associated with community systems			150.5119	(373)
Space and water heating			150.5119	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			49.5789	(383)
CO2 emissions per m2			1.1400	(384)
EI value			99.2481	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

Measured/design AP50												3.0000	(17)
Infiltration rate												0.1500	(18)
Number of sides sheltered												3	(19)
Shelter factor								(20) = 1 - [0.075 x (19)] =				0.7750	(20)
Infiltration rate adjusted to include shelter factor								(21) = (18) x (20) =				0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	6.6400	42.9509	0.6800	0.7000	0.7700	94.0764	(79)

Solar gains	94.0764	142.4047	192.4255	242.6763	263.5772	281.5841	266.0190	247.1729	220.3982	166.1261	110.9823	80.9973	(83)
Total gains	511.9874	558.5192	596.9958	625.5817	625.6505	624.7436	598.0513	581.6852	565.8701	531.0153	499.3898	489.8410	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area													
	0.8800	0.8319	0.7440	0.6263	0.4853	0.3241	0.2281	0.2464	0.4056	0.6247	0.8121	0.8966	(86)
MIT	20.5728	20.6945	20.8418	20.9393	20.9853	20.9985	20.9998	20.9997	20.9951	20.9492	20.7686	20.5214	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house													
	0.8630	0.8106	0.7158	0.5919	0.4458	0.2823	0.1841	0.2013	0.3602	0.5838	0.7856	0.8812	(89)
MIT 2	19.7775	19.9195	20.0866	20.1907	20.2356	20.2465	20.2473	20.2473	20.2442	20.2028	20.0087	19.7168	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.1574	20.2896	20.4473	20.5482	20.5937	20.6057	20.6067	20.6067	20.6028	20.5593	20.3717	20.1011	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1574	20.2896	20.4473	20.5482	20.5937	20.6057	20.6067	20.6067	20.6028	20.5593	20.3717	20.1011	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8608	0.8119	0.7235	0.6058	0.4641	0.3022	0.2051	0.2229	0.3817	0.6010	0.7902	0.8780	(94)
Useful gains	440.7008	453.4394	431.9389	378.9954	290.3557	188.8253	122.6548	129.6320	216.0065	319.1457	394.6230	430.0784	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	544.2816	527.9181	470.4615	393.5242	293.6580	189.1199	122.6846	129.6792	217.0094	330.9381	450.3214	545.8110	(97)
Space heating kWh													
	77.0641	50.0497	28.6608	10.4607	2.4569	0.0000	0.0000	0.0000	0.0000	8.7736	40.1028	86.1051	(98a)
Space heating requirement - total per year (kWh/year)												303.6736	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	77.0641	50.0497	28.6608	10.4607	2.4569	0.0000	0.0000	0.0000	0.0000	8.7736	40.1028	86.1051	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												303.6736	
Space heating per m2										(98c) / (4) =		7.0035	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement													
	77.0641	50.0497	28.6608	10.4607	2.4569	0.0000	0.0000	0.0000	0.0000	8.7736	40.1028	86.1051	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	115.5961	75.0745	42.9912	15.6911	3.6853	0.0000	0.0000	0.0000	0.0000	13.1603	60.1543	129.1576	
Space heating requirement													
	115.5961	75.0745	42.9912	15.6911	3.6853	0.0000	0.0000	0.0000	0.0000	13.1603	60.1543	129.1576	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)

Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5669	-24.0727	-38.8745	-48.0493	-52.9789	-51.6524	-50.3986	-46.8694	-39.7890	-30.3128	-18.7591	-13.8902	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4316	-15.8925	-38.3705	-69.5238	-96.2615	-109.4663	-104.0915	-84.3722	-54.5598	-26.6835	-10.2713	-5.6085	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	455.5104	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	4.5551	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)		
mechanical ventilation fans (SFP = 0.1177)	15.2561	(330a)
Total electricity for the above, kWh/year	15.2561	(331)
Electricity for lighting (calculated in Appendix L)	124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2822.1764	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	455.5104	6.5500	29.8359	(340a)
Space heating total			29.8359	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	28.4300	4.3373	(349)
Energy for lighting	124.6784	28.4300	35.4461	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	28.4300	-122.8784	
PV Unit electricity exported	-622.5330	5.8100	-36.1692	
Total			-159.0476	(352)
Total energy cost			229.5086	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	996.5303	0.1583	19.2234	(367)
Electrical energy for heat distribution (space & water)	4.5551	0.0000	5.3388	(372)
Overall CO2 factor for heat network			0.0395	(386)
Total CO2 associated with community systems			147.7056	(373)
Space and water heating			147.7056	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	0.1330	-57.4796	
PV Unit electricity exported	-622.5330	0.1218	-75.7970	
Total			-133.2765	(380)
Total CO2, kg/year			34.5402	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	996.5303	1.5858	192.6289	(467)
Electrical energy for heat distribution (space & water)	4.5551	0.0000	57.1133	(472)
Overall CO2 factor for heat network			0.4228	(486)
Total CO2 associated with community systems			1580.1353	(473)
Space and water heating			1580.1353	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	1.4914	-644.6094	
PV Unit electricity exported	-622.5330	0.4467	-278.0656	
Total			-922.6749	(480)
Total Primary energy kWh/year			871.7758	(483)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.23	**TER**	15.57
Environmental	99 A	**% DER < TER**			92.10
CO_2 Emissions (t/year)	0.03	**DFEE**	19.33	**TFEE**	30.07
Compliance Check	See BREL	**% DFEE < TFEE**			35.72
% DPER < TPER	72.32	**DPER**	23.27	**TPER**	84.07

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523 (64)
12Total per year (kWh/year)												2188 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0601	78.6737	71.0601	73.4288	71.0601	73.4288	71.0601	71.0601	73.4288	71.0601	73.4288	71.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.2801	384.4058	369.8506	357.2179	340.9558	329.7655	318.6057	319.7771	328.5028	338.8880	357.8362	370.5488	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.6400	36.7938	0.6800	0.7000	0.7700	80.5904	(77)

Solar gains	80.5904	137.2753	187.8260	232.7255	260.6720	258.7869	249.4982	228.6489	203.3758	151.7184	96.5287	68.9686 (83)
Total gains	457.8704	521.6811	557.6766	589.9434	601.6278	588.5524	568.1040	548.4260	531.8786	490.6064	454.3649	439.5174 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292

alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.9196	0.8666	0.7943	0.6747	0.5298	0.3787	0.2707	0.2931	0.4494	0.6920	0.8633	0.9312	(86)
MIT	20.4341	20.6145	20.7770	20.9124	20.9770	20.9965	20.9995	20.9992	20.9919	20.9156	20.6740	20.3812	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.9068	0.8481	0.7688	0.6410	0.4899	0.3349	0.2245	0.2453	0.4020	0.6526	0.8414	0.9199	(89)
MIT 2	19.6124	19.8270	20.0151	20.1636	20.2283	20.2452	20.2472	20.2470	20.2418	20.1702	19.9018	19.5483	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0049	20.2031	20.3790	20.5212	20.5859	20.6040	20.6065	20.6063	20.6000	20.5262	20.2706	19.9461	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0049	20.2031	20.3790	20.5212	20.5859	20.6040	20.6065	20.6063	20.6000	20.5262	20.2706	19.9461	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9022	0.8469	0.7735	0.6535	0.5080	0.3557	0.2466	0.2681	0.4243	0.6676	0.8421	0.9148	(94)
Useful gains	413.1056	441.8354	431.3418	385.5411	305.6337	209.3538	140.0867	147.0302	225.7015	327.5147	382.6218	402.0628	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	549.4417	535.3875	485.5636	406.5742	310.8783	210.0545	140.1697	147.1601	227.4070	347.2738	460.7800	550.8849	(97)
Space heating kWh	101.4341	62.8670	40.3410	15.1438	3.9020	0.0000	0.0000	0.0000	0.0000	14.7008	56.2739	110.7237	(98a)
Space heating requirement - total per year (kWh/year)												405.3863	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	101.4341	62.8670	40.3410	15.1438	3.9020	0.0000	0.0000	0.0000	0.0000	14.7008	56.2739	110.7237	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												405.3863	
Space heating per m2											(98c) / (4) =	9.3493	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	101.4341	62.8670	40.3410	15.1438	3.9020	0.0000	0.0000	0.0000	0.0000	14.7008	56.2739	110.7237	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	152.1511	94.3005	60.5115	22.7158	5.8530	0.0000	0.0000	0.0000	0.0000	22.0511	84.4109	166.0856	
Space heating requirement	152.1511	94.3005	60.5115	22.7158	5.8530	0.0000	0.0000	0.0000	0.0000	22.0511	84.4109	166.0856	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												608.0794	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												6.0808	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3071.2715	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1037.2154	0.1578	25.5960	(367)
Electrical energy for heat distribution (space & water)	6.0808	0.0000	5.5777	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			154.3171	(373)
Space and water heating			154.3171	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			53.3841	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.2300	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1037.2154	1.5843	256.9028	(467)
Electrical energy for heat distribution (space & water)	6.0808	0.0000	59.5236	(472)
Overall CO2 factor for heat network			0.4234	(486)
Total CO2 associated with community systems			1646.8194	(473)
Space and water heating			1646.8194	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	1.4901	-605.6307	
PV Unit electricity exported	-551.7766	0.4464	-246.3315	
Total			-851.9622	(480)
Total Primary energy kWh/year			1009.1726	(483)
Dwelling Primary energy Rate (DPER)			23.2700	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.6400	1.1450	7.6031			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.1800	1.7910			(29a)

Wall to Unheated Com	16.5900	1.8400	14.7500	0.1800	2.6550	(29a)
500mm mineral wool	43.3600		43.3600	0.1100	4.7696	(30)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.6587	(33)
Main dwelling						
Party Wall 1			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.0141 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	4.7800	0.0500	0.2390
E3 Sill	3.8800	0.0500	0.1940
E4 Jamb	17.9200	0.0500	0.8960
E7 Party floor between dwellings (in blocks of flats)	17.6700	0.0700	1.2369
E16 Corner (normal)	5.0000	0.0900	0.4500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.5900	0.0000	0.0000
E14 Flat roof	17.6700	0.0800	1.4136
P4 Party wall - Roof (insulation at ceiling level)	12.5900	0.1200	1.5108
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5403 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 25.1990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	46.0145	45.8869	45.7618	45.1741	45.0641	44.5523	44.5523	44.4575	44.7494	45.0641	45.2866	45.5191	(39)
Average = Sum(39)m / 12 =												45.1735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0612	1.0583	1.0554	1.0418	1.0393	1.0275	1.0275	1.0253	1.0320	1.0393	1.0444	1.0498	(40)
HLP (average)												1.0418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.0518	76.4502	69.0518	71.3535	69.0518	71.3535	69.0518	69.0518	71.3535	69.0518	71.3535	69.0518	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	368.9363	375.8469	361.5069	348.8073	332.6121	318.3548	307.2620	308.4334	317.0921	330.5443	349.4255	362.2051	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.6400	36.7938	0.6300	0.7000	0.7700	74.6646	(77)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	74.6646	127.1815	174.0153	215.6133	241.5049	239.7585	231.1528	211.8365	188.4217	140.5626	89.4310	63.8974	(83)
Total gains	443.6010	503.0284	535.5222	564.4206	574.1170	558.1133	538.4148	520.2699	505.5138	471.1069	438.8565	426.1025	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8575	46.9878	47.1163	47.7293	47.8457	48.3954	48.3954	48.4986	48.1822	47.8457	47.6107	47.3675	
alpha	4.1238	4.1325	4.1411	4.1820	4.1897	4.2264	4.2264	4.2332	4.2121	4.1897	4.1740	4.1578	
util living area	0.9533	0.9243	0.8811	0.7939	0.6645	0.4958	0.3608	0.3885	0.5785	0.8052	0.9205	0.9591	(86)
MIT	19.8750	20.1078	20.3750	20.6777	20.8769	20.9724	20.9943	20.9921	20.9465	20.7076	20.2628	19.8376	(87)
Th 2	20.0326	20.0351	20.0374	20.0486	20.0507	20.0605	20.0605	20.0623	20.0567	20.0507	20.0465	20.0420	(88)
util rest of house	0.9441	0.9101	0.8593	0.7585	0.6122	0.4284	0.2853	0.3114	0.5099	0.7646	0.9033	0.9508	(89)
MIT 2	18.7579	19.0456	19.3709	19.7316	19.9463	20.0430	20.0581	20.0588	20.0196	19.7748	19.2501	18.7184	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.2915	19.5530	19.8505	20.1835	20.3908	20.4869	20.5052	20.5046	20.4623	20.2203	19.7338	19.2530	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2915	19.5530	19.8505	20.1835	20.3908	20.4869	20.5052	20.5046	20.4623	20.2203	19.7338	19.2530	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9355	0.9020	0.8546	0.7638	0.6315	0.4595	0.3213	0.3480	0.5401	0.7724	0.8968	0.9426	(94)
Useful gains	414.9854	453.7144	457.6679	431.1217	362.5803	256.4469	172.9905	181.0699	273.0472	363.8662	393.5851	401.6357	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	689.8249	672.3785	610.9424	509.7221	391.6415	262.2739	173.9877	182.4800	284.7104	433.5321	572.1416	685.1984	(97)
Space heating kWh	204.4806	146.9423	114.0362	56.5923	21.6215	0.0000	0.0000	0.0000	0.0000	51.8315	128.5606	210.9706	(98a)
Space heating requirement - total per year (kWh/year)												935.0357	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	204.4806	146.9423	114.0362	56.5923	21.6215	0.0000	0.0000	0.0000	0.0000	51.8315	128.5606	210.9706	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												935.0357	
Space heating per m2										(98c) / (4) =		21.5645	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	204.4806	146.9423	114.0362	56.5923	21.6215	0.0000	0.0000	0.0000	0.0000	51.8315	128.5606	210.9706	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	221.5391	159.2007	123.5495	61.3134	23.4253	0.0000	0.0000	0.0000	0.0000	56.1554	139.2856	228.5706	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.3038	83.8361	83.1470	82.0385	80.8330	79.8000	79.8000	79.8000	79.8000	81.8715	83.5185	84.3963	(217)
Fuel for water heating, kWh/month	217.6062	193.7206	208.1655	187.2452	185.3832	170.5061	169.2907	175.3325	176.4869	190.2860	196.4783	215.2317	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.3476	11.5102	10.3636	7.5928	5.8649	4.7917	5.3502	6.9544	9.0330	11.8518	13.3866	14.7464	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3196	-12.6515	-19.6021	-23.8221	-27.3050	-26.1047	-25.8068	-23.5584	-19.8837	-15.2375	-9.4737	-7.0906	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2617	-4.9168	-10.0734	-15.5779	-21.0367	-21.2830	-21.0140	-17.5742	-12.6116	-7.1556	-3.0599	-1.7757	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1013.0397	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2285.7331	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	115.7933	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3143.3700	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1013.0397	0.2100	212.7383	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2285.7331	0.2100	480.0039	(264)
Space and water heating			692.7423	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	115.7933	0.1443	16.7126	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	0.1330	-29.1103	
PV Unit electricity exported	-138.3404	0.1251	-17.3028	
Total			-46.4132	(269)
Total CO2, kg/year			674.9709	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.5700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1013.0397	1.1300	1144.7349	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2285.7331	1.1300	2582.8784	(278)
Space and water heating			3727.6133	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	115.7933	1.5338	177.6076	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	1.4915	-326.4228	
PV Unit electricity exported	-138.3404	0.4591	-63.5081	
Total			-389.9309	(283)
Total Primary energy kWh/year			3645.3908	(286)
Target Primary Energy Rate (TPER)			84.0700	(287)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.23	**TER**	15.57
Environmental	99 A	**% DER < TER**			92.10
CO_2 Emissions (t/year)	0.03	**DFEE**	19.33	**TFEE**	30.07
Compliance Check	See BREL	**% DFEE < TFEE**			35.72
% DPER < TPER	72.32	**DPER**	23.27	**TPER**	84.07

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area		Storey height		Volume	
Main dwelling		(m2)		(m)		(m3)	
Ground floor		43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2622	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)

Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	36.9438	36.8677	36.7932	36.4431	36.3776	36.0727	36.0727	36.0162	36.1901	36.3776	36.5101	36.6486	(39)
Average = Sum(39)m / 12 =												36.4428	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8520	0.8503	0.8486	0.8405	0.8390	0.8319	0.8319	0.8306	0.8346	0.8390	0.8420	0.8452	(40)
HLP (average)												0.8405	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)											Total = Sum(45)m =	781.1490	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
										Total per year (kWh/year) = Sum(64)m =	663.9767	(64)

12Total per year (kWh/year) 664 (64)

Electric shower(s)

39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	449.4572	(64a)

Heat gains from water heating, kWh/month

27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0601	78.6737	71.0601	73.4288	71.0601	73.4288	71.0601	71.0601	73.4288	71.0601	73.4288	71.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.0895	291.1341	278.7010	271.1858	257.9340	249.9230	240.9368	240.6593	247.6349	254.4733	268.5369	277.0546	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.6400	36.7938	0.6800	0.7000	0.7700	80.5904	(77)

Solar gains	80.5904	137.2753	187.8260	232.7255	260.6720	258.7869	249.4982	228.6489	203.3758	151.7184	96.5287	68.9686	(83)
Total gains	363.6799	428.4094	466.5270	503.9113	518.6059	508.7099	490.4350	469.3083	451.0107	406.1917	365.0656	346.0231	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.3623	58.4827	58.6012	59.1642	59.2707	59.7717	59.7717	59.8654	59.5777	59.2707	59.0556	58.8323	
alpha	4.8908	4.8988	4.9067	4.9443	4.9514	4.9848	4.9848	4.9910	4.9718	4.9514	4.9370	4.9222	
util living area	0.9676	0.9340	0.8812	0.7719	0.6227	0.4490	0.3228	0.3518	0.5402	0.8011	0.9357	0.9734	(86)
MIT	20.0914	20.3367	20.5801	20.8212	20.9470	20.9915	20.9987	20.9980	20.9791	20.8180	20.4299	20.0425	(87)
Th 2	20.2085	20.2100	20.2115	20.2184	20.2197	20.2257	20.2257	20.2269	20.2234	20.2197	20.2171	20.2143	(88)
util rest of house	0.9613	0.9223	0.8615	0.7392	0.5779	0.3965	0.2664	0.2932	0.4839	0.7645	0.9222	0.9681	(89)

MIT 2	19.3922	19.6293	19.8595	20.0810	20.1845	20.2214	20.2253	20.2261	20.2119	20.0842	19.7283	19.3494	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.7262	19.9672	20.2037	20.4345	20.5487	20.5892	20.5947	20.5948	20.5783	20.4347	20.0634	19.6804	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7262	19.9672	20.2037	20.4345	20.5487	20.5892	20.5947	20.5948	20.5783	20.4347	20.0634	19.6804	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9567	0.9183	0.8613	0.7486	0.5971	0.4213	0.2934	0.3212	0.5100	0.7751	0.9193	0.9639	(94)
Useful gains	347.9365	393.3926	401.7995	377.2383	309.6675	214.2967	143.8714	150.7215	230.0095	314.8594	335.5884	333.5152	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	569.9023	555.4939	504.2025	420.3546	321.8954	216.0469	144.0985	151.0797	234.4517	357.7623	473.2960	567.3368	(97)
Space heating kWh													
	165.1425	108.9321	76.1878	31.0438	9.0976	0.0000	0.0000	0.0000	0.0000	31.9197	99.1494	173.9632	(98a)
Space heating requirement - total per year (kWh/year)												695.4361	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	165.1425	108.9321	76.1878	31.0438	9.0976	0.0000	0.0000	0.0000	0.0000	31.9197	99.1494	173.9632	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												695.4361	
Space heating per m2											(98c) / (4) =	16.0387	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	339.0831	266.9377	273.7231	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9673	0.9854	0.9808	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	327.9877	263.0350	268.4542	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	565.9218	546.1214	522.8242	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	171.3125	210.6163	189.2513	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	42.8281	52.6541	47.3128	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												142.7950	(107)
Energy for space heating												16.0387	(99)
Energy for space cooling												3.2932	(108)
Total												19.3319	(109)
Fabric Energy Efficiency (DFEE)												19.3	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.6400	1.1450	7.6031			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.1800	1.7910			(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.1800	2.6550			(29a)
500mm mineral wool	43.3600		43.3600	0.1100	4.7696			(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.6587			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.0141 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	4.7800	0.0500	0.2390
E3 Sill	3.8800	0.0500	0.1940
E4 Jamb	17.9200	0.0500	0.8960
E7 Party floor between dwellings (in blocks of flats)	17.6700	0.0700	1.2369
E16 Corner (normal)	5.0000	0.0900	0.4500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.5900	0.0000	0.0000
E14 Flat roof	17.6700	0.0800	1.4136
P4 Party wall - Roof (insulation at ceiling level)	12.5900	0.1200	1.5108
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5403 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.1990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	46.0145	45.8869	45.7618	45.1741	45.0641	44.5523	44.5523	44.4575	44.7494	45.0641	45.2866	45.5191	(39)
Average = Sum(39)m / 12 =												45.1735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0612	1.0583	1.0554	1.0418	1.0393	1.0275	1.0275	1.0253	1.0320	1.0393	1.0444	1.0498	(40)
HLP (average)												1.0418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)													
	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							449.4572	(64a)
Heat gains from water heating, kWh/month													
	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	69.0518	76.4502	69.0518	71.3535	69.0518	71.3535	69.0518	69.0518	71.3535	69.0518	71.3535	69.0518	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains													
	281.0812	288.9106	276.6927	269.1105	255.9256	247.8477	238.9285	238.6510	245.5596	252.4649	266.4616	275.0462	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.6400	36.7938	0.6300	0.7000	0.7700	74.6646	(77)

Solar gains	74.6646	127.1815	174.0153	215.6133	241.5049	239.7585	231.1528	211.8365	188.4217	140.5626	89.4310	63.8974	(83)
Total gains	355.7458	416.0921	450.7079	484.7238	497.4305	487.6062	470.0812	450.4875	433.9813	393.0276	355.8927	338.9436	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8575	46.9878	47.1163	47.7293	47.8457	48.3954	48.3954	48.4986	48.1822	47.8457	47.6107	47.3675	
alpha	4.1238	4.1325	4.1411	4.1820	4.1897	4.2264	4.2264	4.2332	4.2121	4.1897	4.1740	4.1578	
util living area													
	0.9771	0.9570	0.9251	0.8522	0.7327	0.5580	0.4109	0.4451	0.6526	0.8711	0.9576	0.9808	(86)
MIT	19.6299	19.8904	20.1960	20.5633	20.8211	20.9572	20.9906	20.9868	20.9161	20.5866	20.0563	19.5888	(87)
Th 2	20.0326	20.0351	20.0374	20.0486	20.0507	20.0605	20.0605	20.0623	20.0567	20.0507	20.0465	20.0420	(88)
util rest of house													
	0.9721	0.9480	0.9093	0.8221	0.6817	0.4853	0.3260	0.3583	0.5812	0.8383	0.9471	0.9766	(89)
MIT 2	18.8016	19.0575	19.3539	19.7048	19.9289	20.0387	20.0574	20.0577	20.0097	19.7351	19.2317	18.7684	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.1972	19.4553	19.7561	20.1148	20.3551	20.4774	20.5031	20.5015	20.4427	20.1418	19.6256	19.1603	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1972	19.4553	19.7561	20.1148	20.3551	20.4774	20.5031	20.5015	20.4427	20.1418	19.6256	19.1603	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9667	0.9415	0.9041	0.8244	0.6989	0.5183	0.3664	0.3995	0.6115	0.8418	0.9415	0.9716	(94)
Useful gains	343.8898	391.7534	407.4702	399.6161	347.6408	252.7390	172.2460	179.9608	265.3958	330.8386	335.0808	329.3215	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	685.4893	667.8982	606.6243	506.6189	390.0331	261.8514	173.8933	182.3410	283.8306	429.9938	567.2403	680.9773	(97)
Space heating kWh													
	254.1501	185.5692	148.1706	77.0420	31.5399	0.0000	0.0000	0.0000	0.0000	73.7715	167.1548	261.6319	(98a)
Space heating requirement - total per year (kWh/year)												1199.0300	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	254.1501	185.5692	148.1706	77.0420	31.5399	0.0000	0.0000	0.0000	0.0000	73.7715	167.1548	261.6319	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1199.0300	
Space heating per m2											(98c) / (4) =	27.6529	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	418.7912	329.6867	337.8767	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8975	0.9427	0.9304	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	375.8650	310.8091	314.3560	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	543.5050	524.4888	502.9266	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	120.7008	158.9777	140.2965	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	30.1752	39.7444	35.0741	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												104.9937	(107)
Energy for space heating												27.6529	(99)
Energy for space cooling												2.4214	(108)
Total												30.0743	(109)
Fabric Energy Efficiency (TFEE)												30.1	(109)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.23	**TER**	15.57
Environmental	99 A	**% DER < TER**			92.10
CO_2 Emissions (t/year)	0.03	**DFEE**	19.33	**TFEE**	30.07
Compliance Check	See BREL	**% DFEE < TFEE**			35.72
% DPER < TPER	72.32	**DPER**	23.27	**TPER**	84.07

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677 (64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523 (64)
12Total per year (kWh/year)												2188 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0601	78.6737	71.0601	73.4288	71.0601	73.4288	71.0601	71.0601	73.4288	71.0601	73.4288	71.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.2801	384.4058	369.8506	357.2179	340.9558	329.7655	318.6057	319.7771	328.5028	338.8880	357.8362	370.5488	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.6400	36.7938	0.6800	0.7000	0.7700	80.5904	(77)

Solar gains	80.5904	137.2753	187.8260	232.7255	260.6720	258.7869	249.4982	228.6489	203.3758	151.7184	96.5287	68.9686 (83)
Total gains	457.8704	521.6811	557.6766	589.9434	601.6278	588.5524	568.1040	548.4260	531.8786	490.6064	454.3649	439.5174 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292

alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.9196	0.8666	0.7943	0.6747	0.5298	0.3787	0.2707	0.2931	0.4494	0.6920	0.8633	0.9312	(86)
MIT	20.4341	20.6145	20.7770	20.9124	20.9770	20.9965	20.9995	20.9992	20.9919	20.9156	20.6740	20.3812	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.9068	0.8481	0.7688	0.6410	0.4899	0.3349	0.2245	0.2453	0.4020	0.6526	0.8414	0.9199	(89)
MIT 2	19.6124	19.8270	20.0151	20.1636	20.2283	20.2452	20.2472	20.2470	20.2418	20.1702	19.9018	19.5483	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0049	20.2031	20.3790	20.5212	20.5859	20.6040	20.6065	20.6063	20.6000	20.5262	20.2706	19.9461	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0049	20.2031	20.3790	20.5212	20.5859	20.6040	20.6065	20.6063	20.6000	20.5262	20.2706	19.9461	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9022	0.8469	0.7735	0.6535	0.5080	0.3557	0.2466	0.2681	0.4243	0.6676	0.8421	0.9148	(94)
Useful gains	413.1056	441.8354	431.3418	385.5411	305.6337	209.3538	140.0867	147.0302	225.7015	327.5147	382.6218	402.0628	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	549.4417	535.3875	485.5636	406.5742	310.8783	210.0545	140.1697	147.1601	227.4070	347.2738	460.7800	550.8849	(97)
Space heating kWh	101.4341	62.8670	40.3410	15.1438	3.9020	0.0000	0.0000	0.0000	0.0000	14.7008	56.2739	110.7237	(98a)
Space heating requirement - total per year (kWh/year)												405.3863	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	101.4341	62.8670	40.3410	15.1438	3.9020	0.0000	0.0000	0.0000	0.0000	14.7008	56.2739	110.7237	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												405.3863	
Space heating per m2											(98c) / (4) =	9.3493	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	101.4341	62.8670	40.3410	15.1438	3.9020	0.0000	0.0000	0.0000	0.0000	14.7008	56.2739	110.7237	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	152.1511	94.3005	60.5115	22.7158	5.8530	0.0000	0.0000	0.0000	0.0000	22.0511	84.4109	166.0856	
Space heating requirement	152.1511	94.3005	60.5115	22.7158	5.8530	0.0000	0.0000	0.0000	0.0000	22.0511	84.4109	166.0856	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												608.0794	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												6.0808	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3071.2715	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1037.2154	0.1578	25.5960	(367)
Electrical energy for heat distribution (space & water)	6.0808	0.0000	5.5777	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			154.3171	(373)
Space and water heating			154.3171	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			53.3841	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.2300	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1037.2154	1.5843	256.9028	(467)
Electrical energy for heat distribution (space & water)	6.0808	0.0000	59.5236	(472)
Overall CO2 factor for heat network			0.4234	(486)
Total CO2 associated with community systems			1646.8194	(473)
Space and water heating			1646.8194	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	1.4901	-605.6307	
PV Unit electricity exported	-551.7766	0.4464	-246.3315	
Total			-851.9622	(480)
Total Primary energy kWh/year			1009.1726	(483)
Dwelling Primary energy Rate (DPER)			23.2700	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.6400	1.1450	7.6031			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.1800	1.7910			(29a)

Wall to Unheated Com	16.5900	1.8400	14.7500	0.1800	2.6550	(29a)
500mm mineral wool	43.3600		43.3600	0.1100	4.7696	(30)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.6587	(33)
Main dwelling						
Party Wall 1			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.0141 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	4.7800	0.0500	0.2390
E3 Sill	3.8800	0.0500	0.1940
E4 Jamb	17.9200	0.0500	0.8960
E7 Party floor between dwellings (in blocks of flats)	17.6700	0.0700	1.2369
E16 Corner (normal)	5.0000	0.0900	0.4500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.5900	0.0000	0.0000
E14 Flat roof	17.6700	0.0800	1.4136
P4 Party wall - Roof (insulation at ceiling level)	12.5900	0.1200	1.5108
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5403 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 25.1990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	46.0145	45.8869	45.7618	45.1741	45.0641	44.5523	44.5523	44.4575	44.7494	45.0641	45.2866	45.5191	(39)
Average = Sum(39)m / 12 =												45.1735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0612	1.0583	1.0554	1.0418	1.0393	1.0275	1.0275	1.0253	1.0320	1.0393	1.0444	1.0498	(40)
HLP (average)												1.0418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.0518	76.4502	69.0518	71.3535	69.0518	71.3535	69.0518	69.0518	71.3535	69.0518	71.3535	69.0518	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	368.9363	375.8469	361.5069	348.8073	332.6121	318.3548	307.2620	308.4334	317.0921	330.5443	349.4255	362.2051	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.6400	36.7938	0.6300	0.7000	0.7700	74.6646	(77)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	74.6646	127.1815	174.0153	215.6133	241.5049	239.7585	231.1528	211.8365	188.4217	140.5626	89.4310	63.8974	(83)
Total gains	443.6010	503.0284	535.5222	564.4206	574.1170	558.1133	538.4148	520.2699	505.5138	471.1069	438.8565	426.1025	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8575	46.9878	47.1163	47.7293	47.8457	48.3954	48.3954	48.4986	48.1822	47.8457	47.6107	47.3675	
alpha	4.1238	4.1325	4.1411	4.1820	4.1897	4.2264	4.2264	4.2332	4.2121	4.1897	4.1740	4.1578	
util living area	0.9533	0.9243	0.8811	0.7939	0.6645	0.4958	0.3608	0.3885	0.5785	0.8052	0.9205	0.9591	(86)
MIT	19.8750	20.1078	20.3750	20.6777	20.8769	20.9724	20.9943	20.9921	20.9465	20.7076	20.2628	19.8376	(87)
Th 2	20.0326	20.0351	20.0374	20.0486	20.0507	20.0605	20.0605	20.0623	20.0567	20.0507	20.0465	20.0420	(88)
util rest of house	0.9441	0.9101	0.8593	0.7585	0.6122	0.4284	0.2853	0.3114	0.5099	0.7646	0.9033	0.9508	(89)
MIT 2	18.7579	19.0456	19.3709	19.7316	19.9463	20.0430	20.0581	20.0588	20.0196	19.7748	19.2501	18.7184	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.2915	19.5530	19.8505	20.1835	20.3908	20.4869	20.5052	20.5046	20.4623	20.2203	19.7338	19.2530	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2915	19.5530	19.8505	20.1835	20.3908	20.4869	20.5052	20.5046	20.4623	20.2203	19.7338	19.2530	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9355	0.9020	0.8546	0.7638	0.6315	0.4595	0.3213	0.3480	0.5401	0.7724	0.8968	0.9426	(94)
Useful gains	414.9854	453.7144	457.6679	431.1217	362.5803	256.4469	172.9905	181.0699	273.0472	363.8662	393.5851	401.6357	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	689.8249	672.3785	610.9424	509.7221	391.6415	262.2739	173.9877	182.4800	284.7104	433.5321	572.1416	685.1984	(97)
Space heating kWh	204.4806	146.9423	114.0362	56.5923	21.6215	0.0000	0.0000	0.0000	0.0000	51.8315	128.5606	210.9706	(98a)
Space heating requirement - total per year (kWh/year)												935.0357	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	204.4806	146.9423	114.0362	56.5923	21.6215	0.0000	0.0000	0.0000	0.0000	51.8315	128.5606	210.9706	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												935.0357	
Space heating per m2										(98c) / (4) =		21.5645	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	204.4806	146.9423	114.0362	56.5923	21.6215	0.0000	0.0000	0.0000	0.0000	51.8315	128.5606	210.9706	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	221.5391	159.2007	123.5495	61.3134	23.4253	0.0000	0.0000	0.0000	0.0000	56.1554	139.2856	228.5706	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.3038	83.8361	83.1470	82.0385	80.8330	79.8000	79.8000	79.8000	79.8000	81.8715	83.5185	84.3963	(217)
Fuel for water heating, kWh/month	217.6062	193.7206	208.1655	187.2452	185.3832	170.5061	169.2907	175.3325	176.4869	190.2860	196.4783	215.2317	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.3476	11.5102	10.3636	7.5928	5.8649	4.7917	5.3502	6.9544	9.0330	11.8518	13.3866	14.7464	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3196	-12.6515	-19.6021	-23.8221	-27.3050	-26.1047	-25.8068	-23.5584	-19.8837	-15.2375	-9.4737	-7.0906	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2617	-4.9168	-10.0734	-15.5779	-21.0367	-21.2830	-21.0140	-17.5742	-12.6116	-7.1556	-3.0599	-1.7757	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1013.0397	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2285.7331	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	115.7933	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3143.3700	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1013.0397	0.2100	212.7383	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2285.7331	0.2100	480.0039	(264)
Space and water heating			692.7423	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	115.7933	0.1443	16.7126	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	0.1330	-29.1103	
PV Unit electricity exported	-138.3404	0.1251	-17.3028	
Total			-46.4132	(269)
Total CO2, kg/year			674.9709	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.5700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1013.0397	1.1300	1144.7349	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2285.7331	1.1300	2582.8784	(278)
Space and water heating			3727.6133	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	115.7933	1.5338	177.6076	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	1.4915	-326.4228	
PV Unit electricity exported	-138.3404	0.4591	-63.5081	
Total			-389.9309	(283)
Total Primary energy kWh/year			3645.3908	(286)
Target Primary Energy Rate (TPER)			84.0700	(287)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.23	**TER**	15.57
Environmental	99 A	**% DER < TER**			92.10
CO_2 Emissions (t/year)	0.03	**DFEE**	19.33	**TFEE**	30.07
Compliance Check	See BREL	**% DFEE < TFEE**			35.72
% DPER < TPER	72.32	**DPER**	23.27	**TPER**	84.07

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.6400	36.7938	0.6800	0.7000	0.7700	80.5904	(77)

Solar gains	80.5904	137.2753	187.8260	232.7255	260.6720	258.7869	249.4982	228.6489	203.3758	151.7184	96.5287	68.9686	(83)
Total gains	498.5013	553.3898	592.3963	615.6310	622.7452	601.9464	581.5305	563.1612	548.8478	516.6076	484.9362	477.8122	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086

util living area													
	0.8949	0.8436	0.7654	0.6523	0.5132	0.3705	0.2645	0.2854	0.4361	0.6649	0.8375	0.9095	(86)
MIT	20.5210	20.6657	20.8131	20.9247	20.9801	20.9969	20.9996	20.9993	20.9929	20.9295	20.7220	20.4689	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house													
	0.8795	0.8234	0.7387	0.6187	0.4742	0.3275	0.2194	0.2389	0.3899	0.6255	0.8134	0.8957	(89)
MIT 2	19.7158	19.8858	20.0546	20.1758	20.2309	20.2454	20.2472	20.2471	20.2425	20.1835	19.9559	19.6537	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.1004	20.2583	20.4169	20.5335	20.5887	20.6043	20.6065	20.6064	20.6009	20.5398	20.3218	20.0431	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1004	20.2583	20.4169	20.5335	20.5887	20.6043	20.6065	20.6064	20.6009	20.5398	20.3218	20.0431	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8763	0.8237	0.7449	0.6317	0.4921	0.3479	0.2409	0.2611	0.4117	0.6412	0.8159	0.8916	(94)
Useful gains	436.8328	455.8429	441.2927	388.9042	306.4278	209.4317	140.0968	147.0478	225.9519	331.2280	395.6765	426.0207	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	552.7853	537.3176	486.8888	407.0028	310.9764	210.0641	140.1710	147.1623	227.4377	347.7482	462.5717	554.2771	(97)
Space heating kWh													
	86.2686	54.7510	33.9235	13.0310	3.3841	0.0000	0.0000	0.0000	0.0000	12.2911	48.1646	95.4228	(98a)
Space heating requirement - total per year (kWh/year)												347.2367	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	86.2686	54.7510	33.9235	13.0310	3.3841	0.0000	0.0000	0.0000	0.0000	12.2911	48.1646	95.4228	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												347.2367	
Space heating per m2											(98c) / (4) =	8.0082	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	86.2686	54.7510	33.9235	13.0310	3.3841	0.0000	0.0000	0.0000	0.0000	12.2911	48.1646	95.4228	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	129.4029	82.1265	50.8853	19.5465	5.0761	0.0000	0.0000	0.0000	0.0000	18.4366	72.2469	143.1342	
Space heating requirement													
	129.4029	82.1265	50.8853	19.5465	5.0761	0.0000	0.0000	0.0000	0.0000	18.4366	72.2469	143.1342	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												520.8550	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												5.2085	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2984.0471	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	520.8550	4.4400	23.1260	(340a)
Space heating total			23.1260	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	16.4900	2.5157	(349)
Energy for lighting	124.6784	16.4900	20.5595	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	16.4900	-67.0227	
PV Unit electricity exported	-551.7766	5.5900	-30.8443	
Total			-97.8670	(352)
Total energy cost			186.0318	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7579 (357)
SAP value		87.7138
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1013.9556	0.1579	21.9283	(367)
Electrical energy for heat distribution (space & water)	5.2085	0.0000	5.4402	(372)
Overall CO2 factor for heat network			0.0396	(386)
Total CO2 associated with community systems			150.5119	(373)
Space and water heating			150.5119	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			49.5789	(383)
CO2 emissions per m2			1.1400	(384)
EI value			99.2481	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	43.3600 (1b)	x 2.4500 (2b)	= 106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)

Adj infilt rate

	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.6400	42.9509	0.6800	0.7000	0.7700	94.0764	(77)

Solar gains	94.0764	142.4047	192.4255	242.6763	263.5772	281.5841	266.0190	247.1729	220.3982	166.1261	110.9823	80.9973	(83)
Total gains	511.9874	558.5192	596.9958	625.5817	625.6505	624.7436	598.0513	581.6852	565.8701	531.0153	499.3898	489.8410	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area													
	0.8800	0.8319	0.7440	0.6263	0.4853	0.3241	0.2281	0.2464	0.4056	0.6247	0.8121	0.8966	(86)
MIT	20.5728	20.6945	20.8418	20.9393	20.9853	20.9985	20.9998	20.9997	20.9951	20.9492	20.7686	20.5214	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house													
	0.8630	0.8106	0.7158	0.5919	0.4458	0.2823	0.1841	0.2013	0.3602	0.5838	0.7856	0.8812	(89)
MIT 2	19.7775	19.9195	20.0866	20.1907	20.2356	20.2465	20.2473	20.2473	20.2442	20.2028	20.0087	19.7168	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.1574	20.2896	20.4473	20.5482	20.5937	20.6057	20.6067	20.6067	20.6028	20.5593	20.3717	20.1011	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1574	20.2896	20.4473	20.5482	20.5937	20.6057	20.6067	20.6067	20.6028	20.5593	20.3717	20.1011	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8608	0.8119	0.7235	0.6058	0.4641	0.3022	0.2051	0.2229	0.3817	0.6010	0.7902	0.8780	(94)
Useful gains	440.7008	453.4394	431.9389	378.9954	290.3557	188.8253	122.6548	129.6320	216.0065	319.1457	394.6230	430.0784	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	544.2816	527.9181	470.4615	393.5242	293.6580	189.1199	122.6846	129.6792	217.0094	330.9381	450.3214	545.8110	(97)
Space heating kWh													
	77.0641	50.0497	28.6608	10.4607	2.4569	0.0000	0.0000	0.0000	0.0000	8.7736	40.1028	86.1051	(98a)
Space heating requirement - total per year (kWh/year)												303.6736	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	77.0641	50.0497	28.6608	10.4607	2.4569	0.0000	0.0000	0.0000	0.0000	8.7736	40.1028	86.1051	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												303.6736	
Space heating per m2											(98c) / (4) =	7.0035	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	77.0641	50.0497	28.6608	10.4607	2.4569	0.0000	0.0000	0.0000	0.0000	8.7736	40.1028	86.1051	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	115.5961	75.0745	42.9912	15.6911	3.6853	0.0000	0.0000	0.0000	0.0000	13.1603	60.1543	129.1576	
Space heating requirement													
	115.5961	75.0745	42.9912	15.6911	3.6853	0.0000	0.0000	0.0000	0.0000	13.1603	60.1543	129.1576	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5669	-24.0727	-38.8745	-48.0493	-52.9789	-51.6524	-50.3986	-46.8694	-39.7890	-30.3128	-18.7591	-13.8902	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4316	-15.8925	-38.3705	-69.5238	-96.2615	-109.4663	-104.0915	-84.3722	-54.5598	-26.6835	-10.2713	-5.6085	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	455.5104	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	4.5551	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)		
mechanical ventilation fans (SFP = 0.1177)	15.2561	(330a)
Total electricity for the above, kWh/year	15.2561	(331)
Electricity for lighting (calculated in Appendix L)	124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2822.1764	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	455.5104	6.5500	29.8359	(340a)
Space heating total			29.8359	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	28.4300	4.3373	(349)
Energy for lighting	124.6784	28.4300	35.4461	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	28.4300	-122.8784	
PV Unit electricity exported	-622.5330	5.8100	-36.1692	
Total			-159.0476	(352)
Total energy cost			229.5086	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	996.5303	0.1583	19.2234	(367)
Electrical energy for heat distribution (space & water)	4.5551	0.0000	5.3388	(372)
Overall CO2 factor for heat network			0.0395	(386)
Total CO2 associated with community systems			147.7056	(373)
Space and water heating			147.7056	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	0.1330	-57.4796	
PV Unit electricity exported	-622.5330	0.1218	-75.7970	
Total			-133.2765	(380)
Total CO2, kg/year			34.5402	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	996.5303	1.5858	192.6289	(467)
Electrical energy for heat distribution (space & water)	4.5551	0.0000	57.1133	(472)
Overall CO2 factor for heat network			0.4228	(486)
Total CO2 associated with community systems			1580.1353	(473)
Space and water heating			1580.1353	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	1.4914	-644.6094	
PV Unit electricity exported	-622.5330	0.4467	-278.0656	
Total			-922.6749	(480)
Total Primary energy kWh/year			871.7758	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Northwest

Current energy efficiency rating:	B 88
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£40	£40	£0
Community scheme	£349	£349	£0
Space heating	£138	£138	£0
Water heating	£215	£215	£0
Lighting	£35	£35	£0
Generated (PV)	-£159	-£159	£0
Total cost of fuels	£230	£230	£0
Total cost of uses	£229	£229	£0
Delivered energy	65 kWh/m²	65 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.0 tonnes	0.0 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	20 kWh/m²	20 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)

Total net area of external elements Aum(A, m2)	76.5400				(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	15.1610			(33)
Main dwelling					
Party Wall 1	31.3600	0.0000	0.0000	70.0000	2195.2000 (32)
Party Floor 1	43.3600			70.0000	3035.2000 (32d)
Internal TF Wall	68.4500			9.0000	616.0500 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.6400	36.7938	0.6800	0.7000	0.7700	80.5904	(77)

Solar gains	80.5904	137.2753	187.8260	232.7255	260.6720	258.7869	249.4982	228.6489	203.3758	151.7184	96.5287	68.9686	(83)
Total gains	498.5013	553.3898	592.3963	615.6310	622.7452	601.9464	581.5305	563.1612	548.8478	516.6076	484.9362	477.8122	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.8949	0.8436	0.7654	0.6523	0.5132	0.3705	0.2645	0.2854	0.4361	0.6649	0.8375	0.9095	(86)
MIT	20.5210	20.6657	20.8131	20.9247	20.9801	20.9969	20.9996	20.9993	20.9929	20.9295	20.7220	20.4689	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.8795	0.8234	0.7387	0.6187	0.4742	0.3275	0.2194	0.2389	0.3899	0.6255	0.8134	0.8957	(89)
MIT 2	19.7158	19.8858	20.0546	20.1758	20.2309	20.2454	20.2472	20.2471	20.2425	20.1835	19.9559	19.6537	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.1004	20.2583	20.4169	20.5335	20.5887	20.6043	20.6065	20.6064	20.6009	20.5398	20.3218	20.0431	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1004	20.2583	20.4169	20.5335	20.5887	20.6043	20.6065	20.6064	20.6009	20.5398	20.3218	20.0431	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8763	0.8237	0.7449	0.6317	0.4921	0.3479	0.2409	0.2611	0.4117	0.6412	0.8159	0.8916	(94)
Useful gains	436.8328	455.8429	441.2927	388.9042	306.4278	209.4317	140.0968	147.0478	225.9519	331.2280	395.6765	426.0207	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	552.7853	537.3176	486.8888	407.0028	310.9764	210.0641	140.1710	147.1623	227.4377	347.7482	462.5717	554.2771	(97)
Space heating kWh	86.2686	54.7510	33.9235	13.0310	3.3841	0.0000	0.0000	0.0000	0.0000	12.2911	48.1646	95.4228	(98a)
Space heating requirement - total per year (kWh/year)												347.2367	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	86.2686	54.7510	33.9235	13.0310	3.3841	0.0000	0.0000	0.0000	12.2911	48.1646		95.4228	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												347.2367	
Space heating per m2											(98c) / (4) =	8.0082	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	86.2686	54.7510	33.9235	13.0310	3.3841	0.0000	0.0000	0.0000	0.0000	12.2911	48.1646	95.4228	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	129.4029	82.1265	50.8853	19.5465	5.0761	0.0000	0.0000	0.0000	0.0000	18.4366	72.2469	143.1342	
Space heating requirement													
	129.4029	82.1265	50.8853	19.5465	5.0761	0.0000	0.0000	0.0000	0.0000	18.4366	72.2469	143.1342	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												520.8550	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												5.2085	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)

Appendix Q - special features

Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2984.0471	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	520.8550	4.4400	23.1260	(340a)
Space heating total			23.1260	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	16.4900	2.5157	(349)
Energy for lighting	124.6784	16.4900	20.5595	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	16.4900	-67.0227	
PV Unit electricity exported	-551.7766	5.5900	-30.8443	
Total			-97.8670	(352)
Total energy cost			186.0318	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7579	(357)
SAP value		87.7138	
SAP rating (Section 12)		88	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1013.9556	0.1579	21.9283	(367)
Electrical energy for heat distribution (space & water)	5.2085	0.0000	5.4402	(372)
Overall CO2 factor for heat network			0.0396	(386)
Total CO2 associated with community systems			150.5119	(373)
Space and water heating			150.5119	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			49.5789	(383)
CO2 emissions per m2			1.1400	(384)
EI value			99.2481	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

Measured/design AP50												3.0000	(17)
Infiltration rate												0.1500	(18)
Number of sides sheltered												3	(19)
Shelter factor								(20) = 1 - [0.075 x (19)] =				0.7750	(20)
Infiltration rate adjusted to include shelter factor								(21) = (18) x (20) =				0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)

Water heating gains (Table 5)

	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)

Total internal gains

	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	6.6400	42.9509	0.6800	0.7000	0.7700	94.0764	(77)

Solar gains	94.0764	142.4047	192.4255	242.6763	263.5772	281.5841	266.0190	247.1729	220.3982	166.1261	110.9823	80.9973	(83)
Total gains	511.9874	558.5192	596.9958	625.5817	625.6505	624.7436	598.0513	581.6852	565.8701	531.0153	499.3898	489.8410	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.8800	0.8319	0.7440	0.6263	0.4853	0.3241	0.2281	0.2464	0.4056	0.6247	0.8121	0.8966	(86)
MIT	20.5728	20.6945	20.8418	20.9393	20.9853	20.9985	20.9998	20.9997	20.9951	20.9492	20.7686	20.5214	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.8630	0.8106	0.7158	0.5919	0.4458	0.2823	0.1841	0.2013	0.3602	0.5838	0.7856	0.8812	(89)
MIT 2	19.7775	19.9195	20.0866	20.1907	20.2356	20.2465	20.2473	20.2473	20.2442	20.2028	20.0087	19.7168	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.1574	20.2896	20.4473	20.5482	20.5937	20.6057	20.6067	20.6067	20.6028	20.5593	20.3717	20.1011	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1574	20.2896	20.4473	20.5482	20.5937	20.6057	20.6067	20.6067	20.6028	20.5593	20.3717	20.1011	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8608	0.8119	0.7235	0.6058	0.4641	0.3022	0.2051	0.2229	0.3817	0.6010	0.7902	0.8780	(94)
Useful gains	440.7008	453.4394	431.9389	378.9954	290.3557	188.8253	122.6548	129.6320	216.0065	319.1457	394.6230	430.0784	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	544.2816	527.9181	470.4615	393.5242	293.6580	189.1199	122.6846	129.6792	217.0094	330.9381	450.3214	545.8110	(97)
Space heating kWh	77.0641	50.0497	28.6608	10.4607	2.4569	0.0000	0.0000	0.0000	0.0000	8.7736	40.1028	86.1051	(98a)

Space heating requirement - total per year (kWh/year) 303.6736

Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh	77.0641	50.0497	28.6608	10.4607	2.4569	0.0000	0.0000	0.0000	0.0000	8.7736	40.1028	86.1051	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 303.6736

Space heating per m2 (98c) / (4) = 7.0035 (99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)

Fraction of space heat from community system 1.0000 (302)

Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)

Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)

Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)

Distribution loss factor (Table 12c) for community heating system 1.5000 (306)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

Space heating:

Space heating requirement	77.0641	50.0497	28.6608	10.4607	2.4569	0.0000	0.0000	0.0000	0.0000	8.7736	40.1028	86.1051	(98)

Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50

307a	115.5961	75.0745	42.9912	15.6911	3.6853	0.0000	0.0000	0.0000	0.0000	13.1603	60.1543	129.1576	
Space heating requirement	115.5961	75.0745	42.9912	15.6911	3.6853	0.0000	0.0000	0.0000	0.0000	13.1603	60.1543	129.1576	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)

Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement

	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)

Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50

310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)

Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5669	-24.0727	-38.8745	-48.0493	-52.9789	-51.6524	-50.3986	-46.8694	-39.7890	-30.3128	-18.7591	-13.8902	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4316	-15.8925	-38.3705	-69.5238	-96.2615	-109.4663	-104.0915	-84.3722	-54.5598	-26.6835	-10.2713	-5.6085	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	455.5104	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	4.5551	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)		
mechanical ventilation fans (SFP = 0.1177)	15.2561	(330a)
Total electricity for the above, kWh/year	15.2561	(331)
Electricity for lighting (calculated in Appendix L)	124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2822.1764	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	455.5104	6.5500	29.8359	(340a)
Space heating total			29.8359	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	28.4300	4.3373	(349)
Energy for lighting	124.6784	28.4300	35.4461	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	28.4300	-122.8784	
PV Unit electricity exported	-622.5330	5.8100	-36.1692	
Total			-159.0476	(352)
Total energy cost			229.5086	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	996.5303	0.1583	19.2234	(367)
Electrical energy for heat distribution (space & water)	4.5551	0.0000	5.3388	(372)
Overall CO2 factor for heat network			0.0395	(386)
Total CO2 associated with community systems			147.7056	(373)
Space and water heating			147.7056	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	0.1330	-57.4796	
PV Unit electricity exported	-622.5330	0.1218	-75.7970	
Total			-133.2765	(380)
Total CO2, kg/year			34.5402	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	996.5303	1.5858	192.6289	(467)
Electrical energy for heat distribution (space & water)	4.5551	0.0000	57.1133	(472)
Overall CO2 factor for heat network			0.4228	(486)
Total CO2 associated with community systems			1580.1353	(473)
Space and water heating			1580.1353	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	1.4914	-644.6094	
PV Unit electricity exported	-622.5330	0.4467	-278.0656	
Total			-922.6749	(480)
Total Primary energy kWh/year			871.7758	(483)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.47	**TER**	16.63
Environmental	99 A	**% DER < TER**			91.16
CO_2 Emissions (t/year)	0.04	**DFEE**	23.68	**TFEE**	35.19
Compliance Check	See BREL	**% DFEE < TFEE**			32.70
% DPER < TPER	71.38	**DPER**	25.70	**TPER**	89.80

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
12Total per year (kWh/year)												2188	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0601	78.6737	71.0601	73.4288	71.0601	73.4288	71.0601	71.0601	73.4288	71.0601	73.4288	71.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.2801	384.4058	369.8506	357.2179	340.9558	329.7655	318.6057	319.7771	328.5028	338.8880	357.8362	370.5488	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.6400	10.6334	0.6800	0.7000	0.7700	23.2906	(74)

Solar gains	23.2906	44.5095	75.6325	121.4851	163.6516	175.1939	163.5659	129.7687	90.9347	52.9827	28.7319	19.4162	(83)
Total gains	400.5706	428.9153	445.4831	478.7030	504.6074	504.9594	482.1716	449.5458	419.4375	391.8707	386.5681	389.9650	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292

alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.9492	0.9269	0.8855	0.7809	0.6187	0.4395	0.3186	0.3568	0.5605	0.8038	0.9158	0.9549	(86)
MIT	20.2926	20.4254	20.6088	20.8284	20.9543	20.9932	20.9989	20.9981	20.9781	20.8305	20.5413	20.2533	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.9402	0.9144	0.8666	0.7494	0.5752	0.3893	0.2644	0.2990	0.5044	0.7682	0.8996	0.9468	(89)
MIT 2	19.4407	19.6035	19.8251	20.0773	20.2084	20.2429	20.2469	20.2465	20.2318	20.0850	19.7482	19.3922	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.8476	19.9961	20.1994	20.4361	20.5646	20.6013	20.6061	20.6055	20.5882	20.4411	20.1270	19.8035	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8476	19.9961	20.1994	20.4361	20.5646	20.6013	20.6061	20.6055	20.5882	20.4411	20.1270	19.8035	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9347	0.9098	0.8653	0.7577	0.5938	0.4130	0.2903	0.3266	0.5301	0.7778	0.8968	0.9412	(94)
Useful gains	374.4146	390.2347	385.4683	362.6957	299.6560	208.5652	139.9750	146.8016	222.3624	304.8086	346.6685	367.0507	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	543.9399	528.1437	479.2811	403.5941	310.1336	209.9574	140.1555	147.1312	226.9942	344.2961	455.7571	545.8956	(97)
Space heating kWh	126.1269	92.6748	69.7967	29.4469	7.7953	0.0000	0.0000	0.0000	0.0000	29.3787	78.5438	133.0606	(98a)
Space heating requirement - total per year (kWh/year)												566.8238	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	126.1269	92.6748	69.7967	29.4469	7.7953	0.0000	0.0000	0.0000	0.0000	29.3787	78.5438	133.0606	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												566.8238	
Space heating per m2											(98c) / (4) =	13.0725	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	126.1269	92.6748	69.7967	29.4469	7.7953	0.0000	0.0000	0.0000	0.0000	29.3787	78.5438	133.0606	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	189.1903	139.0123	104.6951	44.1704	11.6930	0.0000	0.0000	0.0000	0.0000	44.0681	117.8156	199.5910	
Space heating requirement	189.1903	139.0123	104.6951	44.1704	11.6930	0.0000	0.0000	0.0000	0.0000	44.0681	117.8156	199.5910	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												850.2357	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												8.5024	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3313.4278	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1101.7904	0.1568	35.5400	(367)
Electrical energy for heat distribution (space & water)	8.5024	0.0000	5.9506	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			164.6340	(373)
Space and water heating			164.6340	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			63.7010	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.4700	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1101.7904	1.5803	358.3036	(467)
Electrical energy for heat distribution (space & water)	8.5024	0.0000	63.3261	(472)
Overall CO2 factor for heat network			0.4240	(486)
Total CO2 associated with community systems			1752.0228	(473)
Space and water heating			1752.0228	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	1.4901	-605.6307	
PV Unit electricity exported	-551.7766	0.4464	-246.3315	
Total			-851.9622	(480)
Total Primary energy kWh/year			1114.3759	(483)
Dwelling Primary energy Rate (DPER)			25.7000	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.6400	1.1450	7.6031			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.1800	1.7910			(29a)

Wall to Unheated Com	16.5900	1.8400	14.7500	0.1800	2.6550	(29a)
500mm mineral wool	43.3600		43.3600	0.1100	4.7696	(30)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.6587	(33)
Main dwelling						
Party Wall 1			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.0141 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	4.7800	0.0500	0.2390
E3 Sill	3.8800	0.0500	0.1940
E4 Jamb	17.9200	0.0500	0.8960
E7 Party floor between dwellings (in blocks of flats)	17.6700	0.0700	1.2369
E16 Corner (normal)	5.0000	0.0900	0.4500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.5900	0.0000	0.0000
E14 Flat roof	17.6700	0.0800	1.4136
P4 Party wall - Roof (insulation at ceiling level)	12.5900	0.1200	1.5108
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5403 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 25.1990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	46.0145	45.8869	45.7618	45.1741	45.0641	44.5523	44.5523	44.4575	44.7494	45.0641	45.2866	45.5191	(39)
Average = Sum(39)m / 12 =												45.1735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0612	1.0583	1.0554	1.0418	1.0393	1.0275	1.0275	1.0253	1.0320	1.0393	1.0444	1.0498	(40)
HLP (average)												1.0418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.0518	76.4502	69.0518	71.3535	69.0518	71.3535	69.0518	69.0518	71.3535	69.0518	71.3535	69.0518	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	368.9363	375.8469	361.5069	348.8073	332.6121	318.3548	307.2620	308.4334	317.0921	330.5443	349.4255	362.2051	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.6400	10.6334	0.6300	0.7000	0.7700	21.5780	(74)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	21.5780	41.2367	70.0713	112.5524	151.6184	162.3120	151.5390	120.2268	84.2484	49.0869	26.6193	17.9885	(83)
Total gains	390.5144	417.0836	431.5782	461.3597	484.2305	480.6668	458.8010	428.6602	401.3405	379.6312	376.0448	380.1936	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8575	46.9878	47.1163	47.7293	47.8457	48.3954	48.3954	48.4986	48.1822	47.8457	47.6107	47.3675	
alpha	4.1238	4.1325	4.1411	4.1820	4.1897	4.2264	4.2264	4.2332	4.2121	4.1897	4.1740	4.1578	
util living area	0.9689	0.9567	0.9339	0.8687	0.7450	0.5648	0.4205	0.4660	0.6904	0.8818	0.9496	0.9717	(86)
MIT	19.7300	19.8931	20.1507	20.5231	20.8090	20.9552	20.9897	20.9844	20.8961	20.5618	20.1096	19.7095	(87)
Th 2	20.0326	20.0351	20.0374	20.0486	20.0507	20.0605	20.0605	20.0623	20.0567	20.0507	20.0465	20.0420	(88)
util rest of house	0.9623	0.9476	0.9196	0.8407	0.6946	0.4917	0.3338	0.3759	0.6190	0.8507	0.9376	0.9657	(89)
MIT 2	18.5782	18.7839	19.1060	19.5627	19.8829	20.0312	20.0562	20.0552	19.9805	19.6184	19.0660	18.5593	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.1283	19.3137	19.6050	20.0214	20.3252	20.4725	20.5021	20.4990	20.4178	20.0690	19.5645	19.1087	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1283	19.3137	19.6050	20.0214	20.3252	20.4725	20.5021	20.4990	20.4178	20.0690	19.5645	19.1087	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9546	0.9394	0.9120	0.8398	0.7100	0.5245	0.3750	0.4185	0.6477	0.8514	0.9302	0.9584	(94)
Useful gains	372.7740	391.7910	393.5998	387.4380	343.8056	252.1183	172.0482	179.3956	259.9498	323.2070	349.7991	364.3651	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	682.3183	661.3991	599.7074	502.3981	388.6892	261.6339	173.8463	182.2306	282.7194	426.7109	564.4733	678.6296	(97)
Space heating kWh	230.3010	181.1767	153.3440	82.7712	33.3934	0.0000	0.0000	0.0000	0.0000	77.0069	154.5654	233.8128	(98a)
Space heating requirement - total per year (kWh/year)												1146.3715	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	230.3010	181.1767	153.3440	82.7712	33.3934	0.0000	0.0000	0.0000	0.0000	77.0069	154.5654	233.8128	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1146.3715	
Space heating per m2										(98c) / (4) =		26.4385	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	230.3010	181.1767	153.3440	82.7712	33.3934	0.0000	0.0000	0.0000	0.0000	77.0069	154.5654	233.8128	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	249.5135	196.2911	166.1366	89.6763	36.1792	0.0000	0.0000	0.0000	0.0000	83.4311	167.4598	253.3183	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.5710	84.3056	83.7893	82.7362	81.3016	79.8000	79.8000	79.8000	79.8000	82.5682	83.9258	84.6270	(217)
Fuel for water heating, kWh/month	216.9186	192.6416	206.5698	185.6663	184.3148	170.5061	169.2907	175.3325	176.4869	188.6805	195.5246	214.6448	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.3476	11.5102	10.3636	7.5928	5.8649	4.7917	5.3502	6.9544	9.0330	11.8518	13.3866	14.7464	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3196	-12.6515	-19.6021	-23.8221	-27.3050	-26.1047	-25.8068	-23.5584	-19.8837	-15.2375	-9.4737	-7.0906	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2617	-4.9168	-10.0734	-15.5779	-21.0367	-21.2830	-21.0140	-17.5742	-12.6116	-7.1556	-3.0599	-1.7757	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1242.0059	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2276.5772	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	115.7933	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3363.1803	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1242.0059	0.2100	260.8212	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2276.5772	0.2100	478.0812	(264)
Space and water heating			738.9025	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	115.7933	0.1443	16.7126	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	0.1330	-29.1103	
PV Unit electricity exported	-138.3404	0.1251	-17.3028	
Total			-46.4132	(269)
Total CO2, kg/year			721.1311	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.6300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1242.0059	1.1300	1403.4667	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2276.5772	1.1300	2572.5322	(278)
Space and water heating			3975.9989	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	115.7933	1.5338	177.6076	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	1.4915	-326.4228	
PV Unit electricity exported	-138.3404	0.4591	-63.5081	
Total			-389.9309	(283)
Total Primary energy kWh/year			3893.7765	(286)
Target Primary Energy Rate (TPER)			89.8000	(287)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.47	**TER**	16.63
Environmental	99 A	**% DER < TER**			91.16
CO_2 Emissions (t/year)	0.04	**DFEE**	23.68	**TFEE**	35.19
Compliance Check	See BREL	**% DFEE < TFEE**			32.70
% DPER < TPER	71.38	**DPER**	25.70	**TPER**	89.80

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area		Storey height		Volume	
Main dwelling		(m2)		(m)		(m3)	
Ground floor		43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2622	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		7762.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							179.0141	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		17.4572	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	36.9438	36.8677	36.7932	36.4431	36.3776	36.0727	36.0727	36.0162	36.1901	36.3776	36.5101	36.6486	(39)
Average = Sum(39)m / 12 =												36.4428	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8520	0.8503	0.8486	0.8405	0.8390	0.8319	0.8319	0.8306	0.8346	0.8390	0.8420	0.8452	(40)
HLP (average)												0.8405	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)											Total = Sum(45)m =	781.1490	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
										Total per year (kWh/year) = Sum(64)m =	663.9767	(64)
12Total per year (kWh/year)											664	(64)

Electric shower(s)

39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	449.4572	(64a)

Heat gains from water heating, kWh/month

27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0601	78.6737	71.0601	73.4288	71.0601	73.4288	71.0601	71.0601	73.4288	71.0601	73.4288	71.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.0895	291.1341	278.7010	271.1858	257.9340	249.9230	240.9368	240.6593	247.6349	254.4733	268.5369	277.0546	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.6400	10.6334	0.6800	0.7000	0.7700	23.2906	(74)

Solar gains	23.2906	44.5095	75.6325	121.4851	163.6516	175.1939	163.5659	129.7687	90.9347	52.9827	28.7319	19.4162	(83)
Total gains	306.3801	335.6436	354.3335	392.6709	421.5856	425.1169	404.5027	370.4280	338.5696	307.4560	297.2688	296.4707	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.3623	58.4827	58.6012	59.1642	59.2707	59.7717	59.7717	59.8654	59.5777	59.2707	59.0556	58.8323	
alpha	4.8908	4.8988	4.9067	4.9443	4.9514	4.9848	4.9848	4.9910	4.9718	4.9514	4.9370	4.9222	
util living area	0.9833	0.9724	0.9505	0.8761	0.7294	0.5309	0.3901	0.4428	0.6867	0.9054	0.9692	0.9856	(86)
MIT	19.9179	20.0838	20.3251	20.6667	20.8941	20.9822	20.9969	20.9943	20.9407	20.6562	20.2461	19.8892	(87)
Th 2	20.2085	20.2100	20.2115	20.2184	20.2197	20.2257	20.2257	20.2269	20.2234	20.2197	20.2171	20.2143	(88)
util rest of house	0.9798	0.9667	0.9400	0.8516	0.6846	0.4710	0.3225	0.3704	0.6247	0.8809	0.9617	0.9825	(89)

MIT 2	19.2229	19.3870	19.6233	19.9499	20.1464	20.2165	20.2246	20.2247	20.1886	19.9477	19.5538	19.1993 (90)
Living area fraction									fLA = Living area / (4) =			0.4776 (91)
MIT	19.5548	19.7198	19.9585	20.2923	20.5035	20.5822	20.5935	20.5923	20.5478	20.2861	19.8845	19.5288 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5548	19.7198	19.9585	20.2923	20.5035	20.5822	20.5935	20.5923	20.5478	20.2861	19.8845	19.5288 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9762	0.9624	0.9361	0.8541	0.7015	0.4990	0.3548	0.4049	0.6515	0.8832	0.9580	0.9792	(94)
Useful gains	299.0826	323.0339	331.6906	335.3672	295.7468	212.1125	143.5144	149.9705	220.5662	271.5559	284.7748	290.3073	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	563.5718	546.3730	495.1831	415.1705	320.2518	215.7943	144.0553	150.9897	233.3475	352.3572	466.7620	561.7812	(97)
Space heating kWh	196.7800	150.0839	121.6384	57.4584	18.2317	0.0000	0.0000	0.0000	0.0000	60.1162	131.0308	201.9766	(98a)
Space heating requirement - total per year (kWh/year)												937.3158	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	196.7800	150.0839	121.6384	57.4584	18.2317	0.0000	0.0000	0.0000	0.0000	60.1162	131.0308	201.9766	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												937.3158	
Space heating per m2											(98c) / (4) =	21.6171	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	339.0831	266.9377	273.7231	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9354	0.9673	0.9503	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	317.1878	258.2156	260.1092	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	468.2156	445.6810	407.2499	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	108.7401	139.4743	109.4727	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	27.1850	34.8686	27.3682	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												89.4218	(107)
Energy for space heating												21.6171	(99)
Energy for space cooling												2.0623	(108)
Total												23.6794	(109)
Fabric Energy Efficiency (DFEE)												23.7	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.6400	1.1450	7.6031			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.1800	1.7910			(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.1800	2.6550			(29a)
500mm mineral wool	43.3600		43.3600	0.1100	4.7696			(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.6587			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.0141 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	4.7800	0.0500	0.2390
E3 Sill	3.8800	0.0500	0.1940
E4 Jamb	17.9200	0.0500	0.8960
E7 Party floor between dwellings (in blocks of flats)	17.6700	0.0700	1.2369
E16 Corner (normal)	5.0000	0.0900	0.4500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.5900	0.0000	0.0000
E14 Flat roof	17.6700	0.0800	1.4136
P4 Party wall - Roof (insulation at ceiling level)	12.5900	0.1200	1.5108
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5403 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.1990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	46.0145	45.8869	45.7618	45.1741	45.0641	44.5523	44.5523	44.4575	44.7494	45.0641	45.2866	45.5191	(39)
Average = Sum(39)m / 12 =												45.1735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0612	1.0583	1.0554	1.0418	1.0393	1.0275	1.0275	1.0253	1.0320	1.0393	1.0444	1.0498	(40)
HLP (average)												1.0418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)													
	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							449.4572	(64a)
Heat gains from water heating, kWh/month													
	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	69.0518	76.4502	69.0518	71.3535	69.0518	71.3535	69.0518	69.0518	71.3535	69.0518	71.3535	69.0518	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains													
	281.0812	288.9106	276.6927	269.1105	255.9256	247.8477	238.9285	238.6510	245.5596	252.4649	266.4616	275.0462	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.6400	10.6334	0.6300	0.7000	0.7700	21.5780	(74)

Solar gains	21.5780	41.2367	70.0713	112.5524	151.6184	162.3120	151.5390	120.2268	84.2484	49.0869	26.6193	17.9885	(83)
Total gains	302.6592	330.1474	346.7639	381.6629	407.5440	410.1597	390.4674	358.8779	329.8080	301.5519	293.0809	293.0347	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8575	46.9878	47.1163	47.7293	47.8457	48.3954	48.3954	48.4986	48.1822	47.8457	47.6107	47.3675	
alpha	4.1238	4.1325	4.1411	4.1820	4.1897	4.2264	4.2264	4.2332	4.2121	4.1897	4.1740	4.1578	
util living area													
	0.9869	0.9799	0.9663	0.9204	0.8184	0.6416	0.4881	0.5459	0.7806	0.9374	0.9776	0.9885	(86)
MIT	19.4706	19.6470	19.9291	20.3612	20.7200	20.9278	20.9821	20.9718	20.8317	20.3913	19.8789	19.4491	(87)
Th 2	20.0326	20.0351	20.0374	20.0486	20.0507	20.0605	20.0605	20.0623	20.0567	20.0507	20.0465	20.0420	(88)
util rest of house													
	0.9839	0.9752	0.9581	0.9004	0.7738	0.5647	0.3901	0.4448	0.7139	0.9175	0.9715	0.9858	(89)
MIT 2	18.6452	18.8213	19.1008	19.5253	19.8513	20.0223	20.0544	20.0518	19.9547	19.5624	19.0607	18.6309	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.0394	19.2157	19.4964	19.9245	20.2662	20.4548	20.4975	20.4912	20.3736	19.9583	19.4515	19.0217	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0394	19.2157	19.4964	19.9245	20.2662	20.4548	20.4975	20.4912	20.3736	19.9583	19.4515	19.0217	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9798	0.9702	0.9524	0.8974	0.7848	0.5982	0.4365	0.4923	0.7381	0.9152	0.9668	0.9821	(94)
Useful gains	296.5470	320.2945	330.2485	342.4947	319.8444	245.3715	170.4571	176.6866	243.4377	275.9898	283.3406	287.7921	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	678.2288	656.9018	594.7403	498.0235	386.0278	260.8444	173.6423	181.8860	280.7410	421.7234	559.3562	674.6714	(97)
Space heating kWh													
	283.9712	226.2001	196.7819	111.9807	49.2405	0.0000	0.0000	0.0000	0.0000	108.4258	198.7313	287.8381	(98a)
Space heating requirement - total per year (kWh/year)												1463.1696	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	283.9712	226.2001	196.7819	111.9807	49.2405	0.0000	0.0000	0.0000	0.0000	108.4258	198.7313	287.8381	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1463.1696	
Space heating per m2											(98c) / (4) =	33.7447	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	418.7912	329.6867	337.8767	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8390	0.8998	0.8670	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	351.3628	296.6363	292.9486	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	452.9831	431.4337	395.8503	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	73.1666	100.2893	76.5589	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	18.2917	25.0723	19.1397	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												62.5037	(107)
Energy for space heating												33.7447	(99)
Energy for space cooling												1.4415	(108)
Total												35.1862	(109)
Fabric Energy Efficiency (TFEE)												35.2	(109)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.47	**TER**	16.63
Environmental	99 A	**% DER < TER**			91.16
CO_2 Emissions (t/year)	0.04	**DFEE**	23.68	**TFEE**	35.19
Compliance Check	See BREL	**% DFEE < TFEE**			32.70
% DPER < TPER	71.38	**DPER**	25.70	**TPER**	89.80

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
12Total per year (kWh/year)												2188	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0601	78.6737	71.0601	73.4288	71.0601	73.4288	71.0601	71.0601	73.4288	71.0601	73.4288	71.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.2801	384.4058	369.8506	357.2179	340.9558	329.7655	318.6057	319.7771	328.5028	338.8880	357.8362	370.5488	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.6400	10.6334	0.6800	0.7000	0.7700	23.2906	(74)

Solar gains	23.2906	44.5095	75.6325	121.4851	163.6516	175.1939	163.5659	129.7687	90.9347	52.9827	28.7319	19.4162	(83)
Total gains	400.5706	428.9153	445.4831	478.7030	504.6074	504.9594	482.1716	449.5458	419.4375	391.8707	386.5681	389.9650	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292

alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.9492	0.9269	0.8855	0.7809	0.6187	0.4395	0.3186	0.3568	0.5605	0.8038	0.9158	0.9549	(86)
MIT	20.2926	20.4254	20.6088	20.8284	20.9543	20.9932	20.9989	20.9981	20.9781	20.8305	20.5413	20.2533	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.9402	0.9144	0.8666	0.7494	0.5752	0.3893	0.2644	0.2990	0.5044	0.7682	0.8996	0.9468	(89)
MIT 2	19.4407	19.6035	19.8251	20.0773	20.2084	20.2429	20.2469	20.2465	20.2318	20.0850	19.7482	19.3922	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.8476	19.9961	20.1994	20.4361	20.5646	20.6013	20.6061	20.6055	20.5882	20.4411	20.1270	19.8035	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8476	19.9961	20.1994	20.4361	20.5646	20.6013	20.6061	20.6055	20.5882	20.4411	20.1270	19.8035	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9347	0.9098	0.8653	0.7577	0.5938	0.4130	0.2903	0.3266	0.5301	0.7778	0.8968	0.9412	(94)
Useful gains	374.4146	390.2347	385.4683	362.6957	299.6560	208.5652	139.9750	146.8016	222.3624	304.8086	346.6685	367.0507	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	543.9399	528.1437	479.2811	403.5941	310.1336	209.9574	140.1555	147.1312	226.9942	344.2961	455.7571	545.8956	(97)
Space heating kWh	126.1269	92.6748	69.7967	29.4469	7.7953	0.0000	0.0000	0.0000	0.0000	29.3787	78.5438	133.0606	(98a)
Space heating requirement - total per year (kWh/year)												566.8238	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	126.1269	92.6748	69.7967	29.4469	7.7953	0.0000	0.0000	0.0000	0.0000	29.3787	78.5438	133.0606	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												566.8238	
Space heating per m2											(98c) / (4) =	13.0725	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	126.1269	92.6748	69.7967	29.4469	7.7953	0.0000	0.0000	0.0000	0.0000	29.3787	78.5438	133.0606	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	189.1903	139.0123	104.6951	44.1704	11.6930	0.0000	0.0000	0.0000	0.0000	44.0681	117.8156	199.5910	
Space heating requirement	189.1903	139.0123	104.6951	44.1704	11.6930	0.0000	0.0000	0.0000	0.0000	44.0681	117.8156	199.5910	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												850.2357	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												8.5024	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3313.4278	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1101.7904	0.1568	35.5400	(367)
Electrical energy for heat distribution (space & water)	8.5024	0.0000	5.9506	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			164.6340	(373)
Space and water heating			164.6340	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			63.7010	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.4700	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1101.7904	1.5803	358.3036	(467)
Electrical energy for heat distribution (space & water)	8.5024	0.0000	63.3261	(472)
Overall CO2 factor for heat network			0.4240	(486)
Total CO2 associated with community systems			1752.0228	(473)
Space and water heating			1752.0228	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	1.4901	-605.6307	
PV Unit electricity exported	-551.7766	0.4464	-246.3315	
Total			-851.9622	(480)
Total Primary energy kWh/year			1114.3759	(483)
Dwelling Primary energy Rate (DPER)			25.7000	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.6400	1.1450	7.6031			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.1800	1.7910			(29a)

Wall to Unheated Com	16.5900	1.8400	14.7500	0.1800	2.6550	(29a)
500mm mineral wool	43.3600		43.3600	0.1100	4.7696	(30)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.6587	(33)
Main dwelling						
Party Wall 1			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.0141 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	4.7800	0.0500	0.2390
E3 Sill	3.8800	0.0500	0.1940
E4 Jamb	17.9200	0.0500	0.8960
E7 Party floor between dwellings (in blocks of flats)	17.6700	0.0700	1.2369
E16 Corner (normal)	5.0000	0.0900	0.4500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.5900	0.0000	0.0000
E14 Flat roof	17.6700	0.0800	1.4136
P4 Party wall - Roof (insulation at ceiling level)	12.5900	0.1200	1.5108
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5403 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 25.1990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	46.0145	45.8869	45.7618	45.1741	45.0641	44.5523	44.5523	44.4575	44.7494	45.0641	45.2866	45.5191	(39)
Average = Sum(39)m / 12 =												45.1735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0612	1.0583	1.0554	1.0418	1.0393	1.0275	1.0275	1.0253	1.0320	1.0393	1.0444	1.0498	(40)
HLP (average)												1.0418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.0518	76.4502	69.0518	71.3535	69.0518	71.3535	69.0518	69.0518	71.3535	69.0518	71.3535	69.0518	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	368.9363	375.8469	361.5069	348.8073	332.6121	318.3548	307.2620	308.4334	317.0921	330.5443	349.4255	362.2051	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.6400	10.6334	0.6300	0.7000	0.7700	21.5780	(74)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	21.5780	41.2367	70.0713	112.5524	151.6184	162.3120	151.5390	120.2268	84.2484	49.0869	26.6193	17.9885	(83)
Total gains	390.5144	417.0836	431.5782	461.3597	484.2305	480.6668	458.8010	428.6602	401.3405	379.6312	376.0448	380.1936	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8575	46.9878	47.1163	47.7293	47.8457	48.3954	48.3954	48.4986	48.1822	47.8457	47.6107	47.3675	
alpha	4.1238	4.1325	4.1411	4.1820	4.1897	4.2264	4.2264	4.2332	4.2121	4.1897	4.1740	4.1578	
util living area	0.9689	0.9567	0.9339	0.8687	0.7450	0.5648	0.4205	0.4660	0.6904	0.8818	0.9496	0.9717	(86)
MIT	19.7300	19.8931	20.1507	20.5231	20.8090	20.9552	20.9897	20.9844	20.8961	20.5618	20.1096	19.7095	(87)
Th 2	20.0326	20.0351	20.0374	20.0486	20.0507	20.0605	20.0605	20.0623	20.0567	20.0507	20.0465	20.0420	(88)
util rest of house	0.9623	0.9476	0.9196	0.8407	0.6946	0.4917	0.3338	0.3759	0.6190	0.8507	0.9376	0.9657	(89)
MIT 2	18.5782	18.7839	19.1060	19.5627	19.8829	20.0312	20.0562	20.0552	19.9805	19.6184	19.0660	18.5593	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.1283	19.3137	19.6050	20.0214	20.3252	20.4725	20.5021	20.4990	20.4178	20.0690	19.5645	19.1087	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1283	19.3137	19.6050	20.0214	20.3252	20.4725	20.5021	20.4990	20.4178	20.0690	19.5645	19.1087	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9546	0.9394	0.9120	0.8398	0.7100	0.5245	0.3750	0.4185	0.6477	0.8514	0.9302	0.9584	(94)
Useful gains	372.7740	391.7910	393.5998	387.4380	343.8056	252.1183	172.0482	179.3956	259.9498	323.2070	349.7991	364.3651	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	682.3183	661.3991	599.7074	502.3981	388.6892	261.6339	173.8463	182.2306	282.7194	426.7109	564.4733	678.6296	(97)
Space heating kWh	230.3010	181.1767	153.3440	82.7712	33.3934	0.0000	0.0000	0.0000	0.0000	77.0069	154.5654	233.8128	(98a)
Space heating requirement - total per year (kWh/year)												1146.3715	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	230.3010	181.1767	153.3440	82.7712	33.3934	0.0000	0.0000	0.0000	0.0000	77.0069	154.5654	233.8128	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1146.3715	
Space heating per m2										(98c) / (4) =		26.4385	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	230.3010	181.1767	153.3440	82.7712	33.3934	0.0000	0.0000	0.0000	0.0000	77.0069	154.5654	233.8128	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	249.5135	196.2911	166.1366	89.6763	36.1792	0.0000	0.0000	0.0000	0.0000	83.4311	167.4598	253.3183	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.5710	84.3056	83.7893	82.7362	81.3016	79.8000	79.8000	79.8000	79.8000	82.5682	83.9258	84.6270	(217)
Fuel for water heating, kWh/month	216.9186	192.6416	206.5698	185.6663	184.3148	170.5061	169.2907	175.3325	176.4869	188.6805	195.5246	214.6448	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.3476	11.5102	10.3636	7.5928	5.8649	4.7917	5.3502	6.9544	9.0330	11.8518	13.3866	14.7464	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3196	-12.6515	-19.6021	-23.8221	-27.3050	-26.1047	-25.8068	-23.5584	-19.8837	-15.2375	-9.4737	-7.0906	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2617	-4.9168	-10.0734	-15.5779	-21.0367	-21.2830	-21.0140	-17.5742	-12.6116	-7.1556	-3.0599	-1.7757	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1242.0059	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2276.5772	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	115.7933	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3363.1803	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1242.0059	0.2100	260.8212	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2276.5772	0.2100	478.0812	(264)
Space and water heating			738.9025	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	115.7933	0.1443	16.7126	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	0.1330	-29.1103	
PV Unit electricity exported	-138.3404	0.1251	-17.3028	
Total			-46.4132	(269)
Total CO2, kg/year			721.1311	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.6300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1242.0059	1.1300	1403.4667	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2276.5772	1.1300	2572.5322	(278)
Space and water heating			3975.9989	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	115.7933	1.5338	177.6076	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	1.4915	-326.4228	
PV Unit electricity exported	-138.3404	0.4591	-63.5081	
Total			-389.9309	(283)
Total Primary energy kWh/year			3893.7765	(286)
Target Primary Energy Rate (TPER)			89.8000	(287)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.47	**TER**	16.63
Environmental	99 A	**% DER < TER**			91.16
CO_2 Emissions (t/year)	0.04	**DFEE**	23.68	**TFEE**	35.19
Compliance Check	See BREL	**% DFEE < TFEE**			32.70
% DPER < TPER	71.38	**DPER**	25.70	**TPER**	89.80

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600 (1b)	x	2.4500 (2b)	=	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		7762.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							179.0141	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges					(36a) =		0.0000	

Total fabric heat loss (33) + (36) + (36a) = 17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.6400	10.6334	0.6800	0.7000	0.7700	23.2906	(74)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	23.2906	44.5095	75.6325	121.4851	163.6516	175.1939	163.5659	129.7687	90.9347	52.9827	28.7319	19.4162	(83)
Total gains	441.2015	460.6240	480.2027	504.3906	525.7249	518.3534	495.5982	464.2809	436.4067	417.8719	417.1394	428.2598	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086

util living area													
	0.9289	0.9078	0.8584	0.7554	0.5974	0.4286	0.3101	0.3456	0.5408	0.7735	0.8932	0.9370	(86)
MIT	20.3952	20.4969	20.6702	20.8533	20.9609	20.9939	20.9991	20.9984	20.9813	20.8591	20.6058	20.3535	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house													
	0.9172	0.8932	0.8370	0.7229	0.5546	0.3794	0.2573	0.2895	0.4860	0.7361	0.8743	0.9264	(89)
MIT 2	19.5655	19.6889	19.8957	20.1033	20.2142	20.2434	20.2470	20.2466	20.2342	20.1143	19.8235	19.5148	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.9618	20.0748	20.2656	20.4616	20.5708	20.6019	20.6062	20.6057	20.5910	20.4700	20.1971	19.9154	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9618	20.0748	20.2656	20.4616	20.5708	20.6019	20.6062	20.6057	20.5910	20.4700	20.1971	19.9154	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9122	0.8895	0.8375	0.7325	0.5733	0.4027	0.2825	0.3163	0.5113	0.7476	0.8729	0.9212	(94)
Useful gains	402.4795	409.7229	402.1730	369.4464	301.3839	208.7386	140.0000	146.8539	223.1475	312.4199	364.1258	394.5017	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	547.9354	530.8991	481.5972	404.4864	310.3501	209.9788	140.1587	147.1378	227.0917	345.3079	458.2097	549.8099	(97)
Space heating kWh													
	108.2192	81.4304	59.0916	25.2288	6.6708	0.0000	0.0000	0.0000	0.0000	24.4687	67.7405	115.5493	(98a)
Space heating requirement - total per year (kWh/year)												488.3993	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	108.2192	81.4304	59.0916	25.2288	6.6708	0.0000	0.0000	0.0000	0.0000	24.4687	67.7405	115.5493	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												488.3993	
Space heating per m2											(98c) / (4) =	11.2638	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	108.2192	81.4304	59.0916	25.2288	6.6708	0.0000	0.0000	0.0000	0.0000	24.4687	67.7405	115.5493	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	162.3288	122.1456	88.6374	37.8432	10.0063	0.0000	0.0000	0.0000	0.0000	36.7031	101.6107	173.3239	
Space heating requirement													
	162.3288	122.1456	88.6374	37.8432	10.0063	0.0000	0.0000	0.0000	0.0000	36.7031	101.6107	173.3239	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												732.5989	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												7.3260	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3195.7910	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	732.5989	4.4400	32.5274	(340a)
Space heating total			32.5274	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	16.4900	2.5157	(349)
Energy for lighting	124.6784	16.4900	20.5595	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	16.4900	-67.0227	
PV Unit electricity exported	-551.7766	5.5900	-30.8443	
Total			-97.8670	(352)
Total energy cost			195.4333	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7962	(357)
SAP value		87.0929	
SAP rating (Section 12)		87	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1070.4206	0.1568	30.6356	(367)
Electrical energy for heat distribution (space & water)	7.3260	0.0000	5.7667	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			159.5457	(373)
Space and water heating			159.5457	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			58.6127	(383)
CO2 emissions per m2			1.3500	(384)
EI value			99.1111	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	43.3600 (1b)	x 2.4500 (2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)

Adj infilt rate

	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.6400	12.7500	0.6800	0.7000	0.7700	27.9266	(74)

Solar gains	27.9266	47.9073	81.1599	132.5893	171.8912	197.0600	180.6791	146.4300	103.3371	60.4621	34.0340	23.3518	(83)
Total gains	445.8375	464.0218	485.7302	515.4948	533.9644	540.2195	512.7115	480.9422	448.8090	425.3513	422.4415	432.1955	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area													
	0.9218	0.9000	0.8398	0.7274	0.5614	0.3740	0.2659	0.2978	0.5060	0.7402	0.8792	0.9309	(86)
MIT	20.4356	20.5314	20.7160	20.8809	20.9719	20.9970	20.9996	20.9993	20.9867	20.8908	20.6501	20.3935	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house													
	0.9090	0.8842	0.8161	0.6930	0.5176	0.3261	0.2147	0.2434	0.4513	0.6995	0.8581	0.9193	(89)
MIT 2	19.6149	19.7307	19.9490	20.1327	20.2244	20.2456	20.2472	20.2471	20.2384	20.1474	19.8760	19.5640	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0069	20.1131	20.3153	20.4901	20.5814	20.6045	20.6066	20.6064	20.5958	20.5025	20.2457	19.9602	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0069	20.1131	20.3153	20.4901	20.5814	20.6045	20.6066	20.6064	20.5958	20.5025	20.2457	19.9602	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9045	0.8811	0.8183	0.7044	0.5373	0.3489	0.2392	0.2694	0.4768	0.7138	0.8580	0.9144	(94)
Useful gains	403.2493	408.8721	397.4874	363.1155	286.8790	188.5031	122.6170	129.5518	214.0097	303.6242	362.4745	395.1837	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	539.0167	521.7424	465.8432	391.4896	293.2285	189.0800	122.6797	129.6688	216.7633	328.9493	445.9160	540.8819	(97)
Space heating kWh													
	101.0109	75.8488	50.8567	20.4294	4.7240	0.0000	0.0000	0.0000	0.0000	18.8419	60.0779	108.3994	(98a)
Space heating requirement - total per year (kWh/year)												440.1890	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	101.0109	75.8488	50.8567	20.4294	4.7240	0.0000	0.0000	0.0000	0.0000	18.8419	60.0779	108.3994	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												440.1890	
Space heating per m2											(98c) / (4) =	10.1520	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	101.0109	75.8488	50.8567	20.4294	4.7240	0.0000	0.0000	0.0000	0.0000	18.8419	60.0779	108.3994	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	151.5164	113.7732	76.2851	30.6440	7.0860	0.0000	0.0000	0.0000	0.0000	28.2628	90.1168	162.5991	
Space heating requirement													
	151.5164	113.7732	76.2851	30.6440	7.0860	0.0000	0.0000	0.0000	0.0000	28.2628	90.1168	162.5991	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5669	-24.0727	-38.8745	-48.0493	-52.9789	-51.6524	-50.3986	-46.8694	-39.7890	-30.3128	-18.7591	-13.8902	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4316	-15.8925	-38.3705	-69.5238	-96.2615	-109.4663	-104.0915	-84.3722	-54.5598	-26.6835	-10.2713	-5.6085	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year												
Space heating fuel - community heating											660.2835	(307)
Space heating fuel - secondary											0.0000	(309)
Water heating fuel - community heating											3281.4784	(310)
Efficiency of water heater											0.0000	(311)
Electricity used for heat distribution											6.6028	(313)
Space cooling fuel											0.0000	(321)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)												
mechanical ventilation fans (SFP = 0.1177)											15.2561	(330a)
Total electricity for the above, kWh/year											15.2561	(331)
Electricity for lighting (calculated in Appendix L)											124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											-1054.7470	(333)
Wind generation											0.0000	(334)
Hydro-electric generation (Appendix N)											0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)											0.0000	(335)
Appendix Q - special features												
Energy saved or generated											-0.0000	(336)
Energy used											0.0000	(337)
Total delivered energy for all uses											3026.9495	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	660.2835	6.5500	43.2486	(340a)
Space heating total			43.2486	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	28.4300	4.3373	(349)
Energy for lighting	124.6784	28.4300	35.4461	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	28.4300	-122.8784	
PV Unit electricity exported	-622.5330	5.8100	-36.1692	
Total			-159.0476	(352)
Total energy cost			242.9212	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1051.1365	0.1573	27.6920	(367)
Electrical energy for heat distribution (space & water)	6.6028	0.0000	5.6563	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			156.4917	(373)
Space and water heating			156.4917	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	0.1330	-57.4796	
PV Unit electricity exported	-622.5330	0.1218	-75.7970	
Total			-133.2765	(380)
Total CO2, kg/year			43.3264	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1051.1365	1.5822	278.5935	(467)
Electrical energy for heat distribution (space & water)	6.6028	0.0000	60.3370	(472)
Overall CO2 factor for heat network			0.4235	(486)
Total CO2 associated with community systems			1669.3235	(473)
Space and water heating			1669.3235	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	1.4914	-644.6094	
PV Unit electricity exported	-622.5330	0.4467	-278.0656	
Total			-922.6749	(480)
Total Primary energy kWh/year			960.9640	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - South

Current energy efficiency rating:	B 87
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 87
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£40	£40	£0
Community scheme	£362	£362	£0
Space heating	£152	£152	£0
Water heating	£215	£215	£0
Lighting	£35	£35	£0
Generated (PV)	-£159	-£159	£0
Total cost of fuels	£243	£243	£0
Total cost of uses	£243	£243	£0
Delivered energy	70 kWh/m²	70 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.0 tonnes	0.0 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	22 kWh/m²	22 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)

Total net area of external elements Aum(A, m2)	76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	15.1610		(33)
Main dwelling				
Party Wall 1	31.3600	0.0000	0.0000	70.0000 2195.2000 (32)
Party Floor 1	43.3600			70.0000 3035.2000 (32d)
Internal TF Wall	68.4500			9.0000 616.0500 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.6400	10.6334	0.6800	0.7000	0.7700	23.2906	(74)
Solar gains	23.2906	44.5095	75.6325	121.4851	163.6516	175.1939	163.5659	129.7687	90.9347	52.9827	28.7319	19.4162	(83)
Total gains	441.2015	460.6240	480.2027	504.3906	525.7249	518.3534	495.5982	464.2809	436.4067	417.8719	417.1394	428.2598	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.9289	0.9078	0.8584	0.7554	0.5974	0.4286	0.3101	0.3456	0.5408	0.7735	0.8932	0.9370	(86)
MIT	20.3952	20.4969	20.6702	20.8533	20.9609	20.9939	20.9991	20.9984	20.9813	20.8591	20.6058	20.3535	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.9172	0.8932	0.8370	0.7229	0.5546	0.3794	0.2573	0.2895	0.4860	0.7361	0.8743	0.9264	(89)
MIT 2	19.5655	19.6889	19.8957	20.1033	20.2142	20.2434	20.2470	20.2466	20.2342	20.1143	19.8235	19.5148	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.9618	20.0748	20.2656	20.4616	20.5708	20.6019	20.6062	20.6057	20.5910	20.4700	20.1971	19.9154	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9618	20.0748	20.2656	20.4616	20.5708	20.6019	20.6062	20.6057	20.5910	20.4700	20.1971	19.9154	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9122	0.8895	0.8375	0.7325	0.5733	0.4027	0.2825	0.3163	0.5113	0.7476	0.8729	0.9212	(94)
Useful gains	402.4795	409.7229	402.1730	369.4464	301.3839	208.7386	140.0000	146.8539	223.1475	312.4199	364.1258	394.5017	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	547.9354	530.8991	481.5972	404.4864	310.3501	209.9788	140.1587	147.1378	227.0917	345.3079	458.2097	549.8099	(97)
Space heating kWh	108.2192	81.4304	59.0916	25.2288	6.6708	0.0000	0.0000	0.0000	0.0000	24.4687	67.7405	115.5493	(98a)
Space heating requirement - total per year (kWh/year)												488.3993	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	108.2192	81.4304	59.0916	25.2288	6.6708	0.0000	0.0000	0.0000	24.4687	67.7405	115.5493	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												488.3993	
Space heating per m2										(98c) / (4) =		11.2638	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	108.2192	81.4304	59.0916	25.2288	6.6708	0.0000	0.0000	0.0000	0.0000	24.4687	67.7405	115.5493	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	162.3288	122.1456	88.6374	37.8432	10.0063	0.0000	0.0000	0.0000	0.0000	36.7031	101.6107	173.3239	
Space heating requirement													
	162.3288	122.1456	88.6374	37.8432	10.0063	0.0000	0.0000	0.0000	0.0000	36.7031	101.6107	173.3239	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												732.5989	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												7.3260	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)

Appendix Q - special features

Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3195.7910	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	732.5989	4.4400	32.5274	(340a)
Space heating total			32.5274	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	16.4900	2.5157	(349)
Energy for lighting	124.6784	16.4900	20.5595	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	16.4900	-67.0227	
PV Unit electricity exported	-551.7766	5.5900	-30.8443	
Total			-97.8670	(352)
Total energy cost			195.4333	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7962	(357)
SAP value		87.0929	
SAP rating (Section 12)		87	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1070.4206	0.1568	30.6356	(367)
Electrical energy for heat distribution (space & water)	7.3260	0.0000	5.7667	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			159.5457	(373)
Space and water heating			159.5457	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			58.6127	(383)
CO2 emissions per m2			1.3500	(384)
EI value			99.1111	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

Measured/design AP50												3.0000	(17)
Infiltration rate												0.1500	(18)
Number of sides sheltered												3	(19)
Shelter factor								(20) = 1 - [0.075 x (19)] =				0.7750	(20)
Infiltration rate adjusted to include shelter factor								(21) = (18) x (20) =				0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.6400	12.7500	0.6800	0.7000	0.7700	27.9266	(74)

Solar gains	27.9266	47.9073	81.1599	132.5893	171.8912	197.0600	180.6791	146.4300	103.3371	60.4621	34.0340	23.3518	(83)
Total gains	445.8375	464.0218	485.7302	515.4948	533.9644	540.2195	512.7115	480.9422	448.8090	425.3513	422.4415	432.1955	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area													
	0.9218	0.9000	0.8398	0.7274	0.5614	0.3740	0.2659	0.2978	0.5060	0.7402	0.8792	0.9309	(86)
MIT	20.4356	20.5314	20.7160	20.8809	20.9719	20.9970	20.9996	20.9993	20.9867	20.8908	20.6501	20.3935	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house													
	0.9090	0.8842	0.8161	0.6930	0.5176	0.3261	0.2147	0.2434	0.4513	0.6995	0.8581	0.9193	(89)
MIT 2	19.6149	19.7307	19.9490	20.1327	20.2244	20.2456	20.2472	20.2471	20.2384	20.1474	19.8760	19.5640	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.0069	20.1131	20.3153	20.4901	20.5814	20.6045	20.6066	20.6064	20.5958	20.5025	20.2457	19.9602	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0069	20.1131	20.3153	20.4901	20.5814	20.6045	20.6066	20.6064	20.5958	20.5025	20.2457	19.9602	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9045	0.8811	0.8183	0.7044	0.5373	0.3489	0.2392	0.2694	0.4768	0.7138	0.8580	0.9144	(94)
Useful gains	403.2493	408.8721	397.4874	363.1155	286.8790	188.5031	122.6170	129.5518	214.0097	303.6242	362.4745	395.1837	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	539.0167	521.7424	465.8432	391.4896	293.2285	189.0800	122.6797	129.6688	216.7633	328.9493	445.9160	540.8819	(97)
Space heating kWh													
	101.0109	75.8488	50.8567	20.4294	4.7240	0.0000	0.0000	0.0000	0.0000	18.8419	60.0779	108.3994	(98a)
Space heating requirement - total per year (kWh/year)												440.1890	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	101.0109	75.8488	50.8567	20.4294	4.7240	0.0000	0.0000	0.0000	0.0000	18.8419	60.0779	108.3994	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												440.1890	
Space heating per m2											(98c) / (4) =	10.1520	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement

	101.0109	75.8488	50.8567	20.4294	4.7240	0.0000	0.0000	0.0000	0.0000	18.8419	60.0779	108.3994	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	151.5164	113.7732	76.2851	30.6440	7.0860	0.0000	0.0000	0.0000	0.0000	28.2628	90.1168	162.5991	
Space heating requirement													
	151.5164	113.7732	76.2851	30.6440	7.0860	0.0000	0.0000	0.0000	0.0000	28.2628	90.1168	162.5991	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement

	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)

Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5669	-24.0727	-38.8745	-48.0493	-52.9789	-51.6524	-50.3986	-46.8694	-39.7890	-30.3128	-18.7591	-13.8902	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4316	-15.8925	-38.3705	-69.5238	-96.2615	-109.4663	-104.0915	-84.3722	-54.5598	-26.6835	-10.2713	-5.6085	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	660.2835	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	6.6028	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)		
mechanical ventilation fans (SFP = 0.1177)	15.2561	(330a)
Total electricity for the above, kWh/year	15.2561	(331)
Electricity for lighting (calculated in Appendix L)	124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3026.9495	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	660.2835	6.5500	43.2486	(340a)
Space heating total			43.2486	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	28.4300	4.3373	(349)
Energy for lighting	124.6784	28.4300	35.4461	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	28.4300	-122.8784	
PV Unit electricity exported	-622.5330	5.8100	-36.1692	
Total			-159.0476	(352)
Total energy cost			242.9212	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1051.1365	0.1573	27.6920	(367)
Electrical energy for heat distribution (space & water)	6.6028	0.0000	5.6563	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			156.4917	(373)
Space and water heating			156.4917	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	0.1330	-57.4796	
PV Unit electricity exported	-622.5330	0.1218	-75.7970	
Total			-133.2765	(380)
Total CO2, kg/year			43.3264	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1051.1365	1.5822	278.5935	(467)
Electrical energy for heat distribution (space & water)	6.6028	0.0000	60.3370	(472)
Overall CO2 factor for heat network			0.4235	(486)
Total CO2 associated with community systems			1669.3235	(473)
Space and water heating			1669.3235	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	1.4914	-644.6094	
PV Unit electricity exported	-622.5330	0.4467	-278.0656	
Total			-922.6749	(480)
Total Primary energy kWh/year			960.9640	(483)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.45	**TER**	16.51
Environmental	99 A	**% DER < TER**			91.22
CO_2 Emissions (t/year)	0.04	**DFEE**	23.50	**TFEE**	34.79
Compliance Check	See BREL	**% DFEE < TFEE**			32.44
% DPER < TPER	71.45	**DPER**	25.45	**TPER**	89.13

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate
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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			7762.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							179.0141	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
12Total per year (kWh/year)												2188	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0601	78.6737	71.0601	73.4288	71.0601	73.4288	71.0601	71.0601	73.4288	71.0601	73.4288	71.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.2801	384.4058	369.8506	357.2179	340.9558	329.7655	318.6057	319.7771	328.5028	338.8880	357.8362	370.5488	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	6.6400	11.2829	0.6800	0.7000	0.7700	24.7133	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	24.7133	50.3046	90.6329	148.8453	200.0773	213.3036	199.5411	159.0765	110.4376	61.4762	31.0957	20.1821	(83)
Total gains	401.9933	434.7104	460.4835	506.0632	541.0331	543.0690	518.1469	478.8536	438.9404	400.3642	388.9319	390.7309	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292

alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.9486	0.9235	0.8740	0.7538	0.5827	0.4097	0.2967	0.3352	0.5380	0.7939	0.9141	0.9546	(86)
MIT	20.2964	20.4390	20.6365	20.8548	20.9650	20.9950	20.9992	20.9986	20.9818	20.8405	20.5466	20.2554	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.9395	0.9107	0.8539	0.7212	0.5404	0.3625	0.2461	0.2808	0.4834	0.7576	0.8978	0.9464	(89)
MIT 2	19.4453	19.6199	19.8570	20.1049	20.2178	20.2442	20.2471	20.2467	20.2345	20.0953	19.7544	19.3948	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.8518	20.0111	20.2293	20.4631	20.5747	20.6028	20.6063	20.6058	20.5914	20.4512	20.1328	19.8058	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8518	20.0111	20.2293	20.4631	20.5747	20.6028	20.6063	20.6058	20.5914	20.4512	20.1328	19.8058	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9340	0.9062	0.8534	0.7308	0.5590	0.3849	0.2703	0.3068	0.5086	0.7679	0.8950	0.9409	(94)
Useful gains	375.4484	393.9424	392.9839	369.8504	302.4620	209.0037	140.0345	146.8975	223.2529	307.4477	348.0931	367.6255	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	544.0874	528.6693	480.3265	404.5395	310.4847	210.0114	140.1630	147.1433	227.1047	344.6484	455.9580	545.9777	(97)
Space heating kWh	125.4674	90.5365	64.9829	24.9762	5.9689	0.0000	0.0000	0.0000	0.0000	27.6773	77.6627	132.6941	(98a)
Space heating requirement - total per year (kWh/year)												549.9660	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	125.4674	90.5365	64.9829	24.9762	5.9689	0.0000	0.0000	0.0000	0.0000	27.6773	77.6627	132.6941	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												549.9660	
Space heating per m2											(98c) / (4) =	12.6837	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	125.4674	90.5365	64.9829	24.9762	5.9689	0.0000	0.0000	0.0000	0.0000	27.6773	77.6627	132.6941	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	188.2011	135.8047	97.4744	37.4643	8.9533	0.0000	0.0000	0.0000	0.0000	41.5159	116.4941	199.0411	
Space heating requirement	188.2011	135.8047	97.4744	37.4643	8.9533	0.0000	0.0000	0.0000	0.0000	41.5159	116.4941	199.0411	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												824.9490	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												8.2495	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3288.1411	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1095.0473	0.1570	34.5437	(367)
Electrical energy for heat distribution (space & water)	8.2495	0.0000	5.9133	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			163.6003	(373)
Space and water heating			163.6003	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			62.6673	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.4500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1095.0473	1.5813	347.8690	(467)
Electrical energy for heat distribution (space & water)	8.2495	0.0000	62.9348	(472)
Overall CO2 factor for heat network			0.4240	(486)
Total CO2 associated with community systems			1741.1968	(473)
Space and water heating			1741.1968	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	1.4901	-605.6307	
PV Unit electricity exported	-551.7766	0.4464	-246.3315	
Total			-851.9622	(480)
Total Primary energy kWh/year			1103.5500	(483)
Dwelling Primary energy Rate (DPER)			25.4500	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.6400	1.1450	7.6031			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.1800	1.7910			(29a)

Wall to Unheated Com	16.5900	1.8400	14.7500	0.1800	2.6550	(29a)
500mm mineral wool	43.3600		43.3600	0.1100	4.7696	(30)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.6587	(33)
Main dwelling						
Party Wall 1			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.0141 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	4.7800	0.0500	0.2390
E3 Sill	3.8800	0.0500	0.1940
E4 Jamb	17.9200	0.0500	0.8960
E7 Party floor between dwellings (in blocks of flats)	17.6700	0.0700	1.2369
E16 Corner (normal)	5.0000	0.0900	0.4500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.5900	0.0000	0.0000
E14 Flat roof	17.6700	0.0800	1.4136
P4 Party wall - Roof (insulation at ceiling level)	12.5900	0.1200	1.5108
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5403 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 25.1990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	46.0145	45.8869	45.7618	45.1741	45.0641	44.5523	44.5523	44.4575	44.7494	45.0641	45.2866	45.5191	(39)
Average = Sum(39)m / 12 =												45.1735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0612	1.0583	1.0554	1.0418	1.0393	1.0275	1.0275	1.0253	1.0320	1.0393	1.0444	1.0498	(40)
HLP (average)												1.0418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.0518	76.4502	69.0518	71.3535	69.0518	71.3535	69.0518	69.0518	71.3535	69.0518	71.3535	69.0518	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	368.9363	375.8469	361.5069	348.8073	332.6121	318.3548	307.2620	308.4334	317.0921	330.5443	349.4255	362.2051	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	6.6400	11.2829	0.6300	0.7000	0.7700	22.8961	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	22.8961	46.6058	83.9687	137.9008	185.3657	197.6195	184.8690	147.3797	102.3172	56.9559	28.8093	18.6981	(83)
Total gains	391.8325	422.4527	445.4757	486.7081	517.9778	515.9743	492.1310	455.8131	419.4093	387.5002	378.2348	380.9033	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8575	46.9878	47.1163	47.7293	47.8457	48.3954	48.3954	48.4986	48.1822	47.8457	47.6107	47.3675	
alpha	4.1238	4.1325	4.1411	4.1820	4.1897	4.2264	4.2264	4.2332	4.2121	4.1897	4.1740	4.1578	
util living area	0.9685	0.9549	0.9275	0.8508	0.7138	0.5315	0.3934	0.4402	0.6692	0.8755	0.9487	0.9715	(86)
MIT	19.7337	19.9074	20.1838	20.5665	20.8384	20.9642	20.9920	20.9874	20.9078	20.5765	20.1153	19.7116	(87)
Th 2	20.0326	20.0351	20.0374	20.0486	20.0507	20.0605	20.0605	20.0623	20.0567	20.0507	20.0465	20.0420	(88)
util rest of house	0.9619	0.9455	0.9122	0.8206	0.6622	0.4609	0.3117	0.3542	0.5977	0.8434	0.9365	0.9655	(89)
MIT 2	18.5828	18.8015	19.1458	19.6110	19.9107	20.0375	20.0572	20.0566	19.9898	19.6347	19.0729	18.5618	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.1325	19.3297	19.6416	20.0674	20.3538	20.4801	20.5037	20.5012	20.4283	20.0845	19.5708	19.1110	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1325	19.3297	19.6416	20.0674	20.3538	20.4801	20.5037	20.5012	20.4283	20.0845	19.5708	19.1110	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9541	0.9372	0.9048	0.8212	0.6794	0.4931	0.3506	0.3950	0.6270	0.8447	0.9291	0.9581	(94)
Useful gains	373.8614	395.9373	403.0815	399.6896	351.9099	254.4026	172.5258	180.0470	262.9904	327.3217	351.4281	364.9593	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	682.5115	662.1352	601.3809	504.4770	389.9750	261.9726	173.9179	182.3277	283.1871	427.4116	564.7592	678.7342	(97)
Space heating kWh	229.6357	178.8850	147.5348	75.4470	28.3204	0.0000	0.0000	0.0000	0.0000	74.4669	153.5984	233.4485	(98a)
Space heating requirement - total per year (kWh/year)												1121.3366	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	229.6357	178.8850	147.5348	75.4470	28.3204	0.0000	0.0000	0.0000	0.0000	74.4669	153.5984	233.4485	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1121.3366	
Space heating per m2										(98c) / (4) =		25.8611	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	229.6357	178.8850	147.5348	75.4470	28.3204	0.0000	0.0000	0.0000	0.0000	74.4669	153.5984	233.4485	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	248.7927	193.8082	159.8426	81.7410	30.6830	0.0000	0.0000	0.0000	0.0000	80.6792	166.4121	252.9236	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.5645	84.2770	83.7037	82.5559	81.1066	79.8000	79.8000	79.8000	79.8000	82.5043	83.9118	84.6235	(217)
Fuel for water heating, kWh/month	216.9353	192.7071	206.7810	186.0717	184.7579	170.5061	169.2907	175.3325	176.4869	188.8265	195.5573	214.6537	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.3476	11.5102	10.3636	7.5928	5.8649	4.7917	5.3502	6.9544	9.0330	11.8518	13.3866	14.7464	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3196	-12.6515	-19.6021	-23.8221	-27.3050	-26.1047	-25.8068	-23.5584	-19.8837	-15.2375	-9.4737	-7.0906	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2617	-4.9168	-10.0734	-15.5779	-21.0367	-21.2830	-21.0140	-17.5742	-12.6116	-7.1556	-3.0599	-1.7757	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1214.8826 (211)
Space heating fuel - main system 2	0.0000 (213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2277.9066	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	115.7933	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3337.3864	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1214.8826	0.2100	255.1253	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2277.9066	0.2100	478.3604	(264)
Space and water heating			733.4857	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	115.7933	0.1443	16.7126	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	0.1330	-29.1103	
PV Unit electricity exported	-138.3404	0.1251	-17.3028	
Total			-46.4132	(269)
Total CO2, kg/year			715.7144	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.5100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1214.8826	1.1300	1372.8173	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2277.9066	1.1300	2574.0345	(278)
Space and water heating			3946.8518	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	115.7933	1.5338	177.6076	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	1.4915	-326.4228	
PV Unit electricity exported	-138.3404	0.4591	-63.5081	
Total			-389.9309	(283)
Total Primary energy kWh/year			3864.6293	(286)
Target Primary Energy Rate (TPER)			89.1300	(287)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.45	**TER**	16.51
Environmental	99 A	**% DER < TER**			91.22
CO_2 Emissions (t/year)	0.04	**DFEE**	23.50	**TFEE**	34.79
Compliance Check	See BREL	**% DFEE < TFEE**			32.44
% DPER < TPER	71.45	**DPER**	25.45	**TPER**	89.13

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2622	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	36.9438	36.8677	36.7932	36.4431	36.3776	36.0727	36.0727	36.0162	36.1901	36.3776	36.5101	36.6486	(39)
Average = Sum(39)m / 12 =												36.4428	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8520	0.8503	0.8486	0.8405	0.8390	0.8319	0.8319	0.8306	0.8346	0.8390	0.8420	0.8452	(40)
HLP (average)												0.8405	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)											Total = Sum(45)m =	781.1490	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												449.4572	(64a)
Heat gains from water heating, kWh/month	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0601	78.6737	71.0601	73.4288	71.0601	73.4288	71.0601	71.0601	73.4288	71.0601	73.4288	71.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.0895	291.1341	278.7010	271.1858	257.9340	249.9230	240.9368	240.6593	247.6349	254.4733	268.5369	277.0546	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	6.6400	11.2829	0.6800	0.7000	0.7700	24.7133	(81)

Solar gains	24.7133	50.3046	90.6329	148.8453	200.0773	213.3036	199.5411	159.0765	110.4376	61.4762	31.0957	20.1821	(83)
Total gains	307.8028	341.4388	369.3339	420.0311	458.0112	463.2265	440.4779	399.7358	358.0725	315.9495	299.6326	297.2367	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.3623	58.4827	58.6012	59.1642	59.2707	59.7717	59.7717	59.8654	59.5777	59.2707	59.0556	58.8323	
alpha	4.8908	4.8988	4.9067	4.9443	4.9514	4.9848	4.9848	4.9910	4.9718	4.9514	4.9370	4.9222	
util living area	0.9830	0.9706	0.9429	0.8513	0.6871	0.4905	0.3589	0.4115	0.6576	0.8973	0.9682	0.9855	(86)
MIT	19.9224	20.1009	20.3644	20.7134	20.9188	20.9874	20.9978	20.9959	20.9509	20.6739	20.2530	19.8917	(87)
Th 2	20.2085	20.2100	20.2115	20.2184	20.2197	20.2257	20.2257	20.2269	20.2234	20.2197	20.2171	20.2143	(88)
util rest of house	0.9794	0.9645	0.9311	0.8241	0.6416	0.4340	0.2964	0.3437	0.5959	0.8715	0.9606	0.9823	(89)

MIT 2	19.2273	19.4037	19.6604	19.9904	20.1645	20.2193	20.2250	20.2253	20.1950	19.9631	19.5604	19.2017 (90)
Living area fraction										fLA = Living area / (4) =		0.4776 (91)
MIT	19.5593	19.7367	19.9967	20.3357	20.5247	20.5862	20.5941	20.5934	20.5561	20.3026	19.8912	19.5313 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5593	19.7367	19.9967	20.3357	20.5247	20.5862	20.5941	20.5934	20.5561	20.3026	19.8912	19.5313 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9758	0.9602	0.9274	0.8285	0.6599	0.4606	0.3263	0.3760	0.6231	0.8745	0.9568	0.9790	(94)
Useful gains	300.3474	327.8424	342.5285	347.9941	302.2304	213.3426	143.7091	150.2968	223.1029	276.2947	286.6985	290.9980	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	563.7352	546.9959	496.5854	416.7532	321.0225	215.9367	144.0788	151.0288	233.6464	352.9572	467.0094	561.8698	(97)
Space heating kWh	195.9606	147.2712	114.6183	49.5066	13.9813	0.0000	0.0000	0.0000	0.0000	57.0369	129.8238	201.5286	(98a)
Space heating requirement - total per year (kWh/year)												909.7273	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	195.9606	147.2712	114.6183	49.5066	13.9813	0.0000	0.0000	0.0000	0.0000	57.0369	129.8238	201.5286	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												909.7273	
Space heating per m2											(98c) / (4) =	20.9808	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	339.0831	266.9377	273.7231	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9529	0.9769	0.9629	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	323.1240	260.7818	263.5755	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	512.7594	487.7300	441.5058	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	136.5375	168.8494	132.3801	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	34.1344	42.2124	33.0950	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												109.4418	(107)
Energy for space heating												20.9808	(99)
Energy for space cooling												2.5240	(108)
Total												23.5048	(109)
Fabric Energy Efficiency (DFEE)												23.5	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4383 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.6400	1.1450	7.6031			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.1800	1.7910			(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.1800	2.6550			(29a)
500mm mineral wool	43.3600		43.3600	0.1100	4.7696			(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.6587			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.0141 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	4.7800	0.0500	0.2390
E3 Sill	3.8800	0.0500	0.1940
E4 Jamb	17.9200	0.0500	0.8960
E7 Party floor between dwellings (in blocks of flats)	17.6700	0.0700	1.2369
E16 Corner (normal)	5.0000	0.0900	0.4500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.5900	0.0000	0.0000
E14 Flat roof	17.6700	0.0800	1.4136
P4 Party wall - Roof (insulation at ceiling level)	12.5900	0.1200	1.5108
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5403 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.1990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	46.0145	45.8869	45.7618	45.1741	45.0641	44.5523	44.5523	44.4575	44.7494	45.0641	45.2866	45.5191	(39)
Average = Sum(39)m / 12 =												45.1735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0612	1.0583	1.0554	1.0418	1.0393	1.0275	1.0275	1.0253	1.0320	1.0393	1.0444	1.0498	(40)
HLP (average)												1.0418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)													
	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							449.4572	(64a)
Heat gains from water heating, kWh/month													
	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	69.0518	76.4502	69.0518	71.3535	69.0518	71.3535	69.0518	69.0518	71.3535	69.0518	71.3535	69.0518	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains													
	281.0812	288.9106	276.6927	269.1105	255.9256	247.8477	238.9285	238.6510	245.5596	252.4649	266.4616	275.0462	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	6.6400	11.2829	0.6300	0.7000	0.7700	22.8961	(81)

Solar gains	22.8961	46.6058	83.9687	137.9008	185.3657	197.6195	184.8690	147.3797	102.3172	56.9559	28.8093	18.6981	(83)
Total gains	303.9773	335.5164	360.6614	407.0113	441.2914	445.4672	423.7974	386.0307	347.8768	309.4209	295.2709	293.7444	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8575	46.9878	47.1163	47.7293	47.8457	48.3954	48.3954	48.4986	48.1822	47.8457	47.6107	47.3675	
alpha	4.1238	4.1325	4.1411	4.1820	4.1897	4.2264	4.2264	4.2332	4.2121	4.1897	4.1740	4.1578	
util living area													
	0.9867	0.9787	0.9618	0.9050	0.7859	0.6014	0.4528	0.5122	0.7571	0.9325	0.9770	0.9884	(86)
MIT	19.4747	19.6629	19.9676	20.4169	20.7635	20.9434	20.9865	20.9778	20.8512	20.4105	19.8853	19.4513	(87)
Th 2	20.0326	20.0351	20.0374	20.0486	20.0507	20.0605	20.0605	20.0623	20.0567	20.0507	20.0465	20.0420	(88)
util rest of house													
	0.9836	0.9738	0.9526	0.8822	0.7382	0.5260	0.3605	0.4154	0.6885	0.9114	0.9708	0.9857	(89)
MIT 2	18.6492	18.8368	19.1378	19.5758	19.8853	20.0311	20.0560	20.0542	19.9680	19.5798	19.0670	18.6331	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.0434	19.2314	19.5341	19.9775	20.3047	20.4669	20.5004	20.4953	20.3899	19.9765	19.4578	19.0239	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0434	19.2314	19.5341	19.9775	20.3047	20.4669	20.5004	20.4953	20.3899	19.9765	19.4578	19.0239	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9795	0.9687	0.9468	0.8803	0.7519	0.5596	0.4044	0.4611	0.7144	0.9095	0.9660	0.9820	(94)
Useful gains	297.7529	324.9991	341.4617	358.2892	331.7930	249.2884	171.3808	177.9931	248.5346	281.4086	285.2337	288.4476	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	678.4131	657.6232	596.4650	500.4169	387.7644	261.3815	173.7718	182.0675	281.4677	422.5458	559.6439	674.7706	(97)
Space heating kWh													
	283.2112	223.5234	189.7224	102.3319	41.6427	0.0000	0.0000	0.0000	0.0000	105.0060	197.5753	287.4243	(98a)
Space heating requirement - total per year (kWh/year)												1430.4373	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	283.2112	223.5234	189.7224	102.3319	41.6427	0.0000	0.0000	0.0000	0.0000	105.0060	197.5753	287.4243	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1430.4373	
Space heating per m2											(98c) / (4) =	32.9898	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	418.7912	329.6867	337.8767	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8692	0.9211	0.8907	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	363.9929	303.6693	300.9458	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	494.2516	470.3909	427.5874	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	93.7863	124.0408	94.2214	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	23.4466	31.0102	23.5554	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												78.0121	(107)
Energy for space heating												32.9898	(99)
Energy for space cooling												1.7992	(108)
Total												34.7890	(109)
Fabric Energy Efficiency (TFEE)												34.8	(109)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.45	**TER**	16.51
Environmental	99 A	**% DER < TER**			91.22
CO_2 Emissions (t/year)	0.04	**DFEE**	23.50	**TFEE**	34.79
Compliance Check	See BREL	**% DFEE < TFEE**			32.44
% DPER < TPER	71.45	**DPER**	25.45	**TPER**	89.13

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate
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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			7762.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							179.0141	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
12Total per year (kWh/year)												2188	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0601	78.6737	71.0601	73.4288	71.0601	73.4288	71.0601	71.0601	73.4288	71.0601	73.4288	71.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.2801	384.4058	369.8506	357.2179	340.9558	329.7655	318.6057	319.7771	328.5028	338.8880	357.8362	370.5488	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	6.6400	11.2829	0.6800	0.7000	0.7700	24.7133	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	24.7133	50.3046	90.6329	148.8453	200.0773	213.3036	199.5411	159.0765	110.4376	61.4762	31.0957	20.1821	(83)
Total gains	401.9933	434.7104	460.4835	506.0632	541.0331	543.0690	518.1469	478.8536	438.9404	400.3642	388.9319	390.7309	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292

alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.9486	0.9235	0.8740	0.7538	0.5827	0.4097	0.2967	0.3352	0.5380	0.7939	0.9141	0.9546	(86)
MIT	20.2964	20.4390	20.6365	20.8548	20.9650	20.9950	20.9992	20.9986	20.9818	20.8405	20.5466	20.2554	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.9395	0.9107	0.8539	0.7212	0.5404	0.3625	0.2461	0.2808	0.4834	0.7576	0.8978	0.9464	(89)
MIT 2	19.4453	19.6199	19.8570	20.1049	20.2178	20.2442	20.2471	20.2467	20.2345	20.0953	19.7544	19.3948	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.8518	20.0111	20.2293	20.4631	20.5747	20.6028	20.6063	20.6058	20.5914	20.4512	20.1328	19.8058	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8518	20.0111	20.2293	20.4631	20.5747	20.6028	20.6063	20.6058	20.5914	20.4512	20.1328	19.8058	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9340	0.9062	0.8534	0.7308	0.5590	0.3849	0.2703	0.3068	0.5086	0.7679	0.8950	0.9409	(94)
Useful gains	375.4484	393.9424	392.9839	369.8504	302.4620	209.0037	140.0345	146.8975	223.2529	307.4477	348.0931	367.6255	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	544.0874	528.6693	480.3265	404.5395	310.4847	210.0114	140.1630	147.1433	227.1047	344.6484	455.9580	545.9777	(97)
Space heating kWh	125.4674	90.5365	64.9829	24.9762	5.9689	0.0000	0.0000	0.0000	0.0000	27.6773	77.6627	132.6941	(98a)
Space heating requirement - total per year (kWh/year)												549.9660	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	125.4674	90.5365	64.9829	24.9762	5.9689	0.0000	0.0000	0.0000	0.0000	27.6773	77.6627	132.6941	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												549.9660	
Space heating per m2											(98c) / (4) =	12.6837	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	125.4674	90.5365	64.9829	24.9762	5.9689	0.0000	0.0000	0.0000	0.0000	27.6773	77.6627	132.6941	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	188.2011	135.8047	97.4744	37.4643	8.9533	0.0000	0.0000	0.0000	0.0000	41.5159	116.4941	199.0411	
Space heating requirement	188.2011	135.8047	97.4744	37.4643	8.9533	0.0000	0.0000	0.0000	0.0000	41.5159	116.4941	199.0411	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												824.9490	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												8.2495	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3288.1411	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1095.0473	0.1570	34.5437	(367)
Electrical energy for heat distribution (space & water)	8.2495	0.0000	5.9133	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			163.6003	(373)
Space and water heating			163.6003	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			62.6673	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.4500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1095.0473	1.5813	347.8690	(467)
Electrical energy for heat distribution (space & water)	8.2495	0.0000	62.9348	(472)
Overall CO2 factor for heat network			0.4240	(486)
Total CO2 associated with community systems			1741.1968	(473)
Space and water heating			1741.1968	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	1.4901	-605.6307	
PV Unit electricity exported	-551.7766	0.4464	-246.3315	
Total			-851.9622	(480)
Total Primary energy kWh/year			1103.5500	(483)
Dwelling Primary energy Rate (DPER)			25.4500	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.6400	1.1450	7.6031			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.1800	1.7910			(29a)

Wall to Unheated Com	16.5900	1.8400	14.7500	0.1800	2.6550	(29a)
500mm mineral wool	43.3600		43.3600	0.1100	4.7696	(30)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.6587	(33)
Main dwelling						
Party Wall 1			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.0141 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	4.7800	0.0500	0.2390
E3 Sill	3.8800	0.0500	0.1940
E4 Jamb	17.9200	0.0500	0.8960
E7 Party floor between dwellings (in blocks of flats)	17.6700	0.0700	1.2369
E16 Corner (normal)	5.0000	0.0900	0.4500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.5900	0.0000	0.0000
E14 Flat roof	17.6700	0.0800	1.4136
P4 Party wall - Roof (insulation at ceiling level)	12.5900	0.1200	1.5108
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5403 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 25.1990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	46.0145	45.8869	45.7618	45.1741	45.0641	44.5523	44.5523	44.4575	44.7494	45.0641	45.2866	45.5191	(39)
Average = Sum(39)m / 12 =												45.1735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0612	1.0583	1.0554	1.0418	1.0393	1.0275	1.0275	1.0253	1.0320	1.0393	1.0444	1.0498	(40)
HLP (average)												1.0418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.0518	76.4502	69.0518	71.3535	69.0518	71.3535	69.0518	69.0518	71.3535	69.0518	71.3535	69.0518	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	368.9363	375.8469	361.5069	348.8073	332.6121	318.3548	307.2620	308.4334	317.0921	330.5443	349.4255	362.2051	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	6.6400	11.2829	0.6300	0.7000	0.7700	22.8961	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	22.8961	46.6058	83.9687	137.9008	185.3657	197.6195	184.8690	147.3797	102.3172	56.9559	28.8093	18.6981	(83)
Total gains	391.8325	422.4527	445.4757	486.7081	517.9778	515.9743	492.1310	455.8131	419.4093	387.5002	378.2348	380.9033	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8575	46.9878	47.1163	47.7293	47.8457	48.3954	48.3954	48.4986	48.1822	47.8457	47.6107	47.3675	
alpha	4.1238	4.1325	4.1411	4.1820	4.1897	4.2264	4.2264	4.2332	4.2121	4.1897	4.1740	4.1578	
util living area	0.9685	0.9549	0.9275	0.8508	0.7138	0.5315	0.3934	0.4402	0.6692	0.8755	0.9487	0.9715	(86)
MIT	19.7337	19.9074	20.1838	20.5665	20.8384	20.9642	20.9920	20.9874	20.9078	20.5765	20.1153	19.7116	(87)
Th 2	20.0326	20.0351	20.0374	20.0486	20.0507	20.0605	20.0605	20.0623	20.0567	20.0507	20.0465	20.0420	(88)
util rest of house	0.9619	0.9455	0.9122	0.8206	0.6622	0.4609	0.3117	0.3542	0.5977	0.8434	0.9365	0.9655	(89)
MIT 2	18.5828	18.8015	19.1458	19.6110	19.9107	20.0375	20.0572	20.0566	19.9898	19.6347	19.0729	18.5618	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.1325	19.3297	19.6416	20.0674	20.3538	20.4801	20.5037	20.5012	20.4283	20.0845	19.5708	19.1110	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1325	19.3297	19.6416	20.0674	20.3538	20.4801	20.5037	20.5012	20.4283	20.0845	19.5708	19.1110	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9541	0.9372	0.9048	0.8212	0.6794	0.4931	0.3506	0.3950	0.6270	0.8447	0.9291	0.9581	(94)
Useful gains	373.8614	395.9373	403.0815	399.6896	351.9099	254.4026	172.5258	180.0470	262.9904	327.3217	351.4281	364.9593	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	682.5115	662.1352	601.3809	504.4770	389.9750	261.9726	173.9179	182.3277	283.1871	427.4116	564.7592	678.7342	(97)
Space heating kWh	229.6357	178.8850	147.5348	75.4470	28.3204	0.0000	0.0000	0.0000	0.0000	74.4669	153.5984	233.4485	(98a)
Space heating requirement - total per year (kWh/year)												1121.3366	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	229.6357	178.8850	147.5348	75.4470	28.3204	0.0000	0.0000	0.0000	0.0000	74.4669	153.5984	233.4485	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1121.3366	
Space heating per m2										(98c) / (4) =		25.8611	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	229.6357	178.8850	147.5348	75.4470	28.3204	0.0000	0.0000	0.0000	0.0000	74.4669	153.5984	233.4485	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	248.7927	193.8082	159.8426	81.7410	30.6830	0.0000	0.0000	0.0000	0.0000	80.6792	166.4121	252.9236	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.5645	84.2770	83.7037	82.5559	81.1066	79.8000	79.8000	79.8000	79.8000	82.5043	83.9118	84.6235	(217)
Fuel for water heating, kWh/month	216.9353	192.7071	206.7810	186.0717	184.7579	170.5061	169.2907	175.3325	176.4869	188.8265	195.5573	214.6537	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.3476	11.5102	10.3636	7.5928	5.8649	4.7917	5.3502	6.9544	9.0330	11.8518	13.3866	14.7464	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3196	-12.6515	-19.6021	-23.8221	-27.3050	-26.1047	-25.8068	-23.5584	-19.8837	-15.2375	-9.4737	-7.0906	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2617	-4.9168	-10.0734	-15.5779	-21.0367	-21.2830	-21.0140	-17.5742	-12.6116	-7.1556	-3.0599	-1.7757	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1214.8826 (211)
Space heating fuel - main system 2	0.0000 (213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2277.9066	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	115.7933	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3337.3864	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1214.8826	0.2100	255.1253	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2277.9066	0.2100	478.3604	(264)
Space and water heating			733.4857	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	115.7933	0.1443	16.7126	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	0.1330	-29.1103	
PV Unit electricity exported	-138.3404	0.1251	-17.3028	
Total			-46.4132	(269)
Total CO2, kg/year			715.7144	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.5100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1214.8826	1.1300	1372.8173	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2277.9066	1.1300	2574.0345	(278)
Space and water heating			3946.8518	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	115.7933	1.5338	177.6076	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	1.4915	-326.4228	
PV Unit electricity exported	-138.3404	0.4591	-63.5081	
Total			-389.9309	(283)
Total Primary energy kWh/year			3864.6293	(286)
Target Primary Energy Rate (TPER)			89.1300	(287)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.45	**TER**	16.51
Environmental	99 A	**% DER < TER**			91.22
CO_2 Emissions (t/year)	0.04	**DFEE**	23.50	**TFEE**	34.79
Compliance Check	See BREL	**% DFEE < TFEE**			32.44
% DPER < TPER	71.45	**DPER**	25.45	**TPER**	89.13

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			7762.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							179.0141	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	6.6400	11.2829	0.6800	0.7000	0.7700	24.7133	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	24.7133	50.3046	90.6329	148.8453	200.0773	213.3036	199.5411	159.0765	110.4376	61.4762	31.0957	20.1821	(83)
Total gains	442.6242	466.4191	495.2032	531.7508	562.1506	556.4630	531.5734	493.5888	455.9096	426.3655	419.5032	429.0257	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086

util living area													
	0.9281	0.9041	0.8462	0.7287	0.5633	0.4001	0.2892	0.3253	0.5196	0.7636	0.8914	0.9367	(86)
MIT	20.3986	20.5092	20.6940	20.8758	20.9698	20.9955	20.9993	20.9988	20.9844	20.8674	20.6104	20.3554	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house													
	0.9163	0.8891	0.8239	0.6955	0.5218	0.3539	0.2399	0.2724	0.4663	0.7258	0.8723	0.9260	(89)
MIT 2	19.5696	19.7035	19.9227	20.1265	20.2221	20.2445	20.2471	20.2468	20.2364	20.1226	19.8289	19.5171	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.9656	20.0883	20.2911	20.4844	20.5792	20.6032	20.6064	20.6060	20.5937	20.4783	20.2022	19.9175	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9656	20.0883	20.2911	20.4844	20.5792	20.6032	20.6064	20.6060	20.5937	20.4783	20.2022	19.9175	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9114	0.8856	0.8252	0.7063	0.5403	0.3758	0.2635	0.2977	0.4911	0.7379	0.8710	0.9207	(94)
Useful gains	403.4068	413.0739	408.6562	375.5575	303.7453	209.1228	140.0513	146.9346	223.8901	314.6194	365.3890	395.0235	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	548.0670	531.3708	482.4881	405.2860	310.6444	210.0261	140.1652	147.1480	227.1836	345.5979	458.3863	549.8841	(97)
Space heating kWh													
	107.6272	79.4956	54.9310	21.4045	5.1329	0.0000	0.0000	0.0000	0.0000	23.0480	66.9580	115.2163	(98a)
Space heating requirement - total per year (kWh/year)												473.8134	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	107.6272	79.4956	54.9310	21.4045	5.1329	0.0000	0.0000	0.0000	0.0000	23.0480	66.9580	115.2163	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												473.8134	
Space heating per m2											(98c) / (4) =	10.9274	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	107.6272	79.4956	54.9310	21.4045	5.1329	0.0000	0.0000	0.0000	0.0000	23.0480	66.9580	115.2163	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	161.4408	119.2433	82.3964	32.1068	7.6993	0.0000	0.0000	0.0000	0.0000	34.5720	100.4370	172.8244	
Space heating requirement													
	161.4408	119.2433	82.3964	32.1068	7.6993	0.0000	0.0000	0.0000	0.0000	34.5720	100.4370	172.8244	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												710.7201	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												7.1072	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3173.9122	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	710.7201	4.4400	31.5560	(340a)
Space heating total			31.5560	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	16.4900	2.5157	(349)
Energy for lighting	124.6784	16.4900	20.5595	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	16.4900	-67.0227	
PV Unit electricity exported	-551.7766	5.5900	-30.8443	
Total			-97.8670	(352)
Total energy cost			194.4618	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7923 (357)
SAP value		87.1571
SAP rating (Section 12)		87 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1064.5863	0.1571	29.7723	(367)
Electrical energy for heat distribution (space & water)	7.1072	0.0000	5.7343	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			158.6500	(373)
Space and water heating			158.6500	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			57.7170	(383)
CO2 emissions per m2			1.3300	(384)
EI value			99.1247	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	43.3600 (1b)	x 2.4500 (2b)	= 106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)

Adj infilt rate

	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	6.6400	13.7758	0.6800	0.7000	0.7700	30.1734	(81)

Solar gains	30.1734	54.9136	97.9201	162.5490	209.7590	239.3552	219.9338	179.3720	125.9936	70.9619	37.4706	24.7347	(83)
Total gains	448.0843	471.0281	502.4903	545.4545	571.8323	582.5147	551.9661	513.8843	471.4655	435.8511	425.8781	433.5783	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area													
	0.9205	0.8953	0.8254	0.6982	0.5276	0.3473	0.2470	0.2788	0.4832	0.7278	0.8763	0.9302	(86)
MIT	20.4407	20.5456	20.7398	20.9012	20.9787	20.9979	20.9997	20.9995	20.9892	20.8990	20.6564	20.3968	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house													
	0.9076	0.8791	0.8007	0.6633	0.4856	0.3027	0.1994	0.2278	0.4304	0.6868	0.8550	0.9185	(89)
MIT 2	19.6211	19.7474	19.9755	20.1532	20.2301	20.2462	20.2473	20.2472	20.2401	20.1554	19.8831	19.5680	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0126	20.1287	20.3406	20.5104	20.5877	20.6052	20.6067	20.6065	20.5979	20.5105	20.2525	19.9639	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0126	20.1287	20.3406	20.5104	20.5877	20.6052	20.6067	20.6065	20.5979	20.5105	20.2525	19.9639	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9031	0.8763	0.8039	0.6758	0.5048	0.3239	0.2222	0.2522	0.4552	0.7016	0.8551	0.9135	(94)
Useful gains	404.6572	412.7473	403.9726	368.6244	288.6357	188.6960	122.6385	129.5881	214.6021	305.7961	364.1713	396.0944	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	539.2160	522.2860	466.7262	392.2024	293.4461	189.1039	122.6825	129.6735	216.8365	329.2317	446.1516	541.0112	(97)
Space heating kWh													
	100.1118	73.6101	46.6887	16.9762	3.5789	0.0000	0.0000	0.0000	0.0000	17.4360	59.0258	107.8181	(98a)
Space heating requirement - total per year (kWh/year)												425.2455	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	100.1118	73.6101	46.6887	16.9762	3.5789	0.0000	0.0000	0.0000	0.0000	17.4360	59.0258	107.8181	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												425.2455	
Space heating per m2											(98c) / (4) =	9.8073	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	100.1118	73.6101	46.6887	16.9762	3.5789	0.0000	0.0000	0.0000	0.0000	17.4360	59.0258	107.8181	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	150.1677	110.4151	70.0330	25.4643	5.3684	0.0000	0.0000	0.0000	0.0000	26.1541	88.5387	161.7271	
Space heating requirement													
	150.1677	110.4151	70.0330	25.4643	5.3684	0.0000	0.0000	0.0000	0.0000	26.1541	88.5387	161.7271	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5669	-24.0727	-38.8745	-48.0493	-52.9789	-51.6524	-50.3986	-46.8694	-39.7890	-30.3128	-18.7591	-13.8902	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4316	-15.8925	-38.3705	-69.5238	-96.2615	-109.4663	-104.0915	-84.3722	-54.5598	-26.6835	-10.2713	-5.6085	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	637.8683	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	6.3787	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)		
mechanical ventilation fans (SFP = 0.1177)	15.2561	(330a)
Total electricity for the above, kWh/year	15.2561	(331)
Electricity for lighting (calculated in Appendix L)	124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3004.5343	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	637.8683	6.5500	41.7804	(340a)
Space heating total			41.7804	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	28.4300	4.3373	(349)
Energy for lighting	124.6784	28.4300	35.4461	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	28.4300	-122.8784	
PV Unit electricity exported	-622.5330	5.8100	-36.1692	
Total			-159.0476	(352)
Total energy cost			241.4530	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1045.1591	0.1576	26.7991	(367)
Electrical energy for heat distribution (space & water)	6.3787	0.0000	5.6228	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			155.5653	(373)
Space and water heating			155.5653	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	0.1330	-57.4796	
PV Unit electricity exported	-622.5330	0.1218	-75.7970	
Total			-133.2765	(380)
Total CO2, kg/year			42.4000	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1045.1591	1.5832	269.3077	(467)
Electrical energy for heat distribution (space & water)	6.3787	0.0000	59.9888	(472)
Overall CO2 factor for heat network			0.4235	(486)
Total CO2 associated with community systems			1659.6896	(473)
Space and water heating			1659.6896	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	1.4914	-644.6094	
PV Unit electricity exported	-622.5330	0.4467	-278.0656	
Total			-922.6749	(480)
Total Primary energy kWh/year			951.3301	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Southeast

Current energy efficiency rating:	B 87
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: B 87
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£40	£40	£0
Community scheme	£361	£361	£0
Space heating	£150	£150	£0
Water heating	£215	£215	£0
Lighting	£35	£35	£0
Generated (PV)	-£159	-£159	£0
Total cost of fuels	£242	£242	£0
Total cost of uses	£241	£241	£0
Delivered energy	69 kWh/m²	69 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.0 tonnes	0.0 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	22 kWh/m²	22 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)

Total net area of external elements Aum(A, m2)	76.5400				(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	15.1610			(33)
Main dwelling					
Party Wall 1	31.3600	0.0000	0.0000	70.0000	2195.2000 (32)
Party Floor 1	43.3600			70.0000	3035.2000 (32d)
Internal TF Wall	68.4500			9.0000	616.0500 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	6.6400	11.2829	0.6800	0.7000	0.7700	24.7133	(81)

Solar gains	24.7133	50.3046	90.6329	148.8453	200.0773	213.3036	199.5411	159.0765	110.4376	61.4762	31.0957	20.1821	(83)
Total gains	442.6242	466.4191	495.2032	531.7508	562.1506	556.4630	531.5734	493.5888	455.9096	426.3655	419.5032	429.0257	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area													
	0.9281	0.9041	0.8462	0.7287	0.5633	0.4001	0.2892	0.3253	0.5196	0.7636	0.8914	0.9367	(86)
MIT	20.3986	20.5092	20.6940	20.8758	20.9698	20.9955	20.9993	20.9988	20.9844	20.8674	20.6104	20.3554	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house													
	0.9163	0.8891	0.8239	0.6955	0.5218	0.3539	0.2399	0.2724	0.4663	0.7258	0.8723	0.9260	(89)
MIT 2	19.5696	19.7035	19.9227	20.1265	20.2221	20.2445	20.2471	20.2468	20.2364	20.1226	19.8289	19.5171	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.9656	20.0883	20.2911	20.4844	20.5792	20.6032	20.6064	20.6060	20.5937	20.4783	20.2022	19.9175	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9656	20.0883	20.2911	20.4844	20.5792	20.6032	20.6064	20.6060	20.5937	20.4783	20.2022	19.9175	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9114	0.8856	0.8252	0.7063	0.5403	0.3758	0.2635	0.2977	0.4911	0.7379	0.8710	0.9207	(94)
Useful gains	403.4068	413.0739	408.6562	375.5575	303.7453	209.1228	140.0513	146.9346	223.8901	314.6194	365.3890	395.0235	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	548.0670	531.3708	482.4881	405.2860	310.6444	210.0261	140.1652	147.1480	227.1836	345.5979	458.3863	549.8841	(97)
Space heating kWh													
	107.6272	79.4956	54.9310	21.4045	5.1329	0.0000	0.0000	0.0000	0.0000	23.0480	66.9580	115.2163	(98a)
Space heating requirement - total per year (kWh/year)												473.8134	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	107.6272	79.4956	54.9310	21.4045	5.1329	0.0000	0.0000	0.0000	0.0000	23.0480	66.9580	115.2163	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												473.8134	
Space heating per m2											(98c) / (4) =	10.9274	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	107.6272	79.4956	54.9310	21.4045	5.1329	0.0000	0.0000	0.0000	0.0000	23.0480	66.9580	115.2163	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	161.4408	119.2433	82.3964	32.1068	7.6993	0.0000	0.0000	0.0000	0.0000	34.5720	100.4370	172.8244	
Space heating requirement													
	161.4408	119.2433	82.3964	32.1068	7.6993	0.0000	0.0000	0.0000	0.0000	34.5720	100.4370	172.8244	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												710.7201	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												7.1072	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)

Appendix Q - special features

Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3173.9122	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	710.7201	4.4400	31.5560	(340a)
Space heating total			31.5560	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	16.4900	2.5157	(349)
Energy for lighting	124.6784	16.4900	20.5595	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	16.4900	-67.0227	
PV Unit electricity exported	-551.7766	5.5900	-30.8443	
Total			-97.8670	(352)
Total energy cost			194.4618	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7923	(357)
SAP value		87.1571	
SAP rating (Section 12)		87	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1064.5863	0.1571	29.7723	(367)
Electrical energy for heat distribution (space & water)	7.1072	0.0000	5.7343	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			158.6500	(373)
Space and water heating			158.6500	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			57.7170	(383)
CO2 emissions per m2			1.3300	(384)
EI value			99.1247	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

Measured/design AP50												3.0000	(17)
Infiltration rate												0.1500	(18)
Number of sides sheltered												3	(19)
Shelter factor								(20) = 1 - [0.075 x (19)] =				0.7750	(20)
Infiltration rate adjusted to include shelter factor								(21) = (18) x (20) =				0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	6.6400	13.7758	0.6800	0.7000	0.7700	30.1734	(81)

Solar gains	30.1734	54.9136	97.9201	162.5490	209.7590	239.3552	219.9338	179.3720	125.9936	70.9619	37.4706	24.7347	(83)
Total gains	448.0843	471.0281	502.4903	545.4545	571.8323	582.5147	551.9661	513.8843	471.4655	435.8511	425.8781	433.5783	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area													
	0.9205	0.8953	0.8254	0.6982	0.5276	0.3473	0.2470	0.2788	0.4832	0.7278	0.8763	0.9302	(86)
MIT	20.4407	20.5456	20.7398	20.9012	20.9787	20.9979	20.9997	20.9995	20.9892	20.8990	20.6564	20.3968	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house													
	0.9076	0.8791	0.8007	0.6633	0.4856	0.3027	0.1994	0.2278	0.4304	0.6868	0.8550	0.9185	(89)
MIT 2	19.6211	19.7474	19.9755	20.1532	20.2301	20.2462	20.2473	20.2472	20.2401	20.1554	19.8831	19.5680	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.0126	20.1287	20.3406	20.5104	20.5877	20.6052	20.6067	20.6065	20.5979	20.5105	20.2525	19.9639	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0126	20.1287	20.3406	20.5104	20.5877	20.6052	20.6067	20.6065	20.5979	20.5105	20.2525	19.9639	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9031	0.8763	0.8039	0.6758	0.5048	0.3239	0.2222	0.2522	0.4552	0.7016	0.8551	0.9135	(94)
Useful gains	404.6572	412.7473	403.9726	368.6244	288.6357	188.6960	122.6385	129.5881	214.6021	305.7961	364.1713	396.0944	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	539.2160	522.2860	466.7262	392.2024	293.4461	189.1039	122.6825	129.6735	216.8365	329.2317	446.1516	541.0112	(97)
Space heating kWh													
	100.1118	73.6101	46.6887	16.9762	3.5789	0.0000	0.0000	0.0000	0.0000	17.4360	59.0258	107.8181	(98a)
Space heating requirement - total per year (kWh/year)												425.2455	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	100.1118	73.6101	46.6887	16.9762	3.5789	0.0000	0.0000	0.0000	0.0000	17.4360	59.0258	107.8181	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												425.2455	
Space heating per m2										(98c) / (4) =		9.8073	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement		
100.1118 73.6101 46.6887 16.9762 3.5789 0.0000 0.0000 0.0000 0.0000 17.4360 59.0258 107.8181		(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50		
307a 150.1677 110.4151 70.0330 25.4643 5.3684 0.0000 0.0000 0.0000 0.0000 26.1541 88.5387 161.7271		
Space heating requirement		
150.1677 110.4151 70.0330 25.4643 5.3684 0.0000 0.0000 0.0000 0.0000 26.1541 88.5387 161.7271		(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000		(309)

Water heating

Annual water heating requirement		
214.6882 190.1982 202.6545 179.3121 174.6530 158.2600 156.7058 162.3469 163.5105 181.2971 191.5583 212.4677		(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50		
310a 322.0323 285.2973 303.9818 268.9682 261.9796 237.3900 235.0587 243.5203 245.2657 271.9456 287.3375 318.7016		
Water heating fuel		
322.0323 285.2973 303.9818 268.9682 261.9796 237.3900 235.0587 243.5203 245.2657 271.9456 287.3375 318.7016		(310)
Cooling System Energy Efficiency Ratio	0.0000	(314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000		(315)
Pumps and Fa 1.2957 1.1703 1.2957 1.2539 1.2957 1.2539 1.2957 1.2957 1.2539 1.2957 1.2539 1.2957		(331)

Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5669	-24.0727	-38.8745	-48.0493	-52.9789	-51.6524	-50.3986	-46.8694	-39.7890	-30.3128	-18.7591	-13.8902	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4316	-15.8925	-38.3705	-69.5238	-96.2615	-109.4663	-104.0915	-84.3722	-54.5598	-26.6835	-10.2713	-5.6085	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	637.8683	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	6.3787	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)		
mechanical ventilation fans (SFP = 0.1177)	15.2561	(330a)
Total electricity for the above, kWh/year	15.2561	(331)
Electricity for lighting (calculated in Appendix L)	124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3004.5343	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	637.8683	6.5500	41.7804	(340a)
Space heating total			41.7804	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	28.4300	4.3373	(349)
Energy for lighting	124.6784	28.4300	35.4461	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	28.4300	-122.8784	
PV Unit electricity exported	-622.5330	5.8100	-36.1692	
Total			-159.0476	(352)
Total energy cost			241.4530	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1045.1591	0.1576	26.7991	(367)
Electrical energy for heat distribution (space & water)	6.3787	0.0000	5.6228	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			155.5653	(373)
Space and water heating			155.5653	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	0.1330	-57.4796	
PV Unit electricity exported	-622.5330	0.1218	-75.7970	
Total			-133.2765	(380)
Total CO2, kg/year			42.4000	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1045.1591	1.5832	269.3077	(467)
Electrical energy for heat distribution (space & water)	6.3787	0.0000	59.9888	(472)
Overall CO2 factor for heat network			0.4235	(486)
Total CO2 associated with community systems			1659.6896	(473)
Space and water heating			1659.6896	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	1.4914	-644.6094	
PV Unit electricity exported	-622.5330	0.4467	-278.0656	
Total			-922.6749	(480)
Total Primary energy kWh/year			951.3301	(483)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.45	**TER**	16.51
Environmental	99 A	**% DER < TER**			91.22
CO_2 Emissions (t/year)	0.04	**DFEE**	23.50	**TFEE**	34.79
Compliance Check	See BREL	**% DFEE < TFEE**			32.44
% DPER < TPER	71.45	**DPER**	25.45	**TPER**	89.13

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600 (1b)	x	2.4500 (2b)	=	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			7762.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							179.0141	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	

Distribution loss (46)m = 0.15 x (45)m

23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
									Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)

12Total per year (kWh/year) 2188 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

71.0601	78.6737	71.0601	73.4288	71.0601	73.4288	71.0601	71.0601	73.4288	71.0601	73.4288	71.0601	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)

Water heating gains (Table 5)

130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)

Total internal gains

377.2801	384.4058	369.8506	357.2179	340.9558	329.7655	318.6057	319.7771	328.5028	338.8880	357.8362	370.5488	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.6400	11.2829	0.6800	0.7000	0.7700	24.7133	(75)

Solar gains 24.7133	50.3046	90.6329	148.8453	200.0773	213.3036	199.5411	159.0765	110.4376	61.4762	31.0957	20.1821	(83)
Total gains 401.9933	434.7104	460.4835	506.0632	541.0331	543.0690	518.1469	478.8536	438.9404	400.3642	388.9319	390.7309	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292

alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.9486	0.9235	0.8740	0.7538	0.5827	0.4097	0.2967	0.3352	0.5380	0.7939	0.9141	0.9546	(86)
MIT	20.2964	20.4390	20.6365	20.8548	20.9650	20.9950	20.9992	20.9986	20.9818	20.8405	20.5466	20.2554	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.9395	0.9107	0.8539	0.7212	0.5404	0.3625	0.2461	0.2808	0.4834	0.7576	0.8978	0.9464	(89)
MIT 2	19.4453	19.6199	19.8570	20.1049	20.2178	20.2442	20.2471	20.2467	20.2345	20.0953	19.7544	19.3948	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.8518	20.0111	20.2293	20.4631	20.5747	20.6028	20.6063	20.6058	20.5914	20.4512	20.1328	19.8058	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8518	20.0111	20.2293	20.4631	20.5747	20.6028	20.6063	20.6058	20.5914	20.4512	20.1328	19.8058	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9340	0.9062	0.8534	0.7308	0.5590	0.3849	0.2703	0.3068	0.5086	0.7679	0.8950	0.9409	(94)
Useful gains	375.4484	393.9424	392.9839	369.8504	302.4620	209.0037	140.0345	146.8975	223.2529	307.4477	348.0931	367.6255	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	544.0874	528.6693	480.3265	404.5395	310.4847	210.0114	140.1630	147.1433	227.1047	344.6484	455.9580	545.9777	(97)
Space heating kWh	125.4674	90.5365	64.9829	24.9762	5.9689	0.0000	0.0000	0.0000	0.0000	27.6773	77.6627	132.6941	(98a)
Space heating requirement - total per year (kWh/year)												549.9660	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	125.4674	90.5365	64.9829	24.9762	5.9689	0.0000	0.0000	0.0000	0.0000	27.6773	77.6627	132.6941	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												549.9660	
Space heating per m2											(98c) / (4) =	12.6837	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	125.4674	90.5365	64.9829	24.9762	5.9689	0.0000	0.0000	0.0000	0.0000	27.6773	77.6627	132.6941	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	188.2011	135.8047	97.4744	37.4643	8.9533	0.0000	0.0000	0.0000	0.0000	41.5159	116.4941	199.0411	
Space heating requirement	188.2011	135.8047	97.4744	37.4643	8.9533	0.0000	0.0000	0.0000	0.0000	41.5159	116.4941	199.0411	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												824.9490	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												8.2495	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3288.1411	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1095.0473	0.1570	34.5437	(367)
Electrical energy for heat distribution (space & water)	8.2495	0.0000	5.9133	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			163.6003	(373)
Space and water heating			163.6003	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			62.6673	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.4500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1095.0473	1.5813	347.8690	(467)
Electrical energy for heat distribution (space & water)	8.2495	0.0000	62.9348	(472)
Overall CO2 factor for heat network			0.4240	(486)
Total CO2 associated with community systems			1741.1968	(473)
Space and water heating			1741.1968	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	1.4901	-605.6307	
PV Unit electricity exported	-551.7766	0.4464	-246.3315	
Total			-851.9622	(480)
Total Primary energy kWh/year			1103.5500	(483)
Dwelling Primary energy Rate (DPER)			25.4500	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.6400	1.1450	7.6031			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.1800	1.7910			(29a)

Wall to Unheated Com	16.5900	1.8400	14.7500	0.1800	2.6550	(29a)
500mm mineral wool	43.3600		43.3600	0.1100	4.7696	(30)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.6587	(33)
Main dwelling						
Party Wall 1			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.0141 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	4.7800	0.0500	0.2390
E3 Sill	3.8800	0.0500	0.1940
E4 Jamb	17.9200	0.0500	0.8960
E7 Party floor between dwellings (in blocks of flats)	17.6700	0.0700	1.2369
E16 Corner (normal)	5.0000	0.0900	0.4500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.5900	0.0000	0.0000
E14 Flat roof	17.6700	0.0800	1.4136
P4 Party wall - Roof (insulation at ceiling level)	12.5900	0.1200	1.5108
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5403 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 25.1990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	46.0145	45.8869	45.7618	45.1741	45.0641	44.5523	44.5523	44.4575	44.7494	45.0641	45.2866	45.5191	(39)
Average = Sum(39)m / 12 =												45.1735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0612	1.0583	1.0554	1.0418	1.0393	1.0275	1.0275	1.0253	1.0320	1.0393	1.0444	1.0498	(40)
HLP (average)												1.0418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.0518	76.4502	69.0518	71.3535	69.0518	71.3535	69.0518	69.0518	71.3535	69.0518	71.3535	69.0518	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	368.9363	375.8469	361.5069	348.8073	332.6121	318.3548	307.2620	308.4334	317.0921	330.5443	349.4255	362.2051	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.6400	11.2829	0.6300	0.7000	0.7700	22.8961	(75)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	22.8961	46.6058	83.9687	137.9008	185.3657	197.6195	184.8690	147.3797	102.3172	56.9559	28.8093	18.6981	(83)
Total gains	391.8325	422.4527	445.4757	486.7081	517.9778	515.9743	492.1310	455.8131	419.4093	387.5002	378.2348	380.9033	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8575	46.9878	47.1163	47.7293	47.8457	48.3954	48.3954	48.4986	48.1822	47.8457	47.6107	47.3675	
alpha	4.1238	4.1325	4.1411	4.1820	4.1897	4.2264	4.2264	4.2332	4.2121	4.1897	4.1740	4.1578	
util living area	0.9685	0.9549	0.9275	0.8508	0.7138	0.5315	0.3934	0.4402	0.6692	0.8755	0.9487	0.9715	(86)
MIT	19.7337	19.9074	20.1838	20.5665	20.8384	20.9642	20.9920	20.9874	20.9078	20.5765	20.1153	19.7116	(87)
Th 2	20.0326	20.0351	20.0374	20.0486	20.0507	20.0605	20.0605	20.0623	20.0567	20.0507	20.0465	20.0420	(88)
util rest of house	0.9619	0.9455	0.9122	0.8206	0.6622	0.4609	0.3117	0.3542	0.5977	0.8434	0.9365	0.9655	(89)
MIT 2	18.5828	18.8015	19.1458	19.6110	19.9107	20.0375	20.0572	20.0566	19.9898	19.6347	19.0729	18.5618	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.1325	19.3297	19.6416	20.0674	20.3538	20.4801	20.5037	20.5012	20.4283	20.0845	19.5708	19.1110	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1325	19.3297	19.6416	20.0674	20.3538	20.4801	20.5037	20.5012	20.4283	20.0845	19.5708	19.1110	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9541	0.9372	0.9048	0.8212	0.6794	0.4931	0.3506	0.3950	0.6270	0.8447	0.9291	0.9581	(94)
Useful gains	373.8614	395.9373	403.0815	399.6896	351.9099	254.4026	172.5258	180.0470	262.9904	327.3217	351.4281	364.9593	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	682.5115	662.1352	601.3809	504.4770	389.9750	261.9726	173.9179	182.3277	283.1871	427.4116	564.7592	678.7342	(97)
Space heating kWh	229.6357	178.8850	147.5348	75.4470	28.3204	0.0000	0.0000	0.0000	0.0000	74.4669	153.5984	233.4485	(98a)
Space heating requirement - total per year (kWh/year)												1121.3366	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	229.6357	178.8850	147.5348	75.4470	28.3204	0.0000	0.0000	0.0000	0.0000	74.4669	153.5984	233.4485	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1121.3366	
Space heating per m2										(98c) / (4) =		25.8611	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 92.3000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	229.6357	178.8850	147.5348	75.4470	28.3204	0.0000	0.0000	0.0000	0.0000	74.4669	153.5984	233.4485	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	248.7927	193.8082	159.8426	81.7410	30.6830	0.0000	0.0000	0.0000	0.0000	80.6792	166.4121	252.9236	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.5645	84.2770	83.7037	82.5559	81.1066	79.8000	79.8000	79.8000	79.8000	82.5043	83.9118	84.6235	(217)
Fuel for water heating, kWh/month	216.9353	192.7071	206.7810	186.0717	184.7579	170.5061	169.2907	175.3325	176.4869	188.8265	195.5573	214.6537	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.3476	11.5102	10.3636	7.5928	5.8649	4.7917	5.3502	6.9544	9.0330	11.8518	13.3866	14.7464	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3196	-12.6515	-19.6021	-23.8221	-27.3050	-26.1047	-25.8068	-23.5584	-19.8837	-15.2375	-9.4737	-7.0906	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2617	-4.9168	-10.0734	-15.5779	-21.0367	-21.2830	-21.0140	-17.5742	-12.6116	-7.1556	-3.0599	-1.7757	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1214.8826	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2277.9066	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	115.7933	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3337.3864	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1214.8826	0.2100	255.1253	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2277.9066	0.2100	478.3604	(264)
Space and water heating			733.4857	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	115.7933	0.1443	16.7126	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	0.1330	-29.1103	
PV Unit electricity exported	-138.3404	0.1251	-17.3028	
Total			-46.4132	(269)
Total CO2, kg/year			715.7144	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.5100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1214.8826	1.1300	1372.8173	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2277.9066	1.1300	2574.0345	(278)
Space and water heating			3946.8518	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	115.7933	1.5338	177.6076	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	1.4915	-326.4228	
PV Unit electricity exported	-138.3404	0.4591	-63.5081	
Total			-389.9309	(283)
Total Primary energy kWh/year			3864.6293	(286)
Target Primary Energy Rate (TPER)			89.1300	(287)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.45	**TER**	16.51
Environmental	99 A	**% DER < TER**			91.22
CO_2 Emissions (t/year)	0.04	**DFEE**	23.50	**TFEE**	34.79
Compliance Check	See BREL	**% DFEE < TFEE**			32.44
% DPER < TPER	71.45	**DPER**	25.45	**TPER**	89.13

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2622	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	36.9438	36.8677	36.7932	36.4431	36.3776	36.0727	36.0727	36.0162	36.1901	36.3776	36.5101	36.6486	(39)
Average = Sum(39)m / 12 =												36.4428	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8520	0.8503	0.8486	0.8405	0.8390	0.8319	0.8319	0.8306	0.8346	0.8390	0.8420	0.8452	(40)
HLP (average)												0.8405	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)											Total = Sum(45)m =	781.1490	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =		663.9767	(64)
12Total per year (kWh/year)											664	(64)

Electric shower(s)

39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		449.4572	(64a)

Heat gains from water heating, kWh/month

27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0601	78.6737	71.0601	73.4288	71.0601	73.4288	71.0601	71.0601	73.4288	71.0601	73.4288	71.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.0895	291.1341	278.7010	271.1858	257.9340	249.9230	240.9368	240.6593	247.6349	254.4733	268.5369	277.0546	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.6400	11.2829	0.6800	0.7000	0.7700	24.7133	(75)

Solar gains	24.7133	50.3046	90.6329	148.8453	200.0773	213.3036	199.5411	159.0765	110.4376	61.4762	31.0957	20.1821	(83)
Total gains	307.8028	341.4388	369.3339	420.0311	458.0112	463.2265	440.4779	399.7358	358.0725	315.9495	299.6326	297.2367	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.3623	58.4827	58.6012	59.1642	59.2707	59.7717	59.7717	59.8654	59.5777	59.2707	59.0556	58.8323	
alpha	4.8908	4.8988	4.9067	4.9443	4.9514	4.9848	4.9848	4.9910	4.9718	4.9514	4.9370	4.9222	
util living area	0.9830	0.9706	0.9429	0.8513	0.6871	0.4905	0.3589	0.4115	0.6576	0.8973	0.9682	0.9855	(86)
MIT	19.9224	20.1009	20.3644	20.7134	20.9188	20.9874	20.9978	20.9959	20.9509	20.6739	20.2530	19.8917	(87)
Th 2	20.2085	20.2100	20.2115	20.2184	20.2197	20.2257	20.2257	20.2269	20.2234	20.2197	20.2171	20.2143	(88)
util rest of house	0.9794	0.9645	0.9311	0.8241	0.6416	0.4340	0.2964	0.3437	0.5959	0.8715	0.9606	0.9823	(89)

MIT 2	19.2273	19.4037	19.6604	19.9904	20.1645	20.2193	20.2250	20.2253	20.1950	19.9631	19.5604	19.2017 (90)
Living area fraction										fLA = Living area / (4) =		0.4776 (91)
MIT	19.5593	19.7367	19.9967	20.3357	20.5247	20.5862	20.5941	20.5934	20.5561	20.3026	19.8912	19.5313 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5593	19.7367	19.9967	20.3357	20.5247	20.5862	20.5941	20.5934	20.5561	20.3026	19.8912	19.5313 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9758	0.9602	0.9274	0.8285	0.6599	0.4606	0.3263	0.3760	0.6231	0.8745	0.9568	0.9790	(94)
Useful gains	300.3474	327.8424	342.5285	347.9941	302.2304	213.3426	143.7091	150.2968	223.1029	276.2947	286.6985	290.9980	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	563.7352	546.9959	496.5854	416.7532	321.0225	215.9367	144.0788	151.0288	233.6464	352.9572	467.0094	561.8698	(97)
Space heating kWh	195.9606	147.2712	114.6183	49.5066	13.9813	0.0000	0.0000	0.0000	0.0000	57.0369	129.8238	201.5286	(98a)
Space heating requirement - total per year (kWh/year)												909.7273	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	195.9606	147.2712	114.6183	49.5066	13.9813	0.0000	0.0000	0.0000	0.0000	57.0369	129.8238	201.5286	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												909.7273	
Space heating per m2											(98c) / (4) =	20.9808	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	339.0831	266.9377	273.7231	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9529	0.9769	0.9629	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	323.1240	260.7818	263.5755	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	512.7594	487.7300	441.5058	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	136.5375	168.8494	132.3801	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	34.1344	42.2124	33.0950	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												109.4418	(107)
Energy for space heating												20.9808	(99)
Energy for space cooling												2.5240	(108)
Total												23.5048	(109)
Fabric Energy Efficiency (DFEE)												23.5	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4383 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.6400	1.1450	7.6031			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.1800	1.7910			(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.1800	2.6550			(29a)
500mm mineral wool	43.3600		43.3600	0.1100	4.7696			(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.6587			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.0141 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	4.7800	0.0500	0.2390
E3 Sill	3.8800	0.0500	0.1940
E4 Jamb	17.9200	0.0500	0.8960
E7 Party floor between dwellings (in blocks of flats)	17.6700	0.0700	1.2369
E16 Corner (normal)	5.0000	0.0900	0.4500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.5900	0.0000	0.0000
E14 Flat roof	17.6700	0.0800	1.4136
P4 Party wall - Roof (insulation at ceiling level)	12.5900	0.1200	1.5108
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5403 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.1990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	46.0145	45.8869	45.7618	45.1741	45.0641	44.5523	44.5523	44.4575	44.7494	45.0641	45.2866	45.5191	(39)
Average = Sum(39)m / 12 =												45.1735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0612	1.0583	1.0554	1.0418	1.0393	1.0275	1.0275	1.0253	1.0320	1.0393	1.0444	1.0498	(40)
HLP (average)												1.0418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)													
	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							449.4572	(64a)
Heat gains from water heating, kWh/month													
	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	69.0518	76.4502	69.0518	71.3535	69.0518	71.3535	69.0518	69.0518	71.3535	69.0518	71.3535	69.0518	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains													
	281.0812	288.9106	276.6927	269.1105	255.9256	247.8477	238.9285	238.6510	245.5596	252.4649	266.4616	275.0462	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.6400	11.2829	0.6300	0.7000	0.7700	22.8961	(75)

Solar gains	22.8961	46.6058	83.9687	137.9008	185.3657	197.6195	184.8690	147.3797	102.3172	56.9559	28.8093	18.6981	(83)
Total gains	303.9773	335.5164	360.6614	407.0113	441.2914	445.4672	423.7974	386.0307	347.8768	309.4209	295.2709	293.7444	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8575	46.9878	47.1163	47.7293	47.8457	48.3954	48.3954	48.4986	48.1822	47.8457	47.6107	47.3675	
alpha	4.1238	4.1325	4.1411	4.1820	4.1897	4.2264	4.2264	4.2332	4.2121	4.1897	4.1740	4.1578	
util living area													
	0.9867	0.9787	0.9618	0.9050	0.7859	0.6014	0.4528	0.5122	0.7571	0.9325	0.9770	0.9884	(86)
MIT	19.4747	19.6629	19.9676	20.4169	20.7635	20.9434	20.9865	20.9778	20.8512	20.4105	19.8853	19.4513	(87)
Th 2	20.0326	20.0351	20.0374	20.0486	20.0507	20.0605	20.0605	20.0623	20.0567	20.0507	20.0465	20.0420	(88)
util rest of house													
	0.9836	0.9738	0.9526	0.8822	0.7382	0.5260	0.3605	0.4154	0.6885	0.9114	0.9708	0.9857	(89)
MIT 2	18.6492	18.8368	19.1378	19.5758	19.8853	20.0311	20.0560	20.0542	19.9680	19.5798	19.0670	18.6331	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.0434	19.2314	19.5341	19.9775	20.3047	20.4669	20.5004	20.4953	20.3899	19.9765	19.4578	19.0239	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0434	19.2314	19.5341	19.9775	20.3047	20.4669	20.5004	20.4953	20.3899	19.9765	19.4578	19.0239	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9795	0.9687	0.9468	0.8803	0.7519	0.5596	0.4044	0.4611	0.7144	0.9095	0.9660	0.9820	(94)
Useful gains	297.7529	324.9991	341.4617	358.2892	331.7930	249.2884	171.3808	177.9931	248.5346	281.4086	285.2337	288.4476	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	678.4131	657.6232	596.4650	500.4169	387.7644	261.3815	173.7718	182.0675	281.4677	422.5458	559.6439	674.7706	(97)
Space heating kWh													
	283.2112	223.5234	189.7224	102.3319	41.6427	0.0000	0.0000	0.0000	0.0000	105.0060	197.5753	287.4243	(98a)
Space heating requirement - total per year (kWh/year)												1430.4373	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	283.2112	223.5234	189.7224	102.3319	41.6427	0.0000	0.0000	0.0000	0.0000	105.0060	197.5753	287.4243	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1430.4373	
Space heating per m2											(98c) / (4) =	32.9898	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	418.7912	329.6867	337.8767	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8692	0.9211	0.8907	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	363.9929	303.6693	300.9458	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	494.2516	470.3909	427.5874	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	93.7863	124.0408	94.2214	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	23.4466	31.0102	23.5554	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												78.0121	(107)
Energy for space heating												32.9898	(99)
Energy for space cooling												1.7992	(108)
Total												34.7890	(109)
Fabric Energy Efficiency (TFEE)												34.8	(109)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.45	**TER**	16.51
Environmental	99 A	**% DER < TER**			91.22
CO_2 Emissions (t/year)	0.04	**DFEE**	23.50	**TFEE**	34.79
Compliance Check	See BREL	**% DFEE < TFEE**			32.44
% DPER < TPER	71.45	**DPER**	25.45	**TPER**	89.13

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600 (1b)	x	2.4500 (2b)	=	106.2320	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			7762.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							179.0141	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	

Distribution loss (46)m = 0.15 x (45)m

23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)

Volume factor from Table 2a 1.0294 (52)

Temperature factor from Table 2b 0.6000 (53)

Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
									Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)

12Total per year (kWh/year) 2188 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

71.0601	78.6737	71.0601	73.4288	71.0601	73.4288	71.0601	71.0601	73.4288	71.0601	73.4288	71.0601	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)

Water heating gains (Table 5)

130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)

Total internal gains

377.2801	384.4058	369.8506	357.2179	340.9558	329.7655	318.6057	319.7771	328.5028	338.8880	357.8362	370.5488	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.6400	11.2829	0.6800	0.7000	0.7700	24.7133	(75)

Solar gains 24.7133	50.3046	90.6329	148.8453	200.0773	213.3036	199.5411	159.0765	110.4376	61.4762	31.0957	20.1821	(83)
Total gains 401.9933	434.7104	460.4835	506.0632	541.0331	543.0690	518.1469	478.8536	438.9404	400.3642	388.9319	390.7309	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292

alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.9486	0.9235	0.8740	0.7538	0.5827	0.4097	0.2967	0.3352	0.5380	0.7939	0.9141	0.9546	(86)
MIT	20.2964	20.4390	20.6365	20.8548	20.9650	20.9950	20.9992	20.9986	20.9818	20.8405	20.5466	20.2554	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.9395	0.9107	0.8539	0.7212	0.5404	0.3625	0.2461	0.2808	0.4834	0.7576	0.8978	0.9464	(89)
MIT 2	19.4453	19.6199	19.8570	20.1049	20.2178	20.2442	20.2471	20.2467	20.2345	20.0953	19.7544	19.3948	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.8518	20.0111	20.2293	20.4631	20.5747	20.6028	20.6063	20.6058	20.5914	20.4512	20.1328	19.8058	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8518	20.0111	20.2293	20.4631	20.5747	20.6028	20.6063	20.6058	20.5914	20.4512	20.1328	19.8058	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9340	0.9062	0.8534	0.7308	0.5590	0.3849	0.2703	0.3068	0.5086	0.7679	0.8950	0.9409	(94)
Useful gains	375.4484	393.9424	392.9839	369.8504	302.4620	209.0037	140.0345	146.8975	223.2529	307.4477	348.0931	367.6255	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	544.0874	528.6693	480.3265	404.5395	310.4847	210.0114	140.1630	147.1433	227.1047	344.6484	455.9580	545.9777	(97)
Space heating kWh	125.4674	90.5365	64.9829	24.9762	5.9689	0.0000	0.0000	0.0000	0.0000	27.6773	77.6627	132.6941	(98a)
Space heating requirement - total per year (kWh/year)												549.9660	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	125.4674	90.5365	64.9829	24.9762	5.9689	0.0000	0.0000	0.0000	0.0000	27.6773	77.6627	132.6941	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												549.9660	
Space heating per m2											(98c) / (4) =	12.6837	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	125.4674	90.5365	64.9829	24.9762	5.9689	0.0000	0.0000	0.0000	0.0000	27.6773	77.6627	132.6941	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	188.2011	135.8047	97.4744	37.4643	8.9533	0.0000	0.0000	0.0000	0.0000	41.5159	116.4941	199.0411	
Space heating requirement	188.2011	135.8047	97.4744	37.4643	8.9533	0.0000	0.0000	0.0000	0.0000	41.5159	116.4941	199.0411	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												824.9490	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												8.2495	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3288.1411	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1095.0473	0.1570	34.5437	(367)
Electrical energy for heat distribution (space & water)	8.2495	0.0000	5.9133	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			163.6003	(373)
Space and water heating			163.6003	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			62.6673	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.4500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1095.0473	1.5813	347.8690	(467)
Electrical energy for heat distribution (space & water)	8.2495	0.0000	62.9348	(472)
Overall CO2 factor for heat network			0.4240	(486)
Total CO2 associated with community systems			1741.1968	(473)
Space and water heating			1741.1968	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	1.4901	-605.6307	
PV Unit electricity exported	-551.7766	0.4464	-246.3315	
Total			-851.9622	(480)
Total Primary energy kWh/year			1103.5500	(483)
Dwelling Primary energy Rate (DPER)			25.4500	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.6400	1.1450	7.6031			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.1800	1.7910			(29a)

Wall to Unheated Com	16.5900	1.8400	14.7500	0.1800	2.6550	(29a)
500mm mineral wool	43.3600		43.3600	0.1100	4.7696	(30)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.6587	(33)
Main dwelling						
Party Wall 1			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.0141 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	4.7800	0.0500	0.2390
E3 Sill	3.8800	0.0500	0.1940
E4 Jamb	17.9200	0.0500	0.8960
E7 Party floor between dwellings (in blocks of flats)	17.6700	0.0700	1.2369
E16 Corner (normal)	5.0000	0.0900	0.4500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.5900	0.0000	0.0000
E14 Flat roof	17.6700	0.0800	1.4136
P4 Party wall - Roof (insulation at ceiling level)	12.5900	0.1200	1.5108
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5403 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 25.1990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	46.0145	45.8869	45.7618	45.1741	45.0641	44.5523	44.5523	44.4575	44.7494	45.0641	45.2866	45.5191	(39)
Average = Sum(39)m / 12 =												45.1735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0612	1.0583	1.0554	1.0418	1.0393	1.0275	1.0275	1.0253	1.0320	1.0393	1.0444	1.0498	(40)
HLP (average)												1.0418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.0518	76.4502	69.0518	71.3535	69.0518	71.3535	69.0518	69.0518	71.3535	69.0518	71.3535	69.0518	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	368.9363	375.8469	361.5069	348.8073	332.6121	318.3548	307.2620	308.4334	317.0921	330.5443	349.4255	362.2051	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.6400	11.2829	0.6300	0.7000	0.7700	22.8961	(75)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	22.8961	46.6058	83.9687	137.9008	185.3657	197.6195	184.8690	147.3797	102.3172	56.9559	28.8093	18.6981	(83)
Total gains	391.8325	422.4527	445.4757	486.7081	517.9778	515.9743	492.1310	455.8131	419.4093	387.5002	378.2348	380.9033	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8575	46.9878	47.1163	47.7293	47.8457	48.3954	48.3954	48.4986	48.1822	47.8457	47.6107	47.3675	
alpha	4.1238	4.1325	4.1411	4.1820	4.1897	4.2264	4.2264	4.2332	4.2121	4.1897	4.1740	4.1578	
util living area	0.9685	0.9549	0.9275	0.8508	0.7138	0.5315	0.3934	0.4402	0.6692	0.8755	0.9487	0.9715	(86)
MIT	19.7337	19.9074	20.1838	20.5665	20.8384	20.9642	20.9920	20.9874	20.9078	20.5765	20.1153	19.7116	(87)
Th 2	20.0326	20.0351	20.0374	20.0486	20.0507	20.0605	20.0605	20.0623	20.0567	20.0507	20.0465	20.0420	(88)
util rest of house	0.9619	0.9455	0.9122	0.8206	0.6622	0.4609	0.3117	0.3542	0.5977	0.8434	0.9365	0.9655	(89)
MIT 2	18.5828	18.8015	19.1458	19.6110	19.9107	20.0375	20.0572	20.0566	19.9898	19.6347	19.0729	18.5618	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.1325	19.3297	19.6416	20.0674	20.3538	20.4801	20.5037	20.5012	20.4283	20.0845	19.5708	19.1110	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1325	19.3297	19.6416	20.0674	20.3538	20.4801	20.5037	20.5012	20.4283	20.0845	19.5708	19.1110	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9541	0.9372	0.9048	0.8212	0.6794	0.4931	0.3506	0.3950	0.6270	0.8447	0.9291	0.9581	(94)
Useful gains	373.8614	395.9373	403.0815	399.6896	351.9099	254.4026	172.5258	180.0470	262.9904	327.3217	351.4281	364.9593	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	682.5115	662.1352	601.3809	504.4770	389.9750	261.9726	173.9179	182.3277	283.1871	427.4116	564.7592	678.7342	(97)
Space heating kWh	229.6357	178.8850	147.5348	75.4470	28.3204	0.0000	0.0000	0.0000	0.0000	74.4669	153.5984	233.4485	(98a)
Space heating requirement - total per year (kWh/year)												1121.3366	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	229.6357	178.8850	147.5348	75.4470	28.3204	0.0000	0.0000	0.0000	0.0000	74.4669	153.5984	233.4485	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1121.3366	
Space heating per m2										(98c) / (4) =		25.8611	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 92.3000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	229.6357	178.8850	147.5348	75.4470	28.3204	0.0000	0.0000	0.0000	0.0000	74.4669	153.5984	233.4485	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	248.7927	193.8082	159.8426	81.7410	30.6830	0.0000	0.0000	0.0000	0.0000	80.6792	166.4121	252.9236	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.5645	84.2770	83.7037	82.5559	81.1066	79.8000	79.8000	79.8000	79.8000	82.5043	83.9118	84.6235	(217)
Fuel for water heating, kWh/month	216.9353	192.7071	206.7810	186.0717	184.7579	170.5061	169.2907	175.3325	176.4869	188.8265	195.5573	214.6537	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.3476	11.5102	10.3636	7.5928	5.8649	4.7917	5.3502	6.9544	9.0330	11.8518	13.3866	14.7464	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3196	-12.6515	-19.6021	-23.8221	-27.3050	-26.1047	-25.8068	-23.5584	-19.8837	-15.2375	-9.4737	-7.0906	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2617	-4.9168	-10.0734	-15.5779	-21.0367	-21.2830	-21.0140	-17.5742	-12.6116	-7.1556	-3.0599	-1.7757	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1214.8826	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2277.9066	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	115.7933	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3337.3864	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1214.8826	0.2100	255.1253	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2277.9066	0.2100	478.3604	(264)
Space and water heating			733.4857	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	115.7933	0.1443	16.7126	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	0.1330	-29.1103	
PV Unit electricity exported	-138.3404	0.1251	-17.3028	
Total			-46.4132	(269)
Total CO2, kg/year			715.7144	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.5100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1214.8826	1.1300	1372.8173	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2277.9066	1.1300	2574.0345	(278)
Space and water heating			3946.8518	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	115.7933	1.5338	177.6076	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	1.4915	-326.4228	
PV Unit electricity exported	-138.3404	0.4591	-63.5081	
Total			-389.9309	(283)
Total Primary energy kWh/year			3864.6293	(286)
Target Primary Energy Rate (TPER)			89.1300	(287)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.45	**TER**	16.51
Environmental	99 A	**% DER < TER**			91.22
CO_2 Emissions (t/year)	0.04	**DFEE**	23.50	**TFEE**	34.79
Compliance Check	See BREL	**% DFEE < TFEE**			32.44
% DPER < TPER	71.45	**DPER**	25.45	**TPER**	89.13

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.6400	11.2829	0.6800	0.7000	0.7700	24.7133	(75)
Solar gains	24.7133	50.3046	90.6329	148.8453	200.0773	213.3036	199.5411	159.0765	110.4376	61.4762	31.0957	20.1821	(83)
Total gains	442.6242	466.4191	495.2032	531.7508	562.1506	556.4630	531.5734	493.5888	455.9096	426.3655	419.5032	429.0257	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086

util living area													
	0.9281	0.9041	0.8462	0.7287	0.5633	0.4001	0.2892	0.3253	0.5196	0.7636	0.8914	0.9367	(86)
MIT	20.3986	20.5092	20.6940	20.8758	20.9698	20.9955	20.9993	20.9988	20.9844	20.8674	20.6104	20.3554	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house													
	0.9163	0.8891	0.8239	0.6955	0.5218	0.3539	0.2399	0.2724	0.4663	0.7258	0.8723	0.9260	(89)
MIT 2	19.5696	19.7035	19.9227	20.1265	20.2221	20.2445	20.2471	20.2468	20.2364	20.1226	19.8289	19.5171	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.9656	20.0883	20.2911	20.4844	20.5792	20.6032	20.6064	20.6060	20.5937	20.4783	20.2022	19.9175	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9656	20.0883	20.2911	20.4844	20.5792	20.6032	20.6064	20.6060	20.5937	20.4783	20.2022	19.9175	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9114	0.8856	0.8252	0.7063	0.5403	0.3758	0.2635	0.2977	0.4911	0.7379	0.8710	0.9207	(94)
Useful gains	403.4068	413.0739	408.6562	375.5575	303.7453	209.1228	140.0513	146.9346	223.8901	314.6194	365.3890	395.0235	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	548.0670	531.3708	482.4881	405.2860	310.6444	210.0261	140.1652	147.1480	227.1836	345.5979	458.3863	549.8841	(97)
Space heating kWh													
	107.6272	79.4956	54.9310	21.4045	5.1329	0.0000	0.0000	0.0000	0.0000	23.0480	66.9580	115.2163	(98a)
Space heating requirement - total per year (kWh/year)												473.8134	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	107.6272	79.4956	54.9310	21.4045	5.1329	0.0000	0.0000	0.0000	0.0000	23.0480	66.9580	115.2163	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												473.8134	
Space heating per m2											(98c) / (4) =	10.9274	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	107.6272	79.4956	54.9310	21.4045	5.1329	0.0000	0.0000	0.0000	0.0000	23.0480	66.9580	115.2163	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	161.4408	119.2433	82.3964	32.1068	7.6993	0.0000	0.0000	0.0000	0.0000	34.5720	100.4370	172.8244	
Space heating requirement													
	161.4408	119.2433	82.3964	32.1068	7.6993	0.0000	0.0000	0.0000	0.0000	34.5720	100.4370	172.8244	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												710.7201	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												7.1072	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3173.9122	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	710.7201	4.4400	31.5560	(340a)
Space heating total			31.5560	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	16.4900	2.5157	(349)
Energy for lighting	124.6784	16.4900	20.5595	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	16.4900	-67.0227	
PV Unit electricity exported	-551.7766	5.5900	-30.8443	
Total			-97.8670	(352)
Total energy cost			194.4618	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7923 (357)
SAP value		87.1571
SAP rating (Section 12)		87 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1064.5863	0.1571	29.7723	(367)
Electrical energy for heat distribution (space & water)	7.1072	0.0000	5.7343	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			158.6500	(373)
Space and water heating			158.6500	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			57.7170	(383)
CO2 emissions per m2			1.3300	(384)
EI value			99.1247	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	43.3600 (1b)	x 2.4500 (2b)	= 106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)

Adj infilt rate

	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)												
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874 (72)
Total internal gains												
	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.6400	13.7758	0.6800	0.7000	0.7700	30.1734	(75)

Solar gains	30.1734	54.9136	97.9201	162.5490	209.7590	239.3552	219.9338	179.3720	125.9936	70.9619	37.4706	24.7347 (83)
Total gains	448.0843	471.0281	502.4903	545.4545	571.8323	582.5147	551.9661	513.8843	471.4655	435.8511	425.8781	433.5783 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area													
	0.9205	0.8953	0.8254	0.6982	0.5276	0.3473	0.2470	0.2788	0.4832	0.7278	0.8763	0.9302	(86)
MIT	20.4407	20.5456	20.7398	20.9012	20.9787	20.9979	20.9997	20.9995	20.9892	20.8990	20.6564	20.3968	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house													
	0.9076	0.8791	0.8007	0.6633	0.4856	0.3027	0.1994	0.2278	0.4304	0.6868	0.8550	0.9185	(89)
MIT 2	19.6211	19.7474	19.9755	20.1532	20.2301	20.2462	20.2473	20.2472	20.2401	20.1554	19.8831	19.5680	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0126	20.1287	20.3406	20.5104	20.5877	20.6052	20.6067	20.6065	20.5979	20.5105	20.2525	19.9639	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0126	20.1287	20.3406	20.5104	20.5877	20.6052	20.6067	20.6065	20.5979	20.5105	20.2525	19.9639	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9031	0.8763	0.8039	0.6758	0.5048	0.3239	0.2222	0.2522	0.4552	0.7016	0.8551	0.9135	(94)
Useful gains	404.6572	412.7473	403.9726	368.6244	288.6357	188.6960	122.6385	129.5881	214.6021	305.7961	364.1713	396.0944	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	539.2160	522.2860	466.7262	392.2024	293.4461	189.1039	122.6825	129.6735	216.8365	329.2317	446.1516	541.0112	(97)
Space heating kWh													
	100.1118	73.6101	46.6887	16.9762	3.5789	0.0000	0.0000	0.0000	0.0000	17.4360	59.0258	107.8181	(98a)
Space heating requirement - total per year (kWh/year)												425.2455	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	100.1118	73.6101	46.6887	16.9762	3.5789	0.0000	0.0000	0.0000	0.0000	17.4360	59.0258	107.8181	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												425.2455	
Space heating per m2											(98c) / (4) =	9.8073	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	100.1118	73.6101	46.6887	16.9762	3.5789	0.0000	0.0000	0.0000	0.0000	17.4360	59.0258	107.8181	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	150.1677	110.4151	70.0330	25.4643	5.3684	0.0000	0.0000	0.0000	0.0000	26.1541	88.5387	161.7271	
Space heating requirement													
	150.1677	110.4151	70.0330	25.4643	5.3684	0.0000	0.0000	0.0000	0.0000	26.1541	88.5387	161.7271	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5669	-24.0727	-38.8745	-48.0493	-52.9789	-51.6524	-50.3986	-46.8694	-39.7890	-30.3128	-18.7591	-13.8902	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4316	-15.8925	-38.3705	-69.5238	-96.2615	-109.4663	-104.0915	-84.3722	-54.5598	-26.6835	-10.2713	-5.6085	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	637.8683	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	6.3787	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)		
mechanical ventilation fans (SFP = 0.1177)	15.2561	(330a)
Total electricity for the above, kWh/year	15.2561	(331)
Electricity for lighting (calculated in Appendix L)	124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3004.5343	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	637.8683	6.5500	41.7804	(340a)
Space heating total			41.7804	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	28.4300	4.3373	(349)
Energy for lighting	124.6784	28.4300	35.4461	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	28.4300	-122.8784	
PV Unit electricity exported	-622.5330	5.8100	-36.1692	
Total			-159.0476	(352)
Total energy cost			241.4530	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1045.1591	0.1576	26.7991	(367)
Electrical energy for heat distribution (space & water)	6.3787	0.0000	5.6228	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			155.5653	(373)
Space and water heating			155.5653	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	0.1330	-57.4796	
PV Unit electricity exported	-622.5330	0.1218	-75.7970	
Total			-133.2765	(380)
Total CO2, kg/year			42.4000	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1045.1591	1.5832	269.3077	(467)
Electrical energy for heat distribution (space & water)	6.3787	0.0000	59.9888	(472)
Overall CO2 factor for heat network			0.4235	(486)
Total CO2 associated with community systems			1659.6896	(473)
Space and water heating			1659.6896	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	1.4914	-644.6094	
PV Unit electricity exported	-622.5330	0.4467	-278.0656	
Total			-922.6749	(480)
Total Primary energy kWh/year			951.3301	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Southwest

Current energy efficiency rating:	B 87
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: B 87
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£40	£40	£0
Community scheme	£361	£361	£0
Space heating	£150	£150	£0
Water heating	£215	£215	£0
Lighting	£35	£35	£0
Generated (PV)	-£159	-£159	£0
Total cost of fuels	£242	£242	£0
Total cost of uses	£241	£241	£0
Delivered energy	69 kWh/m²	69 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.0 tonnes	0.0 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	22 kWh/m²	22 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)

Total net area of external elements Aum(A, m2)	76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	15.1610		(33)
Main dwelling				
Party Wall 1	31.3600	0.0000	70.0000	2195.2000 (32)
Party Floor 1	43.3600		70.0000	3035.2000 (32d)
Internal TF Wall	68.4500		9.0000	616.0500 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.6400	11.2829	0.6800	0.7000	0.7700	24.7133	(75)

Solar gains	24.7133	50.3046	90.6329	148.8453	200.0773	213.3036	199.5411	159.0765	110.4376	61.4762	31.0957	20.1821	(83)
Total gains	442.6242	466.4191	495.2032	531.7508	562.1506	556.4630	531.5734	493.5888	455.9096	426.3655	419.5032	429.0257	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area													
	0.9281	0.9041	0.8462	0.7287	0.5633	0.4001	0.2892	0.3253	0.5196	0.7636	0.8914	0.9367	(86)
MIT	20.3986	20.5092	20.6940	20.8758	20.9698	20.9955	20.9993	20.9988	20.9844	20.8674	20.6104	20.3554	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house													
	0.9163	0.8891	0.8239	0.6955	0.5218	0.3539	0.2399	0.2724	0.4663	0.7258	0.8723	0.9260	(89)
MIT 2	19.5696	19.7035	19.9227	20.1265	20.2221	20.2445	20.2471	20.2468	20.2364	20.1226	19.8289	19.5171	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.9656	20.0883	20.2911	20.4844	20.5792	20.6032	20.6064	20.6060	20.5937	20.4783	20.2022	19.9175	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9656	20.0883	20.2911	20.4844	20.5792	20.6032	20.6064	20.6060	20.5937	20.4783	20.2022	19.9175	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9114	0.8856	0.8252	0.7063	0.5403	0.3758	0.2635	0.2977	0.4911	0.7379	0.8710	0.9207	(94)
Useful gains	403.4068	413.0739	408.6562	375.5575	303.7453	209.1228	140.0513	146.9346	223.8901	314.6194	365.3890	395.0235	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	548.0670	531.3708	482.4881	405.2860	310.6444	210.0261	140.1652	147.1480	227.1836	345.5979	458.3863	549.8841	(97)
Space heating kWh													
	107.6272	79.4956	54.9310	21.4045	5.1329	0.0000	0.0000	0.0000	0.0000	23.0480	66.9580	115.2163	(98a)
Space heating requirement - total per year (kWh/year)												473.8134	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	107.6272	79.4956	54.9310	21.4045	5.1329	0.0000	0.0000	0.0000	0.0000	23.0480	66.9580	115.2163	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												473.8134	
Space heating per m2											(98c) / (4) =	10.9274	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	107.6272	79.4956	54.9310	21.4045	5.1329	0.0000	0.0000	0.0000	0.0000	23.0480	66.9580	115.2163	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	161.4408	119.2433	82.3964	32.1068	7.6993	0.0000	0.0000	0.0000	0.0000	34.5720	100.4370	172.8244	
Space heating requirement													
	161.4408	119.2433	82.3964	32.1068	7.6993	0.0000	0.0000	0.0000	0.0000	34.5720	100.4370	172.8244	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												710.7201	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												7.1072	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)

Appendix Q - special features

Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3173.9122	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	710.7201	4.4400	31.5560	(340a)
Space heating total			31.5560	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	16.4900	2.5157	(349)
Energy for lighting	124.6784	16.4900	20.5595	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	16.4900	-67.0227	
PV Unit electricity exported	-551.7766	5.5900	-30.8443	
Total			-97.8670	(352)
Total energy cost			194.4618	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7923	(357)
SAP value		87.1571	
SAP rating (Section 12)		87	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1064.5863	0.1571	29.7723	(367)
Electrical energy for heat distribution (space & water)	7.1072	0.0000	5.7343	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			158.6500	(373)
Space and water heating			158.6500	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			57.7170	(383)
CO2 emissions per m2			1.3300	(384)
EI value			99.1247	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

Measured/design AP50												3.0000	(17)
Infiltration rate												0.1500	(18)
Number of sides sheltered												3	(19)
Shelter factor								(20) = 1 - [0.075 x (19)] =				0.7750	(20)
Infiltration rate adjusted to include shelter factor								(21) = (18) x (20) =				0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	6.6400	13.7758	0.6800	0.7000	0.7700	30.1734	(75)

Solar gains	30.1734	54.9136	97.9201	162.5490	209.7590	239.3552	219.9338	179.3720	125.9936	70.9619	37.4706	24.7347	(83)
Total gains	448.0843	471.0281	502.4903	545.4545	571.8323	582.5147	551.9661	513.8843	471.4655	435.8511	425.8781	433.5783	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area													
	0.9205	0.8953	0.8254	0.6982	0.5276	0.3473	0.2470	0.2788	0.4832	0.7278	0.8763	0.9302	(86)
MIT	20.4407	20.5456	20.7398	20.9012	20.9787	20.9979	20.9997	20.9995	20.9892	20.8990	20.6564	20.3968	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house													
	0.9076	0.8791	0.8007	0.6633	0.4856	0.3027	0.1994	0.2278	0.4304	0.6868	0.8550	0.9185	(89)
MIT 2	19.6211	19.7474	19.9755	20.1532	20.2301	20.2462	20.2473	20.2472	20.2401	20.1554	19.8831	19.5680	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.0126	20.1287	20.3406	20.5104	20.5877	20.6052	20.6067	20.6065	20.5979	20.5105	20.2525	19.9639	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0126	20.1287	20.3406	20.5104	20.5877	20.6052	20.6067	20.6065	20.5979	20.5105	20.2525	19.9639	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9031	0.8763	0.8039	0.6758	0.5048	0.3239	0.2222	0.2522	0.4552	0.7016	0.8551	0.9135	(94)
Useful gains	404.6572	412.7473	403.9726	368.6244	288.6357	188.6960	122.6385	129.5881	214.6021	305.7961	364.1713	396.0944	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	539.2160	522.2860	466.7262	392.2024	293.4461	189.1039	122.6825	129.6735	216.8365	329.2317	446.1516	541.0112	(97)
Space heating kWh													
	100.1118	73.6101	46.6887	16.9762	3.5789	0.0000	0.0000	0.0000	0.0000	17.4360	59.0258	107.8181	(98a)
Space heating requirement - total per year (kWh/year)												425.2455	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	100.1118	73.6101	46.6887	16.9762	3.5789	0.0000	0.0000	0.0000	0.0000	17.4360	59.0258	107.8181	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												425.2455	
Space heating per m2										(98c) / (4) =		9.8073	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement													
	100.1118	73.6101	46.6887	16.9762	3.5789	0.0000	0.0000	0.0000	0.0000	17.4360	59.0258	107.8181	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	150.1677	110.4151	70.0330	25.4643	5.3684	0.0000	0.0000	0.0000	0.0000	26.1541	88.5387	161.7271	
Space heating requirement													
	150.1677	110.4151	70.0330	25.4643	5.3684	0.0000	0.0000	0.0000	0.0000	26.1541	88.5387	161.7271	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)

Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5669	-24.0727	-38.8745	-48.0493	-52.9789	-51.6524	-50.3986	-46.8694	-39.7890	-30.3128	-18.7591	-13.8902	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4316	-15.8925	-38.3705	-69.5238	-96.2615	-109.4663	-104.0915	-84.3722	-54.5598	-26.6835	-10.2713	-5.6085	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	637.8683	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	6.3787	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)		
mechanical ventilation fans (SFP = 0.1177)	15.2561	(330a)
Total electricity for the above, kWh/year	15.2561	(331)
Electricity for lighting (calculated in Appendix L)	124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3004.5343	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	637.8683	6.5500	41.7804	(340a)
Space heating total			41.7804	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	28.4300	4.3373	(349)
Energy for lighting	124.6784	28.4300	35.4461	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	28.4300	-122.8784	
PV Unit electricity exported	-622.5330	5.8100	-36.1692	
Total			-159.0476	(352)
Total energy cost			241.4530	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1045.1591	0.1576	26.7991	(367)
Electrical energy for heat distribution (space & water)	6.3787	0.0000	5.6228	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			155.5653	(373)
Space and water heating			155.5653	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	0.1330	-57.4796	
PV Unit electricity exported	-622.5330	0.1218	-75.7970	
Total			-133.2765	(380)
Total CO2, kg/year			42.4000	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1045.1591	1.5832	269.3077	(467)
Electrical energy for heat distribution (space & water)	6.3787	0.0000	59.9888	(472)
Overall CO2 factor for heat network			0.4235	(486)
Total CO2 associated with community systems			1659.6896	(473)
Space and water heating			1659.6896	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	1.4914	-644.6094	
PV Unit electricity exported	-622.5330	0.4467	-278.0656	
Total			-922.6749	(480)
Total Primary energy kWh/year			951.3301	(483)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.35	**TER**	16.09
Environmental	99 A	**% DER < TER**			91.61
CO_2 Emissions (t/year)	0.04	**DFEE**	21.90	**TFEE**	32.86
Compliance Check	See BREL	**% DFEE < TFEE**			33.34
% DPER < TPER	71.80	**DPER**	24.49	**TPER**	86.87

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross (m2)	Openings (m2)	NetArea (m2)	U-value (W/m2K)	A x U (W/K)	K-value (kJ/m2K)	A x K (kJ/K)	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
12Total per year (kWh/year)												2188	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0601	78.6737	71.0601	73.4288	71.0601	73.4288	71.0601	71.0601	73.4288	71.0601	73.4288	71.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.2801	384.4058	369.8506	357.2179	340.9558	329.7655	318.6057	319.7771	328.5028	338.8880	357.8362	370.5488	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	6.6400	19.6403	0.6800	0.7000	0.7700	43.0185	(76)

Solar gains	43.0185	84.1534	138.5886	202.1232	247.7096	253.5749	241.4136	207.3707	161.1843	99.8551	53.6391	35.3763 (83)
Total gains	420.2986	468.5592	508.4392	559.3412	588.6654	583.3403	560.0194	527.1478	489.6871	438.7430	411.4752	405.9252 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292

alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.9398	0.9028	0.8353	0.7026	0.5404	0.3821	0.2746	0.3048	0.4861	0.7494	0.8975	0.9479	(86)
MIT	20.3438	20.5137	20.7137	20.8948	20.9749	20.9964	20.9995	20.9991	20.9884	20.8785	20.5944	20.2962	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.9295	0.8876	0.8122	0.6690	0.5000	0.3378	0.2278	0.2552	0.4355	0.7111	0.8791	0.9387	(89)
MIT 2	19.5032	19.7088	19.9449	20.1459	20.2265	20.2451	20.2472	20.2470	20.2393	20.1338	19.8104	19.4449	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.9047	20.0932	20.3121	20.5036	20.5840	20.6039	20.6065	20.6062	20.5971	20.4895	20.1848	19.8515	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9047	20.0932	20.3121	20.5036	20.5840	20.6039	20.6065	20.6062	20.5971	20.4895	20.1848	19.8515	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9242	0.8842	0.8143	0.6807	0.5183	0.3588	0.2501	0.2789	0.4592	0.7239	0.8774	0.9332	(94)
Useful gains	388.4213	414.2950	414.0272	380.7485	305.0774	209.3208	140.0800	146.9996	224.8671	317.5946	361.0486	378.8125	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	545.9365	531.5426	483.2225	405.9587	310.8096	210.0504	140.1688	147.1562	227.3042	345.9883	457.7791	547.5744	(97)
Space heating kWh	117.1913	78.7904	51.4812	18.1513	4.2647	0.0000	0.0000	0.0000	0.0000	21.1249	69.6459	125.5588	(98a)
Space heating requirement - total per year (kWh/year)												486.2086	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	117.1913	78.7904	51.4812	18.1513	4.2647	0.0000	0.0000	0.0000	0.0000	21.1249	69.6459	125.5588	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												486.2086	
Space heating per m2											(98c) / (4) =	11.2133	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	117.1913	78.7904	51.4812	18.1513	4.2647	0.0000	0.0000	0.0000	0.0000	21.1249	69.6459	125.5588	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	175.7869	118.1856	77.2219	27.2270	6.3971	0.0000	0.0000	0.0000	0.0000	31.6873	104.4689	188.3383	
Space heating requirement	175.7869	118.1856	77.2219	27.2270	6.3971	0.0000	0.0000	0.0000	0.0000	31.6873	104.4689	188.3383	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												729.3129	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												7.2931	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3192.5049	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1069.5443	0.1575	30.6398	(367)
Electrical energy for heat distribution (space & water)	7.2931	0.0000	5.7669	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			159.5500	(373)
Space and water heating			159.5500	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			58.6170	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.3500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1069.5443	1.5832	307.9063	(467)
Electrical energy for heat distribution (space & water)	7.2931	0.0000	61.4362	(472)
Overall CO2 factor for heat network			0.4238	(486)
Total CO2 associated with community systems			1699.7356	(473)
Space and water heating			1699.7356	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	1.4901	-605.6307	
PV Unit electricity exported	-551.7766	0.4464	-246.3315	
Total			-851.9622	(480)
Total Primary energy kWh/year			1062.0888	(483)
Dwelling Primary energy Rate (DPER)			24.4900	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.6400	1.1450	7.6031			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.1800	1.7910			(29a)

Wall to Unheated Com	16.5900	1.8400	14.7500	0.1800	2.6550	(29a)
500mm mineral wool	43.3600		43.3600	0.1100	4.7696	(30)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.6587	(33)
Main dwelling						
Party Wall 1			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.0141 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	4.7800	0.0500	0.2390
E3 Sill	3.8800	0.0500	0.1940
E4 Jamb	17.9200	0.0500	0.8960
E7 Party floor between dwellings (in blocks of flats)	17.6700	0.0700	1.2369
E16 Corner (normal)	5.0000	0.0900	0.4500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.5900	0.0000	0.0000
E14 Flat roof	17.6700	0.0800	1.4136
P4 Party wall - Roof (insulation at ceiling level)	12.5900	0.1200	1.5108
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5403 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 25.1990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	46.0145	45.8869	45.7618	45.1741	45.0641	44.5523	44.5523	44.4575	44.7494	45.0641	45.2866	45.5191	(39)
Average = Sum(39)m / 12 =												45.1735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0612	1.0583	1.0554	1.0418	1.0393	1.0275	1.0275	1.0253	1.0320	1.0393	1.0444	1.0498	(40)
HLP (average)												1.0418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.0518	76.4502	69.0518	71.3535	69.0518	71.3535	69.0518	69.0518	71.3535	69.0518	71.3535	69.0518	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	368.9363	375.8469	361.5069	348.8073	332.6121	318.3548	307.2620	308.4334	317.0921	330.5443	349.4255	362.2051	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	6.6400	19.6403	0.6300	0.7000	0.7700	39.8554	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	39.8554	77.9656	128.3983	187.2612	229.4957	234.9297	223.6626	192.1229	149.3325	92.5128	49.6950	32.7751	(83)
Total gains	408.7917	453.8125	489.9052	536.0685	562.1078	553.2845	530.9247	500.5563	466.4246	423.0570	399.1205	394.9803	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8575	46.9878	47.1163	47.7293	47.8457	48.3954	48.3954	48.4986	48.1822	47.8457	47.6107	47.3675	
alpha	4.1238	4.1325	4.1411	4.1820	4.1897	4.2264	4.2264	4.2332	4.2121	4.1897	4.1740	4.1578	
util living area	0.9639	0.9439	0.9057	0.8148	0.6747	0.4997	0.3658	0.4030	0.6174	0.8463	0.9397	0.9679	(86)
MIT	19.7811	19.9887	20.2832	20.6408	20.8696	20.9716	20.9939	20.9909	20.9319	20.6378	20.1682	19.7516	(87)
Th 2	20.0326	20.0351	20.0374	20.0486	20.0507	20.0605	20.0605	20.0623	20.0567	20.0507	20.0465	20.0420	(88)
util rest of house	0.9564	0.9327	0.8871	0.7810	0.6224	0.4319	0.2893	0.3234	0.5470	0.8100	0.9257	0.9612	(89)
MIT 2	18.6417	18.9012	19.2638	19.6921	19.9396	20.0424	20.0580	20.0583	20.0086	19.7012	19.1370	18.6117	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.1859	19.4206	19.7507	20.1452	20.3838	20.4862	20.5050	20.5038	20.4496	20.1486	19.6295	19.1561	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1859	19.4206	19.7507	20.1452	20.3838	20.4862	20.5050	20.5038	20.4496	20.1486	19.6295	19.1561	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9483	0.9242	0.8808	0.7847	0.6414	0.4631	0.3257	0.3612	0.5773	0.8141	0.9185	0.9535	(94)
Useful gains	387.6771	419.4251	431.4878	420.6633	360.5559	256.2432	172.9274	180.8171	269.2477	344.4106	366.5953	376.6321	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	684.9669	666.3041	606.3758	507.9927	391.3278	262.2440	173.9782	182.4424	284.1393	430.2985	567.4198	680.7898	(97)
Space heating kWh	221.1836	165.9027	130.1167	62.8771	22.8943	0.0000	0.0000	0.0000	0.0000	63.9006	144.5936	226.2934	(98a)
Space heating requirement - total per year (kWh/year)												1037.7620	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	221.1836	165.9027	130.1167	62.8771	22.8943	0.0000	0.0000	0.0000	0.0000	63.9006	144.5936	226.2934	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1037.7620	
Space heating per m2										(98c) / (4) =		23.9336	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	221.1836	165.9027	130.1167	62.8771	22.8943	0.0000	0.0000	0.0000	0.0000	63.9006	144.5936	226.2934	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	239.6355	179.7429	140.9715	68.1226	24.8042	0.0000	0.0000	0.0000	0.0000	69.2315	156.6561	245.1716	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.4803	84.1076	83.4287	82.2203	80.8865	79.8000	79.8000	79.8000	79.8000	82.2239	83.7773	84.5538	(217)
Fuel for water heating, kWh/month	217.1514	193.0952	207.4627	186.8313	185.2607	170.5061	169.2907	175.3325	176.4869	189.4704	195.8713	214.8307	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.3476	11.5102	10.3636	7.5928	5.8649	4.7917	5.3502	6.9544	9.0330	11.8518	13.3866	14.7464	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3196	-12.6515	-19.6021	-23.8221	-27.3050	-26.1047	-25.8068	-23.5584	-19.8837	-15.2375	-9.4737	-7.0906	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2617	-4.9168	-10.0734	-15.5779	-21.0367	-21.2830	-21.0140	-17.5742	-12.6116	-7.1556	-3.0599	-1.7757	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1124.3359	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2281.5901	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	115.7933	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3250.5231	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1124.3359	0.2100	236.1105	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2281.5901	0.2100	479.1339	(264)
Space and water heating			715.2444	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	115.7933	0.1443	16.7126	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	0.1330	-29.1103	
PV Unit electricity exported	-138.3404	0.1251	-17.3028	
Total			-46.4132	(269)
Total CO2, kg/year			697.4731	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.0900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1124.3359	1.1300	1270.4995	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2281.5901	1.1300	2578.1968	(278)
Space and water heating			3848.6963	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	115.7933	1.5338	177.6076	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	1.4915	-326.4228	
PV Unit electricity exported	-138.3404	0.4591	-63.5081	
Total			-389.9309	(283)
Total Primary energy kWh/year			3766.4739	(286)
Target Primary Energy Rate (TPER)			86.8700	(287)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.35	**TER**	16.09
Environmental	99 A	**% DER < TER**			91.61
CO_2 Emissions (t/year)	0.04	**DFEE**	21.90	**TFEE**	32.86
Compliance Check	See BREL	**% DFEE < TFEE**			33.34
% DPER < TPER	71.80	**DPER**	24.49	**TPER**	86.87

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		2 * 10 =	20.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		20.0000 / (5) =	0.1883 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			3.0000 (17)
Infiltration rate			0.3383 (18)
Number of sides sheltered			3 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2622 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3343	0.3277	0.3211	0.2884	0.2818	0.2490	0.2490	0.2425	0.2622	0.2818	0.2949	0.3080	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5474	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		7762.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							179.0141	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		17.4572	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.4866	19.4106	19.3360	18.9859	18.9204	18.6155	18.6155	18.5590	18.7329	18.9204	19.0529	19.1915	(38)
Heat transfer coeff	36.9438	36.8677	36.7932	36.4431	36.3776	36.0727	36.0727	36.0162	36.1901	36.3776	36.5101	36.6486	(39)
Average = Sum(39)m / 12 =												36.4428	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8520	0.8503	0.8486	0.8405	0.8390	0.8319	0.8319	0.8306	0.8346	0.8390	0.8420	0.8452	(40)
HLP (average)												0.8405	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)											Total = Sum(45)m =	781.1490	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
										Total per year (kWh/year) = Sum(64)m =	663.9767	(64)
12Total per year (kWh/year)											664	(64)

Electric shower(s)

39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	449.4572	(64a)

Heat gains from water heating, kWh/month

27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0601	78.6737	71.0601	73.4288	71.0601	73.4288	71.0601	71.0601	73.4288	71.0601	73.4288	71.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains	283.0895	291.1341	278.7010	271.1858	257.9340	249.9230	240.9368	240.6593	247.6349	254.4733	268.5369	277.0546	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	6.6400	19.6403	0.6800	0.7000	0.7700	43.0185	(76)

Solar gains	43.0185	84.1534	138.5886	202.1232	247.7096	253.5749	241.4136	207.3707	161.1843	99.8551	53.6391	35.3763	(83)
Total gains	326.1080	375.2875	417.2896	473.3090	505.6436	503.4979	482.3504	448.0301	408.8192	354.3283	322.1760	312.4309	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.3623	58.4827	58.6012	59.1642	59.2707	59.7717	59.7717	59.8654	59.5777	59.2707	59.0556	58.8323	
alpha	4.8908	4.8988	4.9067	4.9443	4.9514	4.9848	4.9848	4.9910	4.9718	4.9514	4.9370	4.9222	
util living area	0.9786	0.9583	0.9148	0.8010	0.6358	0.4534	0.3282	0.3682	0.5892	0.8580	0.9585	0.9822	(86)
MIT	19.9792	20.1978	20.4793	20.7875	20.9421	20.9911	20.9986	20.9975	20.9696	20.7444	20.3172	19.9396	(87)
Th 2	20.2085	20.2100	20.2115	20.2184	20.2197	20.2257	20.2257	20.2269	20.2234	20.2197	20.2171	20.2143	(88)
util rest of house	0.9742	0.9501	0.8989	0.7699	0.5907	0.4004	0.2709	0.3070	0.5299	0.8267	0.9489	0.9785	(89)

MIT 2	19.2829	19.4971	19.7676	20.0531	20.1810	20.2212	20.2253	20.2259	20.2063	20.0237	19.6219	19.2488	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.6155	19.8318	20.1075	20.4039	20.5445	20.5889	20.5946	20.5945	20.5709	20.3679	19.9540	19.5788	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6155	19.8318	20.1075	20.4039	20.5445	20.5889	20.5946	20.5945	20.5709	20.3679	19.9540	19.5788	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9702	0.9456	0.8966	0.7776	0.6098	0.4254	0.2982	0.3362	0.5569	0.8331	0.9452	0.9748	(94)
Useful gains	316.3988	354.8752	374.1523	368.0670	308.3573	214.2081	143.8510	150.6270	227.6810	295.2080	304.5131	304.5609	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	565.8119	550.5012	500.6651	419.2363	321.7425	216.0367	144.0961	151.0683	234.1815	355.3338	469.3010	563.6107	(97)
Space heating kWh	185.5633	131.4607	94.1255	36.8419	9.9586	0.0000	0.0000	0.0000	0.0000	44.7336	118.6473	192.7331	(98a)
Space heating requirement - total per year (kWh/year)												814.0640	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	185.5633	131.4607	94.1255	36.8419	9.9586	0.0000	0.0000	0.0000	0.0000	44.7336	118.6473	192.7331	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												814.0640	
Space heating per m2											(98c) / (4) =	18.7745	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	339.0831	266.9377	273.7231	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9659	0.9843	0.9766	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	327.5254	262.7454	267.3261	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	559.8297	536.6719	497.9536	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	167.2592	203.8013	171.5869	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	41.8148	50.9503	42.8967	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												135.6618	(107)
Energy for space heating												18.7745	(99)
Energy for space cooling												3.1287	(108)
Total												21.9033	(109)
Fabric Energy Efficiency (DFEE)												21.9	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													

	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.6400	1.1450	7.6031			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.1800	1.7910			(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.1800	2.6550			(29a)
500mm mineral wool	43.3600		43.3600	0.1100	4.7696			(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.6587			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.0141 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	4.7800	0.0500	0.2390
E3 Sill	3.8800	0.0500	0.1940
E4 Jamb	17.9200	0.0500	0.8960
E7 Party floor between dwellings (in blocks of flats)	17.6700	0.0700	1.2369
E16 Corner (normal)	5.0000	0.0900	0.4500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.5900	0.0000	0.0000
E14 Flat roof	17.6700	0.0800	1.4136
P4 Party wall - Roof (insulation at ceiling level)	12.5900	0.1200	1.5108
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5403 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.1990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	46.0145	45.8869	45.7618	45.1741	45.0641	44.5523	44.5523	44.4575	44.7494	45.0641	45.2866	45.5191	(39)
Average = Sum(39)m / 12 =												45.1735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0612	1.0583	1.0554	1.0418	1.0393	1.0275	1.0275	1.0253	1.0320	1.0393	1.0444	1.0498	(40)
HLP (average)												1.0418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 47.0349 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	51.3143	49.9074	48.3711	46.4583	44.7521	42.9789	42.6098	44.1430	45.7155	47.5365	49.4664	51.2421	(44)
Energy conte	81.2693	71.0675	74.3446	63.5990	60.2449	52.8476	51.5329	54.6582	56.3717	64.5066	70.4739	80.2328	(45)
Energy content (annual)										Total = Sum(45)m =		781.1490	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	69.0789	60.4073	63.1929	54.0592	51.2082	44.9204	43.8030	46.4595	47.9160	54.8306	59.9028	68.1979	(64)
									Total per year (kWh/year) = Sum(64)m =			663.9767	(64)
12Total per year (kWh/year)												664	(64)
Electric shower(s)													
	39.5129	35.2063	38.4440	36.6866	37.3750	35.6521	36.8405	37.3750	36.6866	38.4440	37.7211	39.5129	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							449.4572	(64a)
Heat gains from water heating, kWh/month													
	27.1479	23.9034	25.4092	22.6864	22.1458	20.1431	20.1609	20.9586	21.1506	23.3187	24.4060	26.9277	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	69.0518	76.4502	69.0518	71.3535	69.0518	71.3535	69.0518	69.0518	71.3535	69.0518	71.3535	69.0518	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	36.4892	35.5706	34.1522	31.5090	29.7659	27.9766	27.0980	28.1702	29.3759	31.3423	33.8972	36.1931	(72)
Total internal gains													
	281.0812	288.9106	276.6927	269.1105	255.9256	247.8477	238.9285	238.6510	245.5596	252.4649	266.4616	275.0462	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	6.6400	19.6403	0.6300	0.7000	0.7700	39.8554	(76)

Solar gains	39.8554	77.9656	128.3983	187.2612	229.4957	234.9297	223.6626	192.1229	149.3325	92.5128	49.6950	32.7751	(83)
Total gains	320.9366	366.8763	405.0910	456.3717	485.4213	482.7774	462.5911	430.7739	394.8921	344.9777	316.1566	307.8214	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8575	46.9878	47.1163	47.7293	47.8457	48.3954	48.3954	48.4986	48.1822	47.8457	47.6107	47.3675	
alpha	4.1238	4.1325	4.1411	4.1820	4.1897	4.2264	4.2264	4.2332	4.2121	4.1897	4.1740	4.1578	
util living area													
	0.9839	0.9713	0.9452	0.8722	0.7439	0.5627	0.4172	0.4639	0.6982	0.9082	0.9711	0.9863	(86)
MIT	19.5262	19.7540	20.0850	20.5141	20.8102	20.9558	20.9900	20.9846	20.8916	20.4915	19.9459	19.4946	(87)
Th 2	20.0326	20.0351	20.0374	20.0486	20.0507	20.0605	20.0605	20.0623	20.0567	20.0507	20.0465	20.0420	(88)
util rest of house													
	0.9803	0.9649	0.9328	0.8446	0.6934	0.4897	0.3311	0.3741	0.6269	0.8818	0.9635	0.9832	(89)
MIT 2	18.7000	18.9257	19.2497	19.6620	19.9208	20.0380	20.0572	20.0569	19.9944	19.6525	19.1257	18.6759	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.0946	19.3213	19.6487	20.0690	20.3456	20.4764	20.5028	20.5000	20.4229	20.0532	19.5174	19.0669	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0946	19.3213	19.6487	20.0690	20.3456	20.4764	20.5028	20.5000	20.4229	20.0532	19.5174	19.0669	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9757	0.9591	0.9270	0.8452	0.7100	0.5228	0.3721	0.4167	0.6560	0.8819	0.9583	0.9790	(94)
Useful gains	313.1370	351.8664	375.5045	385.7415	344.6275	252.3984	172.1308	179.4860	259.0434	304.2354	302.9775	301.3667	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	680.7677	661.7509	601.7063	504.5490	389.6051	261.8051	173.8771	182.2749	282.9482	426.0007	562.3435	676.7286	(97)
Space heating kWh													
	273.5173	208.2424	168.2941	85.5414	33.4633	0.0000	0.0000	0.0000	0.0000	90.5934	186.7436	279.2692	(98a)
Space heating requirement - total per year (kWh/year)												1325.6646	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	273.5173	208.2424	168.2941	85.5414	33.4633	0.0000	0.0000	0.0000	0.0000	90.5934	186.7436	279.2692	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1325.6646	
Space heating per m2											(98c) / (4) =	30.5734	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	418.7912	329.6867	337.8767	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8946	0.9397	0.9203	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	374.6578	309.8225	310.9425	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	537.8609	515.7341	479.8847	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	117.5062	153.1982	125.6930	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	29.3766	38.2996	31.4232	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												99.0993	(107)
Energy for space heating												30.5734	(99)
Energy for space cooling												2.2855	(108)
Total												32.8589	(109)
Fabric Energy Efficiency (TFEE)												32.9	(109)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.35	**TER**	16.09
Environmental	99 A	**% DER < TER**			91.61
CO_2 Emissions (t/year)	0.04	**DFEE**	21.90	**TFEE**	32.86
Compliance Check	See BREL	**% DFEE < TFEE**			33.34
% DPER < TPER	71.80	**DPER**	24.49	**TPER**	86.87

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross (m2)	Openings (m2)	NetArea (m2)	U-value (W/m2K)	A x U (W/K)	K-value (kJ/m2K)	A x K (kJ/K)	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507 (42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688 (42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733 (42c)
Average daily hot water use (litres/day)												92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
12Total per year (kWh/year)												2188	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.0601	78.6737	71.0601	73.4288	71.0601	73.4288	71.0601	71.0601	73.4288	71.0601	73.4288	71.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	377.2801	384.4058	369.8506	357.2179	340.9558	329.7655	318.6057	319.7771	328.5028	338.8880	357.8362	370.5488	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	6.6400	19.6403	0.6800	0.7000	0.7700	43.0185	(76)

Solar gains	43.0185	84.1534	138.5886	202.1232	247.7096	253.5749	241.4136	207.3707	161.1843	99.8551	53.6391	35.3763 (83)
Total gains	420.2986	468.5592	508.4392	559.3412	588.6654	583.3403	560.0194	527.1478	489.6871	438.7430	411.4752	405.9252 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292

alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.9398	0.9028	0.8353	0.7026	0.5404	0.3821	0.2746	0.3048	0.4861	0.7494	0.8975	0.9479	(86)
MIT	20.3438	20.5137	20.7137	20.8948	20.9749	20.9964	20.9995	20.9991	20.9884	20.8785	20.5944	20.2962	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.9295	0.8876	0.8122	0.6690	0.5000	0.3378	0.2278	0.2552	0.4355	0.7111	0.8791	0.9387	(89)
MIT 2	19.5032	19.7088	19.9449	20.1459	20.2265	20.2451	20.2472	20.2470	20.2393	20.1338	19.8104	19.4449	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	19.9047	20.0932	20.3121	20.5036	20.5840	20.6039	20.6065	20.6062	20.5971	20.4895	20.1848	19.8515	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9047	20.0932	20.3121	20.5036	20.5840	20.6039	20.6065	20.6062	20.5971	20.4895	20.1848	19.8515	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9242	0.8842	0.8143	0.6807	0.5183	0.3588	0.2501	0.2789	0.4592	0.7239	0.8774	0.9332	(94)
Useful gains	388.4213	414.2950	414.0272	380.7485	305.0774	209.3208	140.0800	146.9996	224.8671	317.5946	361.0486	378.8125	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	545.9365	531.5426	483.2225	405.9587	310.8096	210.0504	140.1688	147.1562	227.3042	345.9883	457.7791	547.5744	(97)
Space heating kWh	117.1913	78.7904	51.4812	18.1513	4.2647	0.0000	0.0000	0.0000	0.0000	21.1249	69.6459	125.5588	(98a)
Space heating requirement - total per year (kWh/year)												486.2086	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	117.1913	78.7904	51.4812	18.1513	4.2647	0.0000	0.0000	0.0000	0.0000	21.1249	69.6459	125.5588	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												486.2086	
Space heating per m2											(98c) / (4) =	11.2133	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	117.1913	78.7904	51.4812	18.1513	4.2647	0.0000	0.0000	0.0000	0.0000	21.1249	69.6459	125.5588	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	175.7869	118.1856	77.2219	27.2270	6.3971	0.0000	0.0000	0.0000	0.0000	31.6873	104.4689	188.3383	
Space heating requirement	175.7869	118.1856	77.2219	27.2270	6.3971	0.0000	0.0000	0.0000	0.0000	31.6873	104.4689	188.3383	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												729.3129	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												7.2931	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3192.5049	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1069.5443	0.1575	30.6398	(367)
Electrical energy for heat distribution (space & water)	7.2931	0.0000	5.7669	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			159.5500	(373)
Space and water heating			159.5500	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			58.6170	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.3500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1069.5443	1.5832	307.9063	(467)
Electrical energy for heat distribution (space & water)	7.2931	0.0000	61.4362	(472)
Overall CO2 factor for heat network			0.4238	(486)
Total CO2 associated with community systems			1699.7356	(473)
Space and water heating			1699.7356	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	1.4901	-605.6307	
PV Unit electricity exported	-551.7766	0.4464	-246.3315	
Total			-851.9622	(480)
Total Primary energy kWh/year			1062.0888	(483)
Dwelling Primary energy Rate (DPER)			24.4900	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1883	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4383	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3397	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4331	0.4246	0.4161	0.3736	0.3651	0.3227	0.3227	0.3142	0.3397	0.3651	0.3821	0.3991	(22b)
Effective ac	0.5938	0.5901	0.5866	0.5698	0.5667	0.5521	0.5521	0.5494	0.5577	0.5667	0.5730	0.5796	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			6.6400	1.1450	7.6031			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.1800	1.7910			(29a)

Wall to Unheated Com	16.5900	1.8400	14.7500	0.1800	2.6550	(29a)
500mm mineral wool	43.3600		43.3600	0.1100	4.7696	(30)
Total net area of external elements Aum(A, m2)			76.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.6587	(33)
Main dwelling						
Party Wall 1			31.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.0141 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	4.7800	0.0500	0.2390
E3 Sill	3.8800	0.0500	0.1940
E4 Jamb	17.9200	0.0500	0.8960
E7 Party floor between dwellings (in blocks of flats)	17.6700	0.0700	1.2369
E16 Corner (normal)	5.0000	0.0900	0.4500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.5900	0.0000	0.0000
E14 Flat roof	17.6700	0.0800	1.4136
P4 Party wall - Roof (insulation at ceiling level)	12.5900	0.1200	1.5108
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5403 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 25.1990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	20.8156	20.6879	20.5628	19.9751	19.8652	19.3533	19.3533	19.2585	19.5505	19.8652	20.0876	20.3202	(38)
Heat transfer coeff	46.0145	45.8869	45.7618	45.1741	45.0641	44.5523	44.5523	44.4575	44.7494	45.0641	45.2866	45.5191	(39)
Average = Sum(39)m / 12 =												45.1735	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0612	1.0583	1.0554	1.0418	1.0393	1.0275	1.0275	1.0253	1.0320	1.0393	1.0444	1.0498	(40)
HLP (average)												1.0418	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Hot water usage for mixer showers

49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)

Hot water usage for baths

21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)

Hot water usage for other uses

29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)

Average daily hot water use (litres/day) 92.5245 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.0063	182.3565	193.9726	170.9103	165.9711	149.8581	148.0239	153.6650	155.1086	172.6152	183.1565	203.7858	(62)
WWHRS	-22.5561	-19.9488	-20.8892	-17.2971	-16.1203	-13.7942	-12.9299	-13.7496	-14.2720	-16.8252	-19.0609	-22.1384	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
								Total per year (kWh/year) = Sum(64)m =				1875.8483	(64)
12Total per year (kWh/year)												1876	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month	90.2802	80.3086	86.2790	77.9081	76.9685	70.9083	71.0011	72.8767	72.6540	79.1777	81.9800	89.5419	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	74.9113	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.0518	76.4502	69.0518	71.3535	69.0518	71.3535	69.0518	69.0518	71.3535	69.0518	71.3535	69.0518	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.0668	131.4165	128.0153	120.7747	111.6346	103.0442	97.3053	95.9557	99.3568	106.5975	115.7376	124.3279	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	30.4911	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	121.3444	119.5068	115.9664	108.2057	103.4523	98.4837	95.4315	97.9526	100.9084	106.4216	113.8611	120.3520	(72)
Total internal gains	368.9363	375.8469	361.5069	348.8073	332.6121	318.3548	307.2620	308.4334	317.0921	330.5443	349.4255	362.2051	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	6.6400	19.6403	0.6300	0.7000	0.7700	39.8554	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	39.8554	77.9656	128.3983	187.2612	229.4957	234.9297	223.6626	192.1229	149.3325	92.5128	49.6950	32.7751	(83)
Total gains	408.7917	453.8125	489.9052	536.0685	562.1078	553.2845	530.9247	500.5563	466.4246	423.0570	399.1205	394.9803	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8575	46.9878	47.1163	47.7293	47.8457	48.3954	48.3954	48.4986	48.1822	47.8457	47.6107	47.3675	
alpha	4.1238	4.1325	4.1411	4.1820	4.1897	4.2264	4.2264	4.2332	4.2121	4.1897	4.1740	4.1578	
util living area	0.9639	0.9439	0.9057	0.8148	0.6747	0.4997	0.3658	0.4030	0.6174	0.8463	0.9397	0.9679	(86)
MIT	19.7811	19.9887	20.2832	20.6408	20.8696	20.9716	20.9939	20.9909	20.9319	20.6378	20.1682	19.7516	(87)
Th 2	20.0326	20.0351	20.0374	20.0486	20.0507	20.0605	20.0605	20.0623	20.0567	20.0507	20.0465	20.0420	(88)
util rest of house	0.9564	0.9327	0.8871	0.7810	0.6224	0.4319	0.2893	0.3234	0.5470	0.8100	0.9257	0.9612	(89)
MIT 2	18.6417	18.9012	19.2638	19.6921	19.9396	20.0424	20.0580	20.0583	20.0086	19.7012	19.1370	18.6117	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	19.1859	19.4206	19.7507	20.1452	20.3838	20.4862	20.5050	20.5038	20.4496	20.1486	19.6295	19.1561	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1859	19.4206	19.7507	20.1452	20.3838	20.4862	20.5050	20.5038	20.4496	20.1486	19.6295	19.1561	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9483	0.9242	0.8808	0.7847	0.6414	0.4631	0.3257	0.3612	0.5773	0.8141	0.9185	0.9535	(94)
Useful gains	387.6771	419.4251	431.4878	420.6633	360.5559	256.2432	172.9274	180.8171	269.2477	344.4106	366.5953	376.6321	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	684.9669	666.3041	606.3758	507.9927	391.3278	262.2440	173.9782	182.4424	284.1393	430.2985	567.4198	680.7898	(97)
Space heating kWh	221.1836	165.9027	130.1167	62.8771	22.8943	0.0000	0.0000	0.0000	0.0000	63.9006	144.5936	226.2934	(98a)
Space heating requirement - total per year (kWh/year)												1037.7620	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	221.1836	165.9027	130.1167	62.8771	22.8943	0.0000	0.0000	0.0000	0.0000	63.9006	144.5936	226.2934	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1037.7620	
Space heating per m2										(98c) / (4) =		23.9336	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	221.1836	165.9027	130.1167	62.8771	22.8943	0.0000	0.0000	0.0000	0.0000	63.9006	144.5936	226.2934	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	239.6355	179.7429	140.9715	68.1226	24.8042	0.0000	0.0000	0.0000	0.0000	69.2315	156.6561	245.1716	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.4502	162.4077	173.0834	153.6132	149.8509	136.0639	135.0940	139.9153	140.8366	155.7900	164.0956	181.6475	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.4803	84.1076	83.4287	82.2203	80.8865	79.8000	79.8000	79.8000	79.8000	82.2239	83.7773	84.5538	(217)
Fuel for water heating, kWh/month	217.1514	193.0952	207.4627	186.8313	185.2607	170.5061	169.2907	175.3325	176.4869	189.4704	195.8713	214.8307	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	14.3476	11.5102	10.3636	7.5928	5.8649	4.7917	5.3502	6.9544	9.0330	11.8518	13.3866	14.7464	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.3196	-12.6515	-19.6021	-23.8221	-27.3050	-26.1047	-25.8068	-23.5584	-19.8837	-15.2375	-9.4737	-7.0906	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-2.2617	-4.9168	-10.0734	-15.5779	-21.0367	-21.2830	-21.0140	-17.5742	-12.6116	-7.1556	-3.0599	-1.7757	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1124.3359	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2281.5901	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	115.7933	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-357.1961	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3250.5231	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1124.3359	0.2100	236.1105	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2281.5901	0.2100	479.1339	(264)
Space and water heating			715.2444	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	115.7933	0.1443	16.7126	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	0.1330	-29.1103	
PV Unit electricity exported	-138.3404	0.1251	-17.3028	
Total			-46.4132	(269)
Total CO2, kg/year			697.4731	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.0900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1124.3359	1.1300	1270.4995	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2281.5901	1.1300	2578.1968	(278)
Space and water heating			3848.6963	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	115.7933	1.5338	177.6076	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-218.8557	1.4915	-326.4228	
PV Unit electricity exported	-138.3404	0.4591	-63.5081	
Total			-389.9309	(283)
Total Primary energy kWh/year			3766.4739	(286)
Target Primary Energy Rate (TPER)			86.8700	(287)

Full SAP Calculation Printout

Property Reference	Flat TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.35	**TER**	16.09
Environmental	99 A	**% DER < TER**			91.61
CO_2 Emissions (t/year)	0.04	**DFEE**	21.90	**TFEE**	32.86
Compliance Check	See BREL	**% DFEE < TFEE**			33.34
% DPER < TPER	71.80	**DPER**	24.49	**TPER**	86.87

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.2320	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			7762.0500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							179.0141	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.2962	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	6.6400	19.6403	0.6800	0.7000	0.7700	43.0185	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	43.0185	84.1534	138.5886	202.1232	247.7096	253.5749	241.4136	207.3707	161.1843	99.8551	53.6391	35.3763	(83)
Total gains	460.9295	500.2679	543.1589	585.0287	609.7829	596.7343	573.4459	541.8830	506.6562	464.7443	442.0465	444.2200	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086

util living area													
	0.9178	0.8816	0.8065	0.6791	0.5233	0.3736	0.2682	0.2966	0.4707	0.7201	0.8735	0.9287	(86)
MIT	20.4411	20.5762	20.7599	20.9098	20.9783	20.9967	20.9995	20.9992	20.9900	20.8989	20.6526	20.3925	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house													
	0.9048	0.8644	0.7816	0.6454	0.4837	0.3303	0.2224	0.2482	0.4214	0.6810	0.8525	0.9170	(89)
MIT 2	19.6207	19.7824	19.9963	20.1610	20.2294	20.2453	20.2472	20.2470	20.2404	20.1539	19.8775	19.5620	(90)
Living area fraction											fLA = Living area / (4) =	0.4776	(91)
MIT	20.0125	20.1616	20.3610	20.5186	20.5871	20.6042	20.6065	20.6063	20.5984	20.5097	20.2477	19.9586	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0125	20.1616	20.3610	20.5186	20.5871	20.6042	20.6065	20.6063	20.5984	20.5097	20.2477	19.9586	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9004	0.8623	0.7855	0.6578	0.5017	0.3509	0.2443	0.2713	0.4446	0.6951	0.8525	0.9121	(94)
Useful gains	414.9991	431.3661	426.6509	384.8327	305.9559	209.4025	140.0909	147.0215	225.2448	323.0388	376.8273	405.1517	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	549.7096	533.9329	484.9335	406.4836	310.9181	210.0605	140.1702	147.1590	227.3508	346.6970	459.9785	551.3236	(97)
Space heating kWh													
	100.2246	68.9249	43.3623	15.5886	3.6919	0.0000	0.0000	0.0000	0.0000	17.6016	59.8688	108.7519	(98a)
Space heating requirement - total per year (kWh/year)												418.0146	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	100.2246	68.9249	43.3623	15.5886	3.6919	0.0000	0.0000	0.0000	0.0000	17.6016	59.8688	108.7519	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												418.0146	
Space heating per m2											(98c) / (4) =	9.6406	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	100.2246	68.9249	43.3623	15.5886	3.6919	0.0000	0.0000	0.0000	0.0000	17.6016	59.8688	108.7519	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	150.3369	103.3873	65.0434	23.3829	5.5379	0.0000	0.0000	0.0000	0.0000	26.4025	89.8032	163.1279	
Space heating requirement													
	150.3369	103.3873	65.0434	23.3829	5.5379	0.0000	0.0000	0.0000	0.0000	26.4025	89.8032	163.1279	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												627.0220	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												6.2702	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3090.2140	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	627.0220	4.4400	27.8398	(340a)
Space heating total			27.8398	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	16.4900	2.5157	(349)
Energy for lighting	124.6784	16.4900	20.5595	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	16.4900	-67.0227	
PV Unit electricity exported	-551.7766	5.5900	-30.8443	
Total			-97.8670	(352)
Total energy cost			190.7457	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7771 (357)
SAP value		87.4025
SAP rating (Section 12)		87 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1042.2668	0.1576	26.3504	(367)
Electrical energy for heat distribution (space & water)	6.2702	0.0000	5.6060	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			155.0998	(373)
Space and water heating			155.0998	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			54.1668	(383)
CO2 emissions per m2			1.2500	(384)
EI value			99.1785	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600						(4)
Dwelling volume						106.2320	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)

Adj infilt rate

	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													

	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	6.6400	23.7835	0.6800	0.7000	0.7700	52.0935	(76)

Solar gains	52.0935	90.5491	146.7062	215.9115	254.4951	279.3109	260.9848	228.8358	179.9437	113.3085	63.9852	43.0855	(83)
Total gains	470.0045	506.6636	551.2765	598.8169	616.5683	622.4703	593.0171	563.3481	525.4156	478.1977	452.3927	451.9291	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area													
	0.9073	0.8704	0.7832	0.6492	0.4920	0.3253	0.2300	0.2544	0.4358	0.6796	0.8538	0.9199	(86)
MIT	20.4892	20.6125	20.7987	20.9287	20.9844	20.9985	20.9998	20.9997	20.9932	20.9260	20.7016	20.4399	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house													
	0.8929	0.8519	0.7563	0.6145	0.4521	0.2834	0.1857	0.2078	0.3874	0.6381	0.8303	0.9069	(89)
MIT 2	19.6790	19.8255	20.0402	20.1804	20.2349	20.2465	20.2473	20.2473	20.2429	20.1812	19.9343	19.6198	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0660	20.2014	20.4025	20.5378	20.5929	20.6056	20.6067	20.6066	20.6013	20.5369	20.3008	20.0115	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0660	20.2014	20.4025	20.5378	20.5929	20.6056	20.6067	20.6066	20.6013	20.5369	20.3008	20.0115	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8891	0.8507	0.7620	0.6281	0.4705	0.3033	0.2068	0.2301	0.4103	0.6545	0.8320	0.9024	(94)
Useful gains	417.8877	431.0011	420.0844	376.1181	290.1150	188.8195	122.6533	129.6230	215.5592	312.9642	376.4086	407.8368	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	541.0846	524.8315	468.8937	393.1603	293.6284	189.1192	122.6844	129.6780	216.9544	330.1544	447.8414	542.6760	(97)
Space heating kWh													
	91.6585	63.0540	36.3141	12.2704	2.6140	0.0000	0.0000	0.0000	0.0000	12.7895	51.4316	100.3204	(98a)
Space heating requirement - total per year (kWh/year)												370.4525	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	91.6585	63.0540	36.3141	12.2704	2.6140	0.0000	0.0000	0.0000	0.0000	12.7895	51.4316	100.3204	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												370.4525	
Space heating per m2											(98c) / (4) =	8.5436	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	91.6585	63.0540	36.3141	12.2704	2.6140	0.0000	0.0000	0.0000	0.0000	12.7895	51.4316	100.3204	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	137.4878	94.5810	54.4711	18.4056	3.9210	0.0000	0.0000	0.0000	0.0000	19.1843	77.1474	150.4806	
Space heating requirement													
	137.4878	94.5810	54.4711	18.4056	3.9210	0.0000	0.0000	0.0000	0.0000	19.1843	77.1474	150.4806	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5669	-24.0727	-38.8745	-48.0493	-52.9789	-51.6524	-50.3986	-46.8694	-39.7890	-30.3128	-18.7591	-13.8902	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4316	-15.8925	-38.3705	-69.5238	-96.2615	-109.4663	-104.0915	-84.3722	-54.5598	-26.6835	-10.2713	-5.6085	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	555.6787	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	5.5568	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)		
mechanical ventilation fans (SFP = 0.1177)	15.2561	(330a)
Total electricity for the above, kWh/year	15.2561	(331)
Electricity for lighting (calculated in Appendix L)	124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2922.3447	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	555.6787	6.5500	36.3970	(340a)
Space heating total			36.3970	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	28.4300	4.3373	(349)
Energy for lighting	124.6784	28.4300	35.4461	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	28.4300	-122.8784	
PV Unit electricity exported	-622.5330	5.8100	-36.1692	
Total			-159.0476	(352)
Total energy cost			236.0696	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1023.2419	0.1580	23.4170	(367)
Electrical energy for heat distribution (space & water)	5.5568	0.0000	5.4960	(372)
Overall CO2 factor for heat network			0.0396	(386)
Total CO2 associated with community systems			152.0564	(373)
Space and water heating			152.0564	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	0.1330	-57.4796	
PV Unit electricity exported	-622.5330	0.1218	-75.7970	
Total			-133.2765	(380)
Total CO2, kg/year			38.8911	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1023.2419	1.5850	234.8652	(467)
Electrical energy for heat distribution (space & water)	5.5568	0.0000	58.6972	(472)
Overall CO2 factor for heat network			0.4232	(486)
Total CO2 associated with community systems			1623.9554	(473)
Space and water heating			1623.9554	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	1.4914	-644.6094	
PV Unit electricity exported	-622.5330	0.4467	-278.0656	
Total			-922.6749	(480)
Total Primary energy kWh/year			915.5959	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - West

Current energy efficiency rating:	B 87
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 87
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£40	£40	£0
Community scheme	£355	£355	£0
Space heating	£145	£145	£0
Water heating	£215	£215	£0
Lighting	£35	£35	£0
Generated (PV)	-£159	-£159	£0
Total cost of fuels	£236	£236	£0
Total cost of uses	£236	£236	£0
Delivered energy	67 kWh/m²	67 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.0 tonnes	0.0 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	21 kWh/m²	21 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b) x	2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)

Total net area of external elements Aum(A, m2)	76.5400				(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	15.1610			(33)
Main dwelling					
Party Wall 1	31.3600	0.0000	0.0000	70.0000	2195.2000 (32)
Party Floor 1	43.3600			70.0000	3035.2000 (32d)
Internal TF Wall	68.4500			9.0000	616.0500 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	6.6400	19.6403	0.6800	0.7000	0.7700	43.0185	(76)

Solar gains	43.0185	84.1534	138.5886	202.1232	247.7096	253.5749	241.4136	207.3707	161.1843	99.8551	53.6391	35.3763	(83)
Total gains	460.9295	500.2679	543.1589	585.0287	609.7829	596.7343	573.4459	541.8830	506.6562	464.7443	442.0465	444.2200	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area	0.9178	0.8816	0.8065	0.6791	0.5233	0.3736	0.2682	0.2966	0.4707	0.7201	0.8735	0.9287	(86)
MIT	20.4411	20.5762	20.7599	20.9098	20.9783	20.9967	20.9995	20.9992	20.9900	20.8989	20.6526	20.3925	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house	0.9048	0.8644	0.7816	0.6454	0.4837	0.3303	0.2224	0.2482	0.4214	0.6810	0.8525	0.9170	(89)
MIT 2	19.6207	19.7824	19.9963	20.1610	20.2294	20.2453	20.2472	20.2470	20.2404	20.1539	19.8775	19.5620	(90)
Living area fraction										fLA = Living area / (4) =		0.4776	(91)
MIT	20.0125	20.1616	20.3610	20.5186	20.5871	20.6042	20.6065	20.6063	20.5984	20.5097	20.2477	19.9586	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0125	20.1616	20.3610	20.5186	20.5871	20.6042	20.6065	20.6063	20.5984	20.5097	20.2477	19.9586	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9004	0.8623	0.7855	0.6578	0.5017	0.3509	0.2443	0.2713	0.4446	0.6951	0.8525	0.9121	(94)
Useful gains	414.9991	431.3661	426.6509	384.8327	305.9559	209.4025	140.0909	147.0215	225.2448	323.0388	376.8273	405.1517	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	549.7096	533.9329	484.9335	406.4836	310.9181	210.0605	140.1702	147.1590	227.3508	346.6970	459.9785	551.3236	(97)
Space heating kWh	100.2246	68.9249	43.3623	15.5886	3.6919	0.0000	0.0000	0.0000	0.0000	17.6016	59.8688	108.7519	(98a)
Space heating requirement - total per year (kWh/year)												418.0146	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	100.2246	68.9249	43.3623	15.5886	3.6919	0.0000	0.0000	0.0000	0.0000	17.6016	59.8688	108.7519	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												418.0146	
Space heating per m2											(98c) / (4) =	9.6406	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	100.2246	68.9249	43.3623	15.5886	3.6919	0.0000	0.0000	0.0000	0.0000	17.6016	59.8688	108.7519	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	150.3369	103.3873	65.0434	23.3829	5.5379	0.0000	0.0000	0.0000	0.0000	26.4025	89.8032	163.1279	
Space heating requirement													
	150.3369	103.3873	65.0434	23.3829	5.5379	0.0000	0.0000	0.0000	0.0000	26.4025	89.8032	163.1279	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)
Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.9723	-22.5324	-37.1222	-46.0522	-52.0843	-49.3656	-48.5243	-44.4506	-37.0927	-27.5062	-16.1221	-11.6194	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.5265	-14.0459	-34.8732	-62.8118	-91.9065	-95.7864	-93.2166	-73.2918	-46.3697	-21.9907	-7.8280	-4.1296	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												627.0220	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3281.4784	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												6.2702	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)													
mechanical ventilation fans (SFP = 0.1177)												15.2561	(330a)
Total electricity for the above, kWh/year												15.2561	(331)
Electricity for lighting (calculated in Appendix L)												124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)

Appendix Q - special features

Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3090.2140	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	627.0220	4.4400	27.8398	(340a)
Space heating total			27.8398	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	4.4400	145.6976	(342a)
Water heating total			145.6976	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	16.4900	2.5157	(349)
Energy for lighting	124.6784	16.4900	20.5595	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	16.4900	-67.0227	
PV Unit electricity exported	-551.7766	5.5900	-30.8443	
Total			-97.8670	(352)
Total energy cost			190.7457	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7771	(357)
SAP value		87.4025	
SAP rating (Section 12)		87	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1042.2668	0.1576	26.3504	(367)
Electrical energy for heat distribution (space & water)	6.2702	0.0000	5.6060	(372)
Overall CO2 factor for heat network			0.0397	(386)
Total CO2 associated with community systems			155.0998	(373)
Space and water heating			155.0998	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-406.4443	0.1326	-53.9060	
PV Unit electricity exported	-551.7766	0.1217	-67.1381	
Total			-121.0442	(380)
Total CO2, kg/year			54.1668	(383)
CO2 emissions per m2			1.2500	(384)
EI value			99.1785	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3600	(1b)	x 2.4500	(2b) =	106.2320	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.2320	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

Measured/design AP50												3.0000	(17)
Infiltration rate												0.1500	(18)
Number of sides sheltered												3	(19)
Shelter factor								(20) = 1 - [0.075 x (19)] =				0.7750	(20)
Infiltration rate adjusted to include shelter factor								(21) = (18) x (20) =				0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door Shelt.			1.8400	0.7100	1.3064			(26)
Windows			6.6400	0.7752	5.1473			(27)
100mm Cavity Wall	16.5900	6.6400	9.9500	0.2300	2.2885	60.0000	597.0000	(29a)
Wall to Unheated Com	16.5900	1.8400	14.7500	0.2000	2.9500	60.0000	885.0000	(29a)
500mm mineral wool	43.3600		43.3600	0.0800	3.4688	10.0000	433.6000	(30)
Total net area of external elements Aum(A, m2)			76.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.1610			(33)
Main dwelling								
Party Wall 1			31.3600	0.0000	0.0000	70.0000	2195.2000	(32)
Party Floor 1			43.3600			70.0000	3035.2000	(32d)
Internal TF Wall			68.4500			9.0000	616.0500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7762.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		179.0141 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.2962 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	17.4572 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	17.5283	(38)
Heat transfer coeff	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	34.9855	(39)
Average = Sum(39)m / 12 =												34.9855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	0.8069	(40)
HLP (average)												0.8069	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Hot water usage for mixer showers	49.3398	48.5983	47.5178	45.4505	43.9249	42.2235	41.2565	42.3288	43.5042	45.3309	47.4427	49.1507	(42a)
Hot water usage for baths	21.3409	21.0240	20.5777	19.7547	19.1385	18.4553	18.0862	18.5294	19.0120	19.7431	20.5830	21.2688	(42b)
Hot water usage for other uses	29.9733	28.8834	27.7935	26.7035	25.6136	24.5236	24.5236	25.6136	26.7035	27.7935	28.8834	29.9733	(42c)
Average daily hot water use (litres/day)												92.5245	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6540	98.5057	95.8889	91.9087	88.6770	85.2024	83.8663	86.4717	89.2197	92.8675	96.9090	100.3928	(44)
Energy conte	159.4114	140.2708	147.3777	125.8185	119.3762	104.7663	101.4290	107.0700	110.0168	126.0203	138.0647	157.1909	(45)
Energy content (annual)										Total = Sum(45)m =		1536.8125	
Distribution loss (46)m = 0.15 x (45)m	23.9117	21.0406	22.1067	18.8728	17.9064	15.7149	15.2143	16.0605	16.5025	18.9030	20.7097	23.5786	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
										Total per year (kWh/year) = Sum(64)m =		2187.6523	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	97.2257	86.5820	93.2245	84.6296	83.9140	77.6297	77.9466	79.8222	79.3755	86.1232	88.7014	96.4874	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.6495	15.6762	12.7487	9.6516	7.2147	6.0909	6.5815	8.5548	11.4823	14.5794	17.0163	18.1401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	130.6797	128.8422	125.3018	117.5411	112.7877	107.8191	104.7669	107.2879	110.2438	115.7570	123.1964	129.6874	(72)
Total internal gains													
	417.9109	416.1145	404.5703	382.9055	362.0733	343.1595	332.0323	334.5123	345.4719	364.8892	388.4075	408.8436	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	6.6400	23.7835	0.6800	0.7000	0.7700	52.0935	(76)

Solar gains	52.0935	90.5491	146.7062	215.9115	254.4951	279.3109	260.9848	228.8358	179.9437	113.3085	63.9852	43.0855	(83)
Total gains	470.0045	506.6636	551.2765	598.8169	616.5683	622.4703	593.0171	563.3481	525.4156	478.1977	452.3927	451.9291	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	61.6292	
alpha	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	5.1086	
util living area													
	0.9073	0.8704	0.7832	0.6492	0.4920	0.3253	0.2300	0.2544	0.4358	0.6796	0.8538	0.9199	(86)
MIT	20.4892	20.6125	20.7987	20.9287	20.9844	20.9985	20.9998	20.9997	20.9932	20.9260	20.7016	20.4399	(87)
Th 2	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	20.2474	(88)
util rest of house													
	0.8929	0.8519	0.7563	0.6145	0.4521	0.2834	0.1857	0.2078	0.3874	0.6381	0.8303	0.9069	(89)
MIT 2	19.6790	19.8255	20.0402	20.1804	20.2349	20.2465	20.2473	20.2473	20.2429	20.1812	19.9343	19.6198	(90)
Living area fraction									fLA = Living area / (4) =			0.4776	(91)
MIT	20.0660	20.2014	20.4025	20.5378	20.5929	20.6056	20.6067	20.6066	20.6013	20.5369	20.3008	20.0115	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0660	20.2014	20.4025	20.5378	20.5929	20.6056	20.6067	20.6066	20.6013	20.5369	20.3008	20.0115	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8891	0.8507	0.7620	0.6281	0.4705	0.3033	0.2068	0.2301	0.4103	0.6545	0.8320	0.9024	(94)
Useful gains	417.8877	431.0011	420.0844	376.1181	290.1150	188.8195	122.6533	129.6230	215.5592	312.9642	376.4086	407.8368	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	541.0846	524.8315	468.8937	393.1603	293.6284	189.1192	122.6844	129.6780	216.9544	330.1544	447.8414	542.6760	(97)
Space heating kWh													
	91.6585	63.0540	36.3141	12.2704	2.6140	0.0000	0.0000	0.0000	0.0000	12.7895	51.4316	100.3204	(98a)
Space heating requirement - total per year (kWh/year)												370.4525	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	91.6585	63.0540	36.3141	12.2704	2.6140	0.0000	0.0000	0.0000	0.0000	12.7895	51.4316	100.3204	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												370.4525	
Space heating per m2										(98c) / (4) =		8.5436	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)

Fraction of space heat from community system 1.0000 (302)

Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)

Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)

Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)

Distribution loss factor (Table 12c) for community heating system 1.5000 (306)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

Space heating:

Space heating requirement													
	91.6585	63.0540	36.3141	12.2704	2.6140	0.0000	0.0000	0.0000	0.0000	12.7895	51.4316	100.3204	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	137.4878	94.5810	54.4711	18.4056	3.9210	0.0000	0.0000	0.0000	0.0000	19.1843	77.1474	150.4806	
Space heating requirement													
	137.4878	94.5810	54.4711	18.4056	3.9210	0.0000	0.0000	0.0000	0.0000	19.1843	77.1474	150.4806	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement													
	214.6882	190.1982	202.6545	179.3121	174.6530	158.2600	156.7058	162.3469	163.5105	181.2971	191.5583	212.4677	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	
Water heating fuel													
	322.0323	285.2973	303.9818	268.9682	261.9796	237.3900	235.0587	243.5203	245.2657	271.9456	287.3375	318.7016	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.2957	1.1703	1.2957	1.2539	1.2957	1.2539	1.2957	1.2957	1.2539	1.2957	1.2539	1.2957	(331)

Lighting	15.4485	12.3934	11.1589	8.1755	6.3150	5.1594	5.7607	7.4880	9.7262	12.7613	14.4138	15.8779	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-16.5669	-24.0727	-38.8745	-48.0493	-52.9789	-51.6524	-50.3986	-46.8694	-39.7890	-30.3128	-18.7591	-13.8902	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-7.4316	-15.8925	-38.3705	-69.5238	-96.2615	-109.4663	-104.0915	-84.3722	-54.5598	-26.6835	-10.2713	-5.6085	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	555.6787	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3281.4784	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	5.5568	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.4720, total flow = 21.0000, SFP = 0.1177)		
mechanical ventilation fans (SFP = 0.1177)	15.2561	(330a)
Total electricity for the above, kWh/year	15.2561	(331)
Electricity for lighting (calculated in Appendix L)	124.6784	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2922.3447	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	555.6787	6.5500	36.3970	(340a)
Space heating total			36.3970	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3281.4784	6.5500	214.9368	(342a)
Water heating total			214.9368	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	15.2561	28.4300	4.3373	(349)
Energy for lighting	124.6784	28.4300	35.4461	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	28.4300	-122.8784	
PV Unit electricity exported	-622.5330	5.8100	-36.1692	
Total			-159.0476	(352)
Total energy cost			236.0696	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1023.2419	0.1580	23.4170	(367)
Electrical energy for heat distribution (space & water)	5.5568	0.0000	5.4960	(372)
Overall CO2 factor for heat network			0.0396	(386)
Total CO2 associated with community systems			152.0564	(373)
Space and water heating			152.0564	(376)
Pumps, fans and electric keep-hot	15.2561	0.1387	2.1162	(378)
Energy for lighting	124.6784	0.1443	17.9950	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	0.1330	-57.4796	
PV Unit electricity exported	-622.5330	0.1218	-75.7970	
Total			-133.2765	(380)
Total CO2, kg/year			38.8911	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1023.2419	1.5850	234.8652	(467)
Electrical energy for heat distribution (space & water)	5.5568	0.0000	58.6972	(472)
Overall CO2 factor for heat network			0.4232	(486)
Total CO2 associated with community systems			1623.9554	(473)
Space and water heating			1623.9554	(476)
Pumps, fans and electric keep-hot	15.2561	1.5128	23.0795	(478)
Energy for lighting	124.6784	1.5338	191.2360	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-432.2140	1.4914	-644.6094	
PV Unit electricity exported	-622.5330	0.4467	-278.0656	
Total			-922.6749	(480)
Total Primary energy kWh/year			915.5959	(483)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	80 C	**DER**	4.06	**TER**	11.60
Environmental	97 A	**% DER < TER**			65.00
CO_2 Emissions (t/year)	0.28	**DFEE**	32.26	**TFEE**	34.75
Compliance Check	See BREL	**% DFEE < TFEE**			7.18
% DPER < TPER	29.73	**DPER**	42.71	**TPER**	60.78

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation		0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 4.9323 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)											Total = Sum(45)m =	1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =		2611.4378	(64)
12Total per year (kWh/year)												2611	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)
Total internal gains	529.9009	542.3600	519.8296	502.5508	478.2395	462.4112	445.5913	446.6965	459.7372	474.1489	501.8869	519.6574	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	19.6403	0.7300	0.7000	0.7700	33.6625	(76)
South	1.2200	46.7521	0.7300	0.7000	0.7700	20.1983	(78)
West	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	62.3460	115.5295	177.9208	245.6563	292.3231	296.2018	283.1911	248.4906	201.9391	133.5132	76.4951	52.1134	(83)
Total gains	592.2469	657.8895	697.7504	748.2071	770.5625	758.6130	728.7825	695.1871	661.6764	607.6621	578.3820	571.7708	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9698	0.9526	0.9232	0.8534	0.7347	0.5640	0.4180	0.4552	0.6658	0.8720	0.9499	0.9736	(86)
MIT	19.7189	19.9202	20.1972	20.5449	20.8105	20.9510	20.9887	20.9838	20.9030	20.5685	20.0855	19.6663	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9639	0.9437	0.9086	0.8258	0.6875	0.4953	0.3366	0.3717	0.5991	0.8419	0.9389	0.9684	(89)
MIT 2	18.6269	18.8787	19.2223	19.6400	19.9380	20.0752	20.1038	20.1010	20.0355	19.6767	19.0895	18.5609	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.0275	19.2607	19.5799	19.9719	20.2580	20.3965	20.4284	20.4249	20.3537	20.0039	19.4548	18.9663	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0275	19.2607	19.5799	19.9719	20.2580	20.3965	20.4284	20.4249	20.3537	20.0039	19.4548	18.9663	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9549	0.9333	0.8984	0.8211	0.6959	0.5181	0.3662	0.4018	0.6183	0.8379	0.9290	0.9599	(94)
Useful gains	565.5297	614.0072	626.8502	614.3782	536.2121	393.0377	266.8678	279.3425	409.1146	509.1454	537.3214	548.8532	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1037.5493	1011.7139	921.4784	780.0171	602.9125	408.3613	269.7090	283.5514	440.5723	662.5018	870.3961	1040.2886	(97)
Space heating kWh	351.1826	267.2589	219.2033	119.2600	49.6251	0.0000	0.0000	0.0000	0.0000	114.0972	239.8138	365.6279	(98a)
Space heating requirement - total per year (kWh/year)												1726.0688	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	351.1826	267.2589	219.2033	119.2600	49.6251	0.0000	0.0000	0.0000	0.0000	114.0972	239.8138	365.6279	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1726.0688	
Space heating per m2											(98c) / (4) =	23.7489	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	351.1826	267.2589	219.2033	119.2600	49.6251	0.0000	0.0000	0.0000	0.0000	114.0972	239.8138	365.6279	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	526.7739	400.8883	328.8050	178.8900	74.4376	0.0000	0.0000	0.0000	0.0000	171.1457	359.7208	548.4418	
Space heating requirement													
	526.7739	400.8883	328.8050	178.8900	74.4376	0.0000	0.0000	0.0000	0.0000	171.1457	359.7208	548.4418	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	
Water heating fuel													
	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												2589.1032	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3917.1568	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												25.8910	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.9861	(330a)
Total electricity for the above, kWh/year												19.9861	(331)
Electricity for lighting (calculated in Appendix L)												193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												6719.6862	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1735.0027	0.1555	107.3894	(367)
Electrical energy for heat distribution (space & water)	25.8910	0.0000	9.5450	(372)
Overall CO2 factor for heat network			0.0406	(386)
Total CO2 associated with community systems			264.0773	(373)
Space and water heating			264.0773	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Total CO2, kg/year			294.7690	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.0600	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1735.0027	1.5758	1088.0033	(467)
Electrical energy for heat distribution (space & water)	25.8910	0.0000	100.3747	(472)
Overall CO2 factor for heat network			0.4268	(486)
Total CO2 associated with community systems			2777.0325	(473)
Space and water heating			2777.0325	(476)
Pumps, fans and electric keep-hot	19.9861	1.5128	30.2350	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Total Primary energy kWh/year			3103.9725	(483)
Dwelling Primary energy Rate (DPER)			42.7100	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4185	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3243	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4135	0.4054	0.3973	0.3568	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3649	0.3811	(22b)
Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			7.2800	1.1450	8.3359			(27)
Heatloss floor			36.3400	0.1300	4.7242			(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.1800	14.8338			(29a)
500mm mineral wool	36.3400		36.3400	0.1100	3.9974			(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.9313			(33)
Main dwelling								

Party Wall	26.9500	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	3.6500	0.0500	0.1825
E3 Sill	2.7400	0.0500	0.1370
E4 Jamb	14.8400	0.0500	0.7420
E5 Ground floor (normal)	18.7200	0.1600	2.9952
E6 Intermediate floor within a dwelling	18.7200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.7200	0.0600	1.1232
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	5.5000	0.0800	0.4400
P2 Party wall - Intermediate floor within a dwelling	5.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	5.5000	0.1200	0.6600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8399 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 41.7712 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.4047	34.2096	34.0184	33.1202	32.9522	32.1700	32.1700	32.0251	32.4713	32.9522	33.2921	33.6475	(38)
Heat transfer coeff	76.1759	75.9808	75.7896	74.8914	74.7234	73.9411	73.9411	73.7963	74.2424	74.7234	75.0633	75.4187	(39)

Average = Sum(39)m / 12 = 74.8906

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0481	1.0454	1.0428	1.0304	1.0281	1.0174	1.0174	1.0154	1.0215	1.0281	1.0328	1.0377	(40)
HLP (average)												1.0304	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 118.0387 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	249.9662	221.0368	234.6117	205.6045	198.8885	178.7466	175.9929	183.1904	185.4473	207.3672	221.2297	247.1336	(62)
WWHRS	-28.7738	-25.4478	-26.6475	-22.0651	-20.5639	-17.5967	-16.4941	-17.5398	-18.2062	-21.4631	-24.3151	-28.2410	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
										Total per year (kWh/year) = Sum(64)m =		2241.8614	(64)
12Total per year (kWh/year)												2242	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	104.8969	93.1698	99.7915	89.4439	87.9135	80.5137	80.3008	82.6939	82.7417	90.7327	94.6393	103.9551	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	140.9904	138.6456	134.1284	124.2277	118.1634	111.8245	107.9311	111.1477	114.9190	121.9526	131.4435	139.7245	(72)
Total internal gains	523.5655	536.0247	513.4942	496.2155	471.9041	453.0758	436.2560	437.3612	450.4018	467.8135	495.5515	513.3220	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

East			4.8400		19.6403		0.6300		0.7000		0.7700		29.0512 (76)
South			1.2200		46.7521		0.6300		0.7000		0.7700		17.4314 (78)
West			1.2200		19.6403		0.6300		0.7000		0.7700		7.3228 (80)
Solar gains	53.8055	99.7035	153.5481	212.0047	252.2788	255.6262	244.3978	214.4508	174.2762	115.2237	66.0163	44.9746	(83)
Total gains	577.3710	635.7282	667.0423	708.2202	724.1829	708.7020	680.6538	651.8119	624.6781	583.0372	561.5678	558.2966	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3060	43.4172	43.5268	44.0488	44.1478	44.6149	44.6149	44.7025	44.4338	44.1478	43.9479	43.7408	
alpha	3.8871	3.8945	3.9018	3.9366	3.9432	3.9743	3.9743	3.9802	3.9623	3.9432	3.9299	3.9161	
util living area	0.9741	0.9609	0.9387	0.8824	0.7809	0.6163	0.4644	0.5014	0.7127	0.8939	0.9575	0.9770	(86)
MIT	19.5207	19.7226	20.0131	20.4110	20.7289	20.9234	20.9805	20.9735	20.8593	20.4638	19.9418	19.4919	(87)
Th 2	20.0434	20.0457	20.0478	20.0581	20.0600	20.0689	20.0689	20.0706	20.0655	20.0600	20.0561	20.0521	(88)
util rest of house	0.9689	0.9530	0.9260	0.8576	0.7350	0.5425	0.3719	0.4081	0.6445	0.8665	0.9477	0.9723	(89)
MIT 2	18.3320	18.5872	18.9520	19.4446	19.8114	20.0153	20.0599	20.0574	19.9569	19.5178	18.8737	18.3016	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.7680	19.0037	19.3413	19.7991	20.1480	20.3484	20.3976	20.3935	20.2879	19.8648	19.2655	18.7382	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7680	19.0037	19.3413	19.7991	20.1480	20.3484	20.3976	20.3935	20.2879	19.8648	19.2655	18.7382	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9597	0.9423	0.9145	0.8498	0.7396	0.5656	0.4053	0.4414	0.6618	0.8599	0.9373	0.9638	(94)
Useful gains	554.1097	599.0361	610.0335	601.8307	535.6184	400.8363	275.8511	287.7137	413.4292	501.3446	526.3683	538.0705	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1102.1140	1071.6086	973.2330	816.2508	631.2611	425.0408	280.7995	294.7018	459.4050	692.2961	913.1821	1096.4542	(97)
Space heating kWh	407.7152	317.5688	270.2204	154.3825	71.1582	0.0000	0.0000	0.0000	0.0000	142.0679	278.5059	415.4375	(98a)
Space heating requirement - total per year (kWh/year)												2057.0563	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	407.7152	317.5688	270.2204	154.3825	71.1582	0.0000	0.0000	0.0000	0.0000	142.0679	278.5059	415.4375	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2057.0563	
Space heating per m2											(98c) / (4) =	28.3029	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	407.7152	317.5688	270.2204	154.3825	71.1582	0.0000	0.0000	0.0000	0.0000	142.0679	278.5059	415.4375	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	441.7283	344.0615	292.7631	167.2616	77.0945	0.0000	0.0000	0.0000	0.0000	153.9198	301.7399	450.0948	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4120	85.1401	84.6481	83.6744	82.1755	79.8000	79.8000	79.8000	79.8000	83.4643	84.8370	85.4735	(217)
Fuel for water heating, kWh/month	258.9710	229.7261	245.6810	219.3495	217.0045	201.9422	199.8732	207.5821	209.5753	222.7349	232.1094	256.0942	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.6146	19.7468	17.7798	13.0262	10.0618	8.2206	9.1787	11.9309	15.4970	20.3329	22.9660	25.2988	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-34.1427	-48.1921	-69.3402	-78.0353	-84.2042	-78.6248	-77.6860	-73.3488	-65.6465	-55.1924	-37.5712	-29.5143	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.0663	-40.1520	-79.8860	-120.0915	-158.8866	-159.6687	-157.7568	-133.4905	-97.7594	-57.4135	-25.4553	-15.0706	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2228.6634	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	

Water heating fuel used	2700.6435	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	198.6542	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1796.1956	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3417.7656	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2228.6634	0.2100	468.0193	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2700.6435	0.2100	567.1351	(264)
Space and water heating			1035.1545	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	198.6542	0.1443	28.6719	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	0.1346	-98.4313	
PV Unit electricity exported	-1064.6971	0.1259	-134.0169	
Total			-232.4482	(269)
Total CO2, kg/year			843.3075	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.6000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2228.6634	1.1300	2518.3897	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2700.6435	1.1300	3051.7272	(278)
Space and water heating			5570.1168	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	198.6542	1.5338	304.7025	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	1.4973	-1095.2830	
PV Unit electricity exported	-1064.6971	0.4620	-491.9332	
Total			-1587.2162	(283)
Total Primary energy kWh/year			4417.7039	(286)
Target Primary Energy Rate (TPER)			60.7800	(287)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	80 C	**DER**	4.06	**TER**	11.60
Environmental	97 A	**% DER < TER**			65.00
CO_2 Emissions (t/year)	0.28	**DFEE**	32.26	**TFEE**	34.75
Compliance Check	See BREL	**% DFEE < TFEE**			7.18
% DPER < TPER	29.73	**DPER**	42.71	**TPER**	60.78

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		3 * 10 =	30.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1685	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.3185	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2468	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3147	0.3085	0.3024	0.2715	0.2653	0.2345	0.2345	0.2283	0.2468	0.2653	0.2777	0.2900	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5495	0.5476	0.5457	0.5369	0.5352	0.5275	0.5275	0.5261	0.5305	0.5352	0.5386	0.5421	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		11875.9502	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							163.4005	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							4.9323	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.2906	32.1776	32.0668	31.5466	31.4493	30.9963	30.9963	30.9124	31.1708	31.4493	31.6462	31.8520	(38)
Heat transfer coeff	73.3597	73.2467	73.1359	72.6157	72.5184	72.0654	72.0654	71.9815	72.2399	72.5184	72.7153	72.9211	(39)
Average = Sum(39)m / 12 =												72.6153	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0094	1.0078	1.0063	0.9991	0.9978	0.9915	0.9915	0.9904	0.9939	0.9978	1.0005	1.0033	(40)
HLP (average)												0.9991	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 60.0096 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.4702	63.6744	61.7137	59.2732	57.0961	54.8336	54.3634	56.3200	58.3269	60.6504	63.1125	65.3783	(44)
Energy conte	103.6888	90.6715	94.8517	81.1421	76.8624	67.4243	65.7478	69.7360	71.9229	82.3020	89.9153	102.3666	(45)
Energy content (annual)										Total = Sum(45)m =		996.6312	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(62)

WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(64)
								Total per year (kWh/year) = Sum(64)m =			847.1365	(64)
12Total per year (kWh/year)											847	(64)	

Electric shower(s)

50.4049	44.9112	49.0413	46.7995	47.6777	45.4799	46.9959	47.6777	46.7995	49.0413	48.1191	50.4049	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 573.3528 (64a)

Heat gains from water heating, kWh/month

34.6351	30.4955	32.4163	28.9426	28.2527	25.6976	25.7204	26.7383	26.9835	29.7495	31.1368	34.3541	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	46.5525	45.3802	43.5703	40.1980	37.9740	35.6912	34.5704	35.9386	37.4771	39.9859	43.2455	46.1749	(72)
Total internal gains	426.1276	439.7593	419.9362	409.1858	388.7147	376.9424	362.8952	362.1520	372.9599	382.8469	404.3535	416.7724	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	19.6403	0.7300	0.7000	0.7700	33.6625	(76)
South	1.2200	46.7521	0.7300	0.7000	0.7700	20.1983	(78)
West	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(80)

Solar gains	62.3460	115.5295	177.9208	245.6563	292.3231	296.2018	283.1911	248.4906	201.9391	133.5132	76.4951	52.1134	(83)
Total gains	488.4737	555.2888	597.8569	654.8421	681.0378	673.1442	646.0863	610.6426	574.8991	516.3600	480.8487	468.8858	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	44.9685	45.0379	45.1061	45.4292	45.4902	45.7762	45.7762	45.8295	45.6656	45.4902	45.3670	45.2389	
alpha	3.9979	4.0025	4.0071	4.0286	4.0327	4.0517	4.0517	4.0553	4.0444	4.0327	4.0245	4.0159	
util living area	0.9846	0.9734	0.9535	0.8991	0.7974	0.6304	0.4764	0.5205	0.7409	0.9196	0.9730	0.9868	(86)

MIT	19.4333	19.6547	19.9666	20.3880	20.7226	20.9221	20.9804	20.9719	20.8467	20.4101	19.8544	19.3924	(87)
Th 2	20.0755	20.0768	20.0781	20.0841	20.0852	20.0904	20.0904	20.0914	20.0884	20.0852	20.0829	20.0806	(88)
util rest of house													
	0.9814	0.9679	0.9434	0.8770	0.7535	0.5576	0.3841	0.4266	0.6751	0.8973	0.9664	0.9841	(89)
MIT 2	18.6483	18.8675	19.1742	19.5819	19.8848	20.0474	20.0832	20.0803	19.9943	19.6111	19.0713	18.6116	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.9362	19.1562	19.4649	19.8776	20.1921	20.3682	20.4123	20.4074	20.3070	19.9042	19.3586	18.8980	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9362	19.1562	19.4649	19.8776	20.1921	20.3682	20.4123	20.4074	20.3070	19.9042	19.3586	18.8980	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9761	0.9610	0.9354	0.8713	0.7591	0.5808	0.4175	0.4602	0.6920	0.8921	0.9598	0.9793	(94)
Useful gains	476.8221	533.6102	559.2201	570.5454	516.9580	390.9736	269.7288	281.0180	397.8519	460.6557	461.5066	459.1979	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1073.7082	1044.2200	948.1965	797.1465	615.8319	415.6902	274.7349	288.4563	448.3907	674.7235	891.3847	1071.7964	(97)
Space heating kWh													
	444.0833	343.1298	289.3984	163.1528	73.5622	0.0000	0.0000	0.0000	0.0000	159.2664	309.5122	455.7733	(98a)
Space heating requirement - total per year (kWh/year)												2237.8785	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	444.0833	343.1298	289.3984	163.1528	73.5622	0.0000	0.0000	0.0000	0.0000	159.2664	309.5122	455.7733	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2237.8785	
Space heating per m2											(98c) / (4) =	30.7908	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	677.4144	533.2836	547.0591	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8309	0.8946	0.8707	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	562.8935	477.0793	476.2994	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	730.2120	701.3194	662.3353	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	120.4693	166.8346	138.4108	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	30.1173	41.7087	34.6027	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												106.4287	(107)
Energy for space heating												30.7908	(99)
Energy for space cooling												1.4643	(108)
Total												32.2552	(109)
Fabric Energy Efficiency (DFEE)												32.3	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor		36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

		m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)	
Number of open flues	0 * 20 =	0.0000	(6b)	
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)	
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)	
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)	
Number of blocked chimneys	0 * 20 =	0.0000	(6f)	
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)	
Number of passive vents	0 * 10 =	0.0000	(7b)	
Number of flueless gas fires	0 * 40 =	0.0000	(7c)	
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)	
Pressure test		Yes		
Pressure Test Method		Blower Door		
Measured/design AP50		5.0000	(17)	
Infiltration rate		0.4185	(18)	
Number of sides sheltered		3	(19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3243	(21)	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4135	0.4054	0.3973	0.3568	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3649	0.3811	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			7.2800	1.1450	8.3359			(27)
Heatloss floor			36.3400	0.1300	4.7242			(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.1800	14.8338			(29a)
500mm mineral wool	36.3400		36.3400	0.1100	3.9974			(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.9313			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	3.6500	0.0500	0.1825
E3 Sill	2.7400	0.0500	0.1370
E4 Jamb	14.8400	0.0500	0.7420
E5 Ground floor (normal)	18.7200	0.1600	2.9952
E6 Intermediate floor within a dwelling	18.7200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.7200	0.0600	1.1232
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	5.5000	0.0800	0.4400
P2 Party wall - Intermediate floor within a dwelling	5.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	5.5000	0.1200	0.6600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8399 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.7712 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.4047	34.2096	34.0184	33.1202	32.9522	32.1700	32.1700	32.0251	32.4713	32.9522	33.2921	33.6475	(38)
Heat transfer coeff	76.1759	75.9808	75.7896	74.8914	74.7234	73.9411	73.9411	73.7963	74.2424	74.7234	75.0633	75.4187	(39)
Average = Sum(39)m / 12 =												74.8906	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0481	1.0454	1.0428	1.0304	1.0281	1.0174	1.0174	1.0154	1.0215	1.0281	1.0328	1.0377	(40)
HLP (average)												1.0304	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 60.0096 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.4702	63.6744	61.7137	59.2732	57.0961	54.8336	54.3634	56.3200	58.3269	60.6504	63.1125	65.3783	(44)
Energy conte	103.6888	90.6715	94.8517	81.1421	76.8624	67.4243	65.7478	69.7360	71.9229	82.3020	89.9153	102.3666	(45)
Energy content (annual)										Total = Sum(45)m =		996.6312	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(64)
								Total per year (kWh/year) = Sum(64)m =			847.1365	(64)
12Total per year (kWh/year)											847	(64)	

Electric shower(s)

50.4049	44.9112	49.0413	46.7995	47.6777	45.4799	46.9959	47.6777	46.7995	49.0413	48.1191	50.4049	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				573.3528	(64a)

Heat gains from water heating, kWh/month

34.6351	30.4955	32.4163	28.9426	28.2527	25.6976	25.7204	26.7383	26.9835	29.7495	31.1368	34.3541	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)													
	46.5525	45.3802	43.5703	40.1980	37.9740	35.6912	34.5704	35.9386	37.4771	39.9859	43.2455	46.1749	(72)
Total internal gains													
	426.1276	439.7593	419.9362	409.1858	388.7147	376.9424	362.8952	362.1520	372.9599	382.8469	404.3535	416.7724	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	19.6403	0.6300	0.7000	0.7700	29.0512	(76)
South	1.2200	46.7521	0.6300	0.7000	0.7700	17.4314	(78)
West	1.2200	19.6403	0.6300	0.7000	0.7700	7.3228	(80)

Solar gains	53.8055	99.7035	153.5481	212.0047	252.2788	255.6262	244.3978	214.4508	174.2762	115.2237	66.0163	44.9746	(83)
Total gains	479.9331	539.4628	573.4842	621.1905	640.9935	632.5686	607.2930	576.6028	547.2362	498.0706	470.3699	461.7470	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3060	43.4172	43.5268	44.0488	44.1478	44.6149	44.6149	44.7025	44.4338	44.1478	43.9479	43.7408	
alpha	3.8871	3.8945	3.9018	3.9366	3.9432	3.9743	3.9743	3.9802	3.9623	3.9432	3.9299	3.9161	
util living area													
	0.9858	0.9765	0.9606	0.9158	0.8286	0.6703	0.5139	0.5571	0.7713	0.9301	0.9755	0.9877	(86)
MIT	19.3345	19.5472	19.8560	20.2937	20.6568	20.8965	20.9722	20.9616	20.8107	20.3424	19.7768	19.3051	(87)
Th 2	20.0434	20.0457	20.0478	20.0581	20.0600	20.0689	20.0689	20.0706	20.0655	20.0600	20.0561	20.0521	(88)
util rest of house													
	0.9827	0.9715	0.9517	0.8961	0.7873	0.5956	0.4143	0.4572	0.7066	0.9097	0.9694	0.9851	(89)
MIT 2	18.5268	18.7385	19.0439	19.4739	19.8085	20.0109	20.0586	20.0553	19.9475	19.5283	18.9752	18.5040	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.8231	19.0351	19.3418	19.7746	20.1196	20.3357	20.3937	20.3877	20.2642	19.8269	19.2692	18.7979	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8231	19.0351	19.3418	19.7746	20.1196	20.3357	20.3937	20.3877	20.2642	19.8269	19.2692	18.7979	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9776	0.9647	0.9436	0.8892	0.7902	0.6182	0.4501	0.4926	0.7217	0.9037	0.9629	0.9804	(94)
Useful gains	469.1756	520.4295	541.1549	552.3676	506.5082	391.0515	273.3508	284.0123	394.9171	450.0999	452.9016	452.6979	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1106.3081	1073.9997	973.2745	814.4159	629.1446	424.1071	280.5132	294.2801	457.6422	689.4660	913.4615	1100.9515	(97)
Space heating kWh													
	474.0266	371.9992	321.4969	188.6748	91.2415	0.0000	0.0000	0.0000	0.0000	178.0884	331.6032	482.3006	(98a)
Space heating requirement - total per year (kWh/year)												2439.4312	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	474.0266	371.9992	321.4969	188.6748	91.2415	0.0000	0.0000	0.0000	0.0000	178.0884	331.6032	482.3006	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2439.4312	
Space heating per m2											(98c) / (4) =	33.5640	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	695.0467	547.1644	560.8517	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7918	0.8643	0.8386	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	550.3351	472.8936	470.3361	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	682.7860	655.9765	622.5485	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	95.3646	136.2137	113.2460	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	23.8412	34.0534	28.3115	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												86.2061	(107)
Energy for space heating												33.5640	(99)
Energy for space cooling												1.1861	(108)
Total												34.7501	(109)
Fabric Energy Efficiency (TFEE)												34.8	(109)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	80 C	**DER**	4.06	**TER**	11.60
Environmental	97 A	**% DER < TER**			65.00
CO_2 Emissions (t/year)	0.28	**DFEE**	32.26	**TFEE**	34.75
Compliance Check	See BREL	**% DFEE < TFEE**			7.18
% DPER < TPER	29.73	**DPER**	42.71	**TPER**	60.78

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation		0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 4.9323 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)											Total = Sum(45)m =	1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =		2611.4378	(64)
12Total per year (kWh/year)												2611	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)
Total internal gains	529.9009	542.3600	519.8296	502.5508	478.2395	462.4112	445.5913	446.6965	459.7372	474.1489	501.8869	519.6574	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	19.6403	0.7300	0.7000	0.7700	33.6625	(76)
South	1.2200	46.7521	0.7300	0.7000	0.7700	20.1983	(78)
West	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	62.3460	115.5295	177.9208	245.6563	292.3231	296.2018	283.1911	248.4906	201.9391	133.5132	76.4951	52.1134	(83)
Total gains	592.2469	657.8895	697.7504	748.2071	770.5625	758.6130	728.7825	695.1871	661.6764	607.6621	578.3820	571.7708	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9698	0.9526	0.9232	0.8534	0.7347	0.5640	0.4180	0.4552	0.6658	0.8720	0.9499	0.9736	(86)
MIT	19.7189	19.9202	20.1972	20.5449	20.8105	20.9510	20.9887	20.9838	20.9030	20.5685	20.0855	19.6663	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9639	0.9437	0.9086	0.8258	0.6875	0.4953	0.3366	0.3717	0.5991	0.8419	0.9389	0.9684	(89)
MIT 2	18.6269	18.8787	19.2223	19.6400	19.9380	20.0752	20.1038	20.1010	20.0355	19.6767	19.0895	18.5609	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.0275	19.2607	19.5799	19.9719	20.2580	20.3965	20.4284	20.4249	20.3537	20.0039	19.4548	18.9663	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0275	19.2607	19.5799	19.9719	20.2580	20.3965	20.4284	20.4249	20.3537	20.0039	19.4548	18.9663	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9549	0.9333	0.8984	0.8211	0.6959	0.5181	0.3662	0.4018	0.6183	0.8379	0.9290	0.9599	(94)
Useful gains	565.5297	614.0072	626.8502	614.3782	536.2121	393.0377	266.8678	279.3425	409.1146	509.1454	537.3214	548.8532	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1037.5493	1011.7139	921.4784	780.0171	602.9125	408.3613	269.7090	283.5514	440.5723	662.5018	870.3961	1040.2886	(97)
Space heating kWh	351.1826	267.2589	219.2033	119.2600	49.6251	0.0000	0.0000	0.0000	0.0000	114.0972	239.8138	365.6279	(98a)
Space heating requirement - total per year (kWh/year)												1726.0688	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	351.1826	267.2589	219.2033	119.2600	49.6251	0.0000	0.0000	0.0000	0.0000	114.0972	239.8138	365.6279	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1726.0688	
Space heating per m2											(98c) / (4) =	23.7489	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	351.1826	267.2589	219.2033	119.2600	49.6251	0.0000	0.0000	0.0000	0.0000	114.0972	239.8138	365.6279	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	526.7739	400.8883	328.8050	178.8900	74.4376	0.0000	0.0000	0.0000	0.0000	171.1457	359.7208	548.4418	
Space heating requirement													
	526.7739	400.8883	328.8050	178.8900	74.4376	0.0000	0.0000	0.0000	0.0000	171.1457	359.7208	548.4418	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	
Water heating fuel													
	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												2589.1032	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3917.1568	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												25.8910	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.9861	(330a)
Total electricity for the above, kWh/year												19.9861	(331)
Electricity for lighting (calculated in Appendix L)												193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												6719.6862	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1735.0027	0.1555	107.3894	(367)
Electrical energy for heat distribution (space & water)	25.8910	0.0000	9.5450	(372)
Overall CO2 factor for heat network			0.0406	(386)
Total CO2 associated with community systems			264.0773	(373)
Space and water heating			264.0773	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Total CO2, kg/year			294.7690	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.0600	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1735.0027	1.5758	1088.0033	(467)
Electrical energy for heat distribution (space & water)	25.8910	0.0000	100.3747	(472)
Overall CO2 factor for heat network			0.4268	(486)
Total CO2 associated with community systems			2777.0325	(473)
Space and water heating			2777.0325	(476)
Pumps, fans and electric keep-hot	19.9861	1.5128	30.2350	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Total Primary energy kWh/year			3103.9725	(483)
Dwelling Primary energy Rate (DPER)			42.7100	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4185	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3243	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4135	0.4054	0.3973	0.3568	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3649	0.3811	(22b)
Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			7.2800	1.1450	8.3359			(27)
Heatloss floor			36.3400	0.1300	4.7242			(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.1800	14.8338			(29a)
500mm mineral wool	36.3400		36.3400	0.1100	3.9974			(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.9313			(33)
Main dwelling								

Party Wall	26.9500	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	3.6500	0.0500	0.1825
E3 Sill	2.7400	0.0500	0.1370
E4 Jamb	14.8400	0.0500	0.7420
E5 Ground floor (normal)	18.7200	0.1600	2.9952
E6 Intermediate floor within a dwelling	18.7200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.7200	0.0600	1.1232
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	5.5000	0.0800	0.4400
P2 Party wall - Intermediate floor within a dwelling	5.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	5.5000	0.1200	0.6600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8399 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 41.7712 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.4047	34.2096	34.0184	33.1202	32.9522	32.1700	32.1700	32.0251	32.4713	32.9522	33.2921	33.6475	(38)
Heat transfer coeff	76.1759	75.9808	75.7896	74.8914	74.7234	73.9411	73.9411	73.7963	74.2424	74.7234	75.0633	75.4187	(39)

Average = Sum(39)m / 12 = 74.8906

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0481	1.0454	1.0428	1.0304	1.0281	1.0174	1.0174	1.0154	1.0215	1.0281	1.0328	1.0377	(40)
HLP (average)												1.0304	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 118.0387 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	249.9662	221.0368	234.6117	205.6045	198.8885	178.7466	175.9929	183.1904	185.4473	207.3672	221.2297	247.1336	(62)
WWHRS	-28.7738	-25.4478	-26.6475	-22.0651	-20.5639	-17.5967	-16.4941	-17.5398	-18.2062	-21.4631	-24.3151	-28.2410	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
										Total per year (kWh/year) = Sum(64)m =		2241.8614	(64)
12Total per year (kWh/year)												2242	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	104.8969	93.1698	99.7915	89.4439	87.9135	80.5137	80.3008	82.6939	82.7417	90.7327	94.6393	103.9551	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	140.9904	138.6456	134.1284	124.2277	118.1634	111.8245	107.9311	111.1477	114.9190	121.9526	131.4435	139.7245	(72)
Total internal gains	523.5655	536.0247	513.4942	496.2155	471.9041	453.0758	436.2560	437.3612	450.4018	467.8135	495.5515	513.3220	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

East			4.8400		19.6403		0.6300		0.7000		0.7700		29.0512 (76)
South			1.2200		46.7521		0.6300		0.7000		0.7700		17.4314 (78)
West			1.2200		19.6403		0.6300		0.7000		0.7700		7.3228 (80)
Solar gains	53.8055	99.7035	153.5481	212.0047	252.2788	255.6262	244.3978	214.4508	174.2762	115.2237	66.0163	44.9746	(83)
Total gains	577.3710	635.7282	667.0423	708.2202	724.1829	708.7020	680.6538	651.8119	624.6781	583.0372	561.5678	558.2966	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3060	43.4172	43.5268	44.0488	44.1478	44.6149	44.6149	44.7025	44.4338	44.1478	43.9479	43.7408	
alpha	3.8871	3.8945	3.9018	3.9366	3.9432	3.9743	3.9743	3.9802	3.9623	3.9432	3.9299	3.9161	
util living area	0.9741	0.9609	0.9387	0.8824	0.7809	0.6163	0.4644	0.5014	0.7127	0.8939	0.9575	0.9770	(86)
MIT	19.5207	19.7226	20.0131	20.4110	20.7289	20.9234	20.9805	20.9735	20.8593	20.4638	19.9418	19.4919	(87)
Th 2	20.0434	20.0457	20.0478	20.0581	20.0600	20.0689	20.0689	20.0706	20.0655	20.0600	20.0561	20.0521	(88)
util rest of house	0.9689	0.9530	0.9260	0.8576	0.7350	0.5425	0.3719	0.4081	0.6445	0.8665	0.9477	0.9723	(89)
MIT 2	18.3320	18.5872	18.9520	19.4446	19.8114	20.0153	20.0599	20.0574	19.9569	19.5178	18.8737	18.3016	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.7680	19.0037	19.3413	19.7991	20.1480	20.3484	20.3976	20.3935	20.2879	19.8648	19.2655	18.7382	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7680	19.0037	19.3413	19.7991	20.1480	20.3484	20.3976	20.3935	20.2879	19.8648	19.2655	18.7382	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9597	0.9423	0.9145	0.8498	0.7396	0.5656	0.4053	0.4414	0.6618	0.8599	0.9373	0.9638	(94)
Useful gains	554.1097	599.0361	610.0335	601.8307	535.6184	400.8363	275.8511	287.7137	413.4292	501.3446	526.3683	538.0705	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1102.1140	1071.6086	973.2330	816.2508	631.2611	425.0408	280.7995	294.7018	459.4050	692.2961	913.1821	1096.4542	(97)
Space heating kWh	407.7152	317.5688	270.2204	154.3825	71.1582	0.0000	0.0000	0.0000	0.0000	142.0679	278.5059	415.4375	(98a)
Space heating requirement - total per year (kWh/year)												2057.0563	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	407.7152	317.5688	270.2204	154.3825	71.1582	0.0000	0.0000	0.0000	0.0000	142.0679	278.5059	415.4375	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2057.0563	
Space heating per m2											(98c) / (4) =	28.3029	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	407.7152	317.5688	270.2204	154.3825	71.1582	0.0000	0.0000	0.0000	0.0000	142.0679	278.5059	415.4375	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	441.7283	344.0615	292.7631	167.2616	77.0945	0.0000	0.0000	0.0000	0.0000	153.9198	301.7399	450.0948	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4120	85.1401	84.6481	83.6744	82.1755	79.8000	79.8000	79.8000	79.8000	83.4643	84.8370	85.4735	(217)
Fuel for water heating, kWh/month	258.9710	229.7261	245.6810	219.3495	217.0045	201.9422	199.8732	207.5821	209.5753	222.7349	232.1094	256.0942	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.6146	19.7468	17.7798	13.0262	10.0618	8.2206	9.1787	11.9309	15.4970	20.3329	22.9660	25.2988	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-34.1427	-48.1921	-69.3402	-78.0353	-84.2042	-78.6248	-77.6860	-73.3488	-65.6465	-55.1924	-37.5712	-29.5143	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.0663	-40.1520	-79.8860	-120.0915	-158.8866	-159.6687	-157.7568	-133.4905	-97.7594	-57.4135	-25.4553	-15.0706	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2228.6634	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	

Water heating fuel used	2700.6435	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	198.6542	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1796.1956	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3417.7656	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2228.6634	0.2100	468.0193	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2700.6435	0.2100	567.1351	(264)
Space and water heating			1035.1545	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	198.6542	0.1443	28.6719	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	0.1346	-98.4313	
PV Unit electricity exported	-1064.6971	0.1259	-134.0169	
Total			-232.4482	(269)
Total CO2, kg/year			843.3075	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.6000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2228.6634	1.1300	2518.3897	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2700.6435	1.1300	3051.7272	(278)
Space and water heating			5570.1168	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	198.6542	1.5338	304.7025	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	1.4973	-1095.2830	
PV Unit electricity exported	-1064.6971	0.4620	-491.9332	
Total			-1587.2162	(283)
Total Primary energy kWh/year			4417.7039	(286)
Target Primary Energy Rate (TPER)			60.7800	(287)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	80 C	**DER**	4.06	**TER**	11.60
Environmental	97 A	**% DER < TER**			65.00
CO_2 Emissions (t/year)	0.28	**DFEE**	32.26	**TFEE**	34.75
Compliance Check	See BREL	**% DFEE < TFEE**			7.18
% DPER < TPER	29.73	**DPER**	42.71	**TPER**	60.78

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =	11875.9502			(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							163.4005	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 4.9323 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
									Total per year (kWh/year) = Sum(64)m =			2611.4378	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						0.0000	(64a)
Heat gains from water heating, kWh/month	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)
Total internal gains	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	19.6403	0.7300	0.7000	0.7700	33.6625	(76)
South	1.2200	46.7521	0.7300	0.7000	0.7700	20.1983	(78)
West	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(80)

Solar gains	62.3460	115.5295	177.9208	245.6563	292.3231	296.2018	283.1911	248.4906	201.9391	133.5132	76.4951	52.1134	(83)
Total gains	641.0946	692.0228	737.4137	773.5375	789.0184	764.7577	735.2153	703.6417	673.3447	633.6634	611.2577	616.9578	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area	0.9610	0.9447	0.9106	0.8417	0.7238	0.5602	0.4146	0.4502	0.6573	0.8584	0.9408	0.9661	(86)
MIT	19.8077	19.9778	20.2552	20.5717	20.8210	20.9522	20.9890	20.9845	20.9075	20.5984	20.1401	19.7501	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house	0.9537	0.9346	0.8942	0.8130	0.6762	0.4917	0.3337	0.3674	0.5907	0.8265	0.9283	0.9597	(89)
MIT 2	18.7376	18.9495	19.2916	19.6700	19.9483	20.0761	20.1039	20.1014	20.0391	19.7098	19.1560	18.6657	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.1301	19.3267	19.6451	20.0007	20.2684	20.3975	20.4286	20.4253	20.3577	20.0358	19.5170	19.0635	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1301	19.3267	19.6451	20.0007	20.2684	20.3975	20.4286	20.4253	20.3577	20.0358	19.5170	19.0635	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9438	0.9239	0.8843	0.8091	0.6852	0.5145	0.3631	0.3973	0.6102	0.8235	0.9182	0.9503	(94)
Useful gains	605.0488	639.3765	652.1063	625.8920	540.6287	393.4855	266.9708	279.5459	410.8611	521.8408	561.2602	586.2765	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1044.7817	1016.3608	926.0715	782.0460	603.6439	408.4310	269.7250	283.5830	440.8520	664.7509	874.7761	1047.1300	(97)
Space heating kWh	327.1613	253.3334	203.8301	112.4308	46.8833	0.0000	0.0000	0.0000	0.0000	106.3251	225.7315	342.8750	(98a)
Space heating requirement - total per year (kWh/year)												1618.5706	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	327.1613	253.3334	203.8301	112.4308	46.8833	0.0000	0.0000	0.0000	0.0000	106.3251	225.7315	342.8750	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1618.5706	
Space heating per m2											(98c) / (4) =	22.2698	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	327.1613	253.3334	203.8301	112.4308	46.8833	0.0000	0.0000	0.0000	0.0000	106.3251	225.7315	342.8750 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	490.7420	380.0001	305.7452	168.6463	70.3250	0.0000	0.0000	0.0000	0.0000	159.4877	338.5972	514.3125
Space heating requirement												
	490.7420	380.0001	305.7452	168.6463	70.3250	0.0000	0.0000	0.0000	0.0000	159.4877	338.5972	514.3125 (307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement												
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233
Water heating fuel												
	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975 (331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year		
Space heating fuel - community heating	2427.8559	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3917.1568	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	24.2786	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
Total electricity for the above, kWh/year	19.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	6558.4390	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2427.8559	4.4400	107.7968	(340a)
Space heating total			107.7968	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3917.1568	4.4400	173.9218	(342a)
Water heating total			173.9218	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	16.4900	3.2957	(349)
Energy for lighting	193.4401	16.4900	31.8983	(350)
Additional standing charges			92.0000	(351)
Total energy cost			408.9126	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.2509	(357)
SAP value		79.7226	
SAP rating (Section 12)		80	(358)
SAP band		C	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1692.0034	0.1555	100.6989	(367)
Electrical energy for heat distribution (space & water)	24.2786	0.0000	9.2941	(372)
Overall CO2 factor for heat network			0.0405	(386)
Total CO2 associated with community systems			257.1359	(373)
Space and water heating			257.1359	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Total CO2, kg/year			287.8276	(383)
CO2 emissions per m2			3.9600	(384)
EI value			96.7226	(384a)
EI rating			97	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b) x	2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c) x	2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		4.9323 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3094	(42)
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =		2611.4378	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)
Total internal gains													

	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	23.7835	0.7300	0.7000	0.7700	40.7638	(76)
South	1.2200	54.0600	0.7300	0.7000	0.7700	23.3555	(78)
West	1.2200	23.7835	0.7300	0.7000	0.7700	10.2752	(80)

Solar gains	74.3946	122.6177	186.2329	260.3509	298.7480	324.9059	304.7294	272.3724	223.2097	149.5564	89.9365	62.5313	(83)
Total gains	653.1431	699.1110	745.7259	788.2321	795.4433	793.4618	756.7535	727.5235	694.6153	649.7066	624.6991	627.3756	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area	0.9562	0.9397	0.8988	0.8223	0.6940	0.4982	0.3595	0.3917	0.6209	0.8322	0.9313	0.9622	(86)
MIT	19.8706	20.0296	20.3276	20.6254	20.8555	20.9717	20.9942	20.9917	20.9283	20.6665	20.2144	19.8112	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house	0.9480	0.9287	0.8802	0.7906	0.6428	0.4277	0.2791	0.3090	0.5517	0.7952	0.9167	0.9550	(89)
MIT 2	18.8166	19.0140	19.3796	19.7314	19.9837	20.0914	20.1068	20.1055	20.0572	19.7868	19.2473	18.7425	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.2032	19.3865	19.7274	20.0593	20.3035	20.4143	20.4323	20.4306	20.3767	20.1095	19.6021	19.1345	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2032	19.3865	19.7274	20.0593	20.3035	20.4143	20.4323	20.4306	20.3767	20.1095	19.6021	19.1345	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9378	0.9180	0.8711	0.7887	0.6545	0.4524	0.3085	0.3392	0.5733	0.7952	0.9069	0.9452	(94)
Useful gains	612.5215	641.7586	649.6041	621.6800	520.6318	358.9308	233.4577	246.7594	398.2371	516.6780	566.5337	592.9734	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	1028.7961	999.4399	896.6423	757.9945	570.8920	367.3458	234.7616	248.7300	421.0609	634.7163	852.5898	1031.0004	(97)
Space heating kWh	309.7084	240.3618	183.7964	98.1464	37.3936	0.0000	0.0000	0.0000	0.0000	87.8205	205.9604	325.8921	(98a)
Space heating requirement - total per year (kWh/year)												1489.0795	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	309.7084	240.3618	183.7964	98.1464	37.3936	0.0000	0.0000	0.0000	0.0000	87.8205	205.9604	325.8921	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1489.0795	
Space heating per m2										(98c) / (4) =		20.4882	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	309.7084	240.3618	183.7964	98.1464	37.3936	0.0000	0.0000	0.0000	0.0000	87.8205	205.9604	325.8921	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	464.5625	360.5427	275.6946	147.2196	56.0904	0.0000	0.0000	0.0000	0.0000	131.7308	308.9405	488.8381	
Space heating requirement	464.5625	360.5427	275.6946	147.2196	56.0904	0.0000	0.0000	0.0000	0.0000	131.7308	308.9405	488.8381	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	
Water heating fuel	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2233.6193	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3917.1568	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	22.3362	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
Total electricity for the above, kWh/year	19.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	6364.2023	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2233.6193	6.5500	146.3021	(340a)
Space heating total			146.3021	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3917.1568	6.5500	256.5738	(342a)
Water heating total			256.5738	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	28.4300	5.6821	(349)
Energy for lighting	193.4401	28.4300	54.9950	(350)
Additional standing charges			104.0000	(351)
Total energy cost			567.5529	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1640.2070	0.1559	92.8784	(367)
Electrical energy for heat distribution (space & water)	22.3362	0.0000	9.0008	(372)
Overall CO2 factor for heat network			0.0405	(386)
Total CO2 associated with community systems			249.0222	(373)
Space and water heating			249.0222	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Total CO2, kg/year			279.7139	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1640.2070	1.5773	939.4838	(467)
Electrical energy for heat distribution (space & water)	22.3362	0.0000	94.8052	(472)
Overall CO2 factor for heat network			0.4264	(486)
Total CO2 associated with community systems			2622.9434	(473)
Space and water heating			2622.9434	(476)
Pumps, fans and electric keep-hot	19.9861	1.5128	30.2350	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Total Primary energy kWh/year			2949.8834	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Be Clean

Current energy efficiency rating:	C 80
Current environmental impact rating:	A 97

N	Solar water heating	Recommended
U	Solar photovoltaic panels	Recommended
V2	Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.4	-£ 46	-26 kg (9.3%)
U Solar photovoltaic panels	+ 8.7	-£ 279	-242 kg (95.4%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£46	0.36 kg/m²	B 81	A 97
Solar photovoltaic panels	£279	3.33 kg/m²	B 90	A 100
Total Savings	£325	3.69 kg/m²		

Potential energy efficiency rating:	B 90
Potential environmental impact rating:	A 100

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)

Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£61	£83	-£23
Community scheme	£507	£438	£69
Space heating	£256	£279	-£23
Water heating	£257	£188	£69
Lighting	£55	£55	£0
Generated (PV)	-£0	-£279	£279
Total cost of fuels	£568	£242	£325
Total cost of uses	£568	£243	£325
Delivered energy	88 kWh/m²	48 kWh/m²	39 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.0 tonnes	0.3 tonnes
CO2 emissions per m²	4 kg/m²	0 kg/m²	4 kg/m²
Primary energy	41 kWh/m²	14 kWh/m²	27 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b)	x 2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c)	x 2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		4.9323 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3094	(42)
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)											Total = Sum(45)m =	1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												624.1873	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												624.1873	
Solar input	-0.0000	-16.2194	-58.0608	-80.0094	-105.2873	-97.2929	-96.7392	-84.2620	-57.6788	-28.6375	-0.0000	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.6481	212.6591	185.2328	133.9970	102.2831	89.8555	87.9356	107.6103	136.1704	187.4116	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =		1987.2506	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)
Total internal gains	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	19.6403	0.7300	0.7000	0.7700	33.6625	(76)
South	1.2200	46.7521	0.7300	0.7000	0.7700	20.1983	(78)

West				1.2200	19.6403	0.7300	0.7000		0.7700		8.4852	(80)	
Solar gains	62.3460	115.5295	177.9208	245.6563	292.3231	296.2018	283.1911	248.4906	201.9391	133.5132	76.4951	52.1134	(83)
Total gains	641.0946	692.0228	737.4137	773.5375	789.0184	764.7577	735.2153	703.6417	673.3447	633.6634	611.2577	616.9578	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area	0.9610	0.9447	0.9106	0.8417	0.7238	0.5602	0.4146	0.4502	0.6573	0.8584	0.9408	0.9661	(86)
MIT	19.8077	19.9778	20.2552	20.5717	20.8210	20.9522	20.9890	20.9845	20.9075	20.5984	20.1401	19.7501	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house	0.9537	0.9346	0.8942	0.8130	0.6762	0.4917	0.3337	0.3674	0.5907	0.8265	0.9283	0.9597	(89)
MIT 2	18.7376	18.9495	19.2916	19.6700	19.9483	20.0761	20.1039	20.1014	20.0391	19.7098	19.1560	18.6657	(90)
Living area fraction									fLA = Living area / (4) =			0.3668	(91)
MIT	19.1301	19.3267	19.6451	20.0007	20.2684	20.3975	20.4286	20.4253	20.3577	20.0358	19.5170	19.0635	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1301	19.3267	19.6451	20.0007	20.2684	20.3975	20.4286	20.4253	20.3577	20.0358	19.5170	19.0635	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9438	0.9239	0.8843	0.8091	0.6852	0.5145	0.3631	0.3973	0.6102	0.8235	0.9182	0.9503	(94)
Useful gains	605.0488	639.3765	652.1063	625.8920	540.6287	393.4855	266.9708	279.5459	410.8611	521.8408	561.2602	586.2765	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1044.7817	1016.3608	926.0715	782.0460	603.6439	408.4310	269.7250	283.5830	440.8520	664.7509	874.7761	1047.1300	(97)
Space heating kWh	327.1613	253.3334	203.8301	112.4308	46.8833	0.0000	0.0000	0.0000	0.0000	106.3251	225.7315	342.8750	(98a)
Space heating requirement - total per year (kWh/year)												1618.5706	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	327.1613	253.3334	203.8301	112.4308	46.8833	0.0000	0.0000	0.0000	0.0000	106.3251	225.7315	342.8750	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1618.5706	
Space heating per m2										(98c) / (4) =		22.2698	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	327.1613	253.3334	203.8301	112.4308	46.8833	0.0000	0.0000	0.0000	0.0000	106.3251	225.7315	342.8750	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	490.7420	380.0001	305.7452	168.6463	70.3250	0.0000	0.0000	0.0000	0.0000	159.4877	338.5972	514.3125	
Space heating requirement	490.7420	380.0001	305.7452	168.6463	70.3250	0.0000	0.0000	0.0000	0.0000	159.4877	338.5972	514.3125	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	258.6481	212.6591	185.2328	133.9970	102.2831	89.8555	87.9356	107.6103	136.1704	187.4116	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	318.9886	277.8492	200.9955	153.4247	134.7833	131.9034	161.4154	204.2556	281.1174	344.4473	383.7233	
Water heating fuel	387.9721	318.9886	277.8492	200.9955	153.4247	134.7833	131.9034	161.4154	204.2556	281.1174	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	8.4920	7.6702	8.4920	8.2180	8.4920	8.2180	8.4920	8.4920	8.2180	8.4920	8.2180	8.4920	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-32.5900	-46.4028	-67.4326	-76.6109	-83.1861	-77.8646	-76.8968	-72.3094	-64.2328	-53.4210	-35.9853	-28.1154	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-17.4965	-37.1772	-74.9136	-114.1611	-152.4967	-153.8491	-151.7547	-127.4646	-92.2303	-53.4249	-23.4245	-13.7985	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												2427.8559	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2980.8759	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												24.2786	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.9861	(330a)
pump for solar water heating												80.0000	(330g)
Total electricity for the above, kWh/year												99.9861	(331)
Electricity for lighting (calculated in Appendix L)												193.4401	(332)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1727.2394	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3974.9187	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2427.8559	4.4400	107.7968	(340a)
Space heating total			107.7968	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2980.8759	4.4400	132.3509	(342a)
Water heating total			132.3509	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	16.4900	3.2957	(349)
Pump for solar water heating	80.0000	16.4900	13.1920	(349)
Energy for lighting	193.4401	16.4900	31.8983	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-715.0478	16.4900	-117.9114	
PV Unit electricity exported	-1012.1916	5.5900	-56.5815	
Total			-174.4929	(352)
Total energy cost			206.0408	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.6303	(357)
SAP value		89.7827	
SAP rating (Section 12)		90	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1442.3285	0.1555	100.6989	(367)
Electrical energy for heat distribution (space & water)	24.2786	0.0000	8.1001	(372)
Overall CO2 factor for heat network			0.0414	(386)
Total CO2 associated with community systems			224.1020	(373)
Space and water heating			224.1020	(376)
Pumps, fans and electric keep-hot	99.9861	0.1387	13.8693	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-715.0478	0.1344	-96.0859	
PV Unit electricity exported	-1012.1916	0.1255	-127.0602	
Total			-223.1462	(380)
Total CO2, kg/year			42.7445	(383)
CO2 emissions per m2			0.5900	(384)
EI value			99.5133	(384a)
EI rating			100	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		36.3400	(1b)	x 2.4500	(2b) =	89.0330	(1b) - (3b)
First floor		36.3400	(1c)	x 2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)

Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		4.9323 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)

Water storage loss:		
Store volume		110.0000 (47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)		0.0152 (51)
Volume factor from Table 2a		1.0294 (52)
Temperature factor from Table 2b		0.6000 (53)
Enter (49) or (54) in (55)		1.0327 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)

Aperture area of solar collector		3.0000 (H1)
Zero-loss collector efficiency		0.8000 (H2)
Collector linear heat loss coefficient		1.8000 (H3)
Collector 2nd order heat loss coefficient		0.0000 (H4)
Collector loop efficiency		0.9000 (H5)
Incidence angle modifier		1.0000 (H6)
Overshading factor		0.8000 (H8)

Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												698.3818	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												698.3818	
Solar input	-0.2882	-19.8943	-63.0504	-86.9122	-108.6771	-108.6071	-105.7317	-94.9883	-67.4759	-37.8323	-4.9243	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	258.3599	208.9842	180.2432	127.0942	98.8933	78.5413	78.9431	96.8840	126.3733	178.2168	224.7072	255.8155	(64)
									Total per year (kWh/year) = Sum(64)m =			1913.0561	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month													
	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)													
	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)
Total internal gains													
	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	23.7835	0.7300	0.7000	0.7700	40.7638	(76)
South	1.2200	54.0600	0.7300	0.7000	0.7700	23.3555	(78)
West	1.2200	23.7835	0.7300	0.7000	0.7700	10.2752	(80)

Solar gains	74.3946	122.6177	186.2329	260.3509	298.7480	324.9059	304.7294	272.3724	223.2097	149.5564	89.9365	62.5313	(83)
Total gains	653.1431	699.1110	745.7259	788.2321	795.4433	793.4618	756.7535	727.5235	694.6153	649.7066	624.6991	627.3756	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9562	0.9397	0.8988	0.8223	0.6940	0.4982	0.3595	0.3917	0.6209	0.8322	0.9313	0.9622	(86)
MIT	19.8706	20.0296	20.3276	20.6254	20.8555	20.9717	20.9942	20.9917	20.9283	20.6665	20.2144	19.8112	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9480	0.9287	0.8802	0.7906	0.6428	0.4277	0.2791	0.3090	0.5517	0.7952	0.9167	0.9550	(89)
MIT 2	18.8166	19.0140	19.3796	19.7314	19.9837	20.0914	20.1068	20.1055	20.0572	19.7868	19.2473	18.7425	(90)
Living area fraction									fLA = Living area / (4) =			0.3668	(91)
MIT	19.2032	19.3865	19.7274	20.0593	20.3035	20.4143	20.4323	20.4306	20.3767	20.1095	19.6021	19.1345	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2032	19.3865	19.7274	20.0593	20.3035	20.4143	20.4323	20.4306	20.3767	20.1095	19.6021	19.1345	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9378	0.9180	0.8711	0.7887	0.6545	0.4524	0.3085	0.3392	0.5733	0.7952	0.9069	0.9452	(94)
Useful gains	612.5215	641.7586	649.6041	621.6800	520.6318	358.9308	233.4577	246.7594	398.2371	516.6780	566.5337	592.9734	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	1028.7961	999.4399	896.6423	757.9945	570.8920	367.3458	234.7616	248.7300	421.0609	634.7163	852.5898	1031.0004	(97)
Space heating kWh													
	309.7084	240.3618	183.7964	98.1464	37.3936	0.0000	0.0000	0.0000	0.0000	87.8205	205.9604	325.8921	(98a)
Space heating requirement - total per year (kWh/year)												1489.0795	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	309.7084	240.3618	183.7964	98.1464	37.3936	0.0000	0.0000	0.0000	0.0000	87.8205	205.9604	325.8921	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1489.0795	
Space heating per m2											(98c) / (4) =	20.4882	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)

Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	309.7084	240.3618	183.7964	98.1464	37.3936	0.0000	0.0000	0.0000	0.0000	87.8205	205.9604	325.8921	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	464.5625	360.5427	275.6946	147.2196	56.0904	0.0000	0.0000	0.0000	0.0000	131.7308	308.9405	488.8381	
Space heating requirement													
	464.5625	360.5427	275.6946	147.2196	56.0904	0.0000	0.0000	0.0000	0.0000	131.7308	308.9405	488.8381	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.3599	208.9842	180.2432	127.0942	98.8933	78.5413	78.9431	96.8840	126.3733	178.2168	224.7072	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.5399	313.4764	270.3648	190.6413	148.3399	117.8120	118.4147	145.3260	189.5599	267.3252	337.0608	383.7233	
Water heating fuel													
	387.5399	313.4764	270.3648	190.6413	148.3399	117.8120	118.4147	145.3260	189.5599	267.3252	337.0608	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	8.4920	7.6702	8.4920	8.2180	8.4920	8.2180	8.4920	8.4920	8.2180	8.4920	8.2180	8.4920	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-37.3139	-48.3454	-69.3588	-79.0310	-84.0802	-81.0632	-79.4178	-75.5234	-67.7754	-57.4056	-40.4939	-32.4201	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-22.3955	-40.3172	-79.6722	-123.3451	-157.0877	-173.4381	-166.9438	-143.6963	-105.2634	-62.2498	-29.2971	-17.8201	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												2233.6193	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2869.5841	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												22.3362	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.9861	(330a)
pump for solar water heating												80.0000	(330g)
Total electricity for the above, kWh/year												99.9861	(331)
Electricity for lighting (calculated in Appendix L)												193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1873.7550	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3522.8747	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2233.6193	6.5500	146.3021	(340a)
Space heating total			146.3021	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2869.5841	6.5500	187.9578	(342a)
Water heating total			187.9578	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	28.4300	5.6821	(349)
Pump for solar water heating	80.0000	28.4300	22.7440	(349)
Energy for lighting	193.4401	28.4300	54.9950	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-752.2287	28.4300	-213.8586	
PV Unit electricity exported	-1121.5263	5.8100	-65.1607	
Total			-279.0193	(352)
Total energy cost			242.6616	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1360.8542	0.1559	92.8784	(367)
Electrical energy for heat distribution (space & water)	22.3362	0.0000	7.6631	(372)
Overall CO2 factor for heat network			0.0415	(386)
Total CO2 associated with community systems			212.0128	(373)
Space and water heating			212.0128	(376)
Pumps, fans and electric keep-hot	99.9861	0.1387	13.8693	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-752.2287	0.1347	-101.3057	
PV Unit electricity exported	-1121.5263	0.1256	-140.8668	
Total			-242.1725	(380)
Total CO2, kg/year			11.6290	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1360.8542	1.5773	939.4838	(467)
Electrical energy for heat distribution (space & water)	22.3362	0.0000	79.3891	(472)
Overall CO2 factor for heat network			0.4304	(486)
Total CO2 associated with community systems			2196.4304	(473)
Space and water heating			2196.4304	(476)
Pumps, fans and electric keep-hot	99.9861	1.5128	151.2590	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-752.2287	1.4977	-1126.6320	
PV Unit electricity exported	-1121.5263	0.4610	-516.9806	
Total			-1643.6126	(480)
Total Primary energy kWh/year			1000.7818	(483)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.39	**TER**	11.60
Environmental	98 A	**% DER < TER**			79.40
CO_2 Emissions (t/year)	0.15	**DFEE**	32.26	**TFEE**	34.75
Compliance Check	See BREL	**% DFEE < TFEE**			7.18
% DPER < TPER	50.64	**DPER**	30.00	**TPER**	60.78

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 11875.9502	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	163.4005	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 4.9323 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 118.0387 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)											Total = Sum(45)m =	1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =	2611.4378	(64)
12Total per year (kWh/year)											2611	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)

Water heating gains (Table 5)

150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)

Total internal gains

529.9009	542.3600	519.8296	502.5508	478.2395	462.4112	445.5913	446.6965	459.7372	474.1489	501.8869	519.6574	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	19.6403	0.7300	0.7000	0.7700	33.6625	(76)
South	1.2200	46.7521	0.7300	0.7000	0.7700	20.1983	(78)
West	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(80)

Solar gains 62.3460	115.5295	177.9208	245.6563	292.3231	296.2018	283.1911	248.4906	201.9391	133.5132	76.4951	52.1134	(83)
Total gains 592.2469	657.8895	697.7504	748.2071	770.5625	758.6130	728.7825	695.1871	661.6764	607.6621	578.3820	571.7708	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9698	0.9526	0.9232	0.8534	0.7347	0.5640	0.4180	0.4552	0.6658	0.8720	0.9499	0.9736	(86)
MIT	19.7189	19.9202	20.1972	20.5449	20.8105	20.9510	20.9887	20.9838	20.9030	20.5685	20.0855	19.6663	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9639	0.9437	0.9086	0.8258	0.6875	0.4953	0.3366	0.3717	0.5991	0.8419	0.9389	0.9684	(89)
MIT 2	18.6269	18.8787	19.2223	19.6400	19.9380	20.0752	20.1038	20.1010	20.0355	19.6767	19.0895	18.5609	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.0275	19.2607	19.5799	19.9719	20.2580	20.3965	20.4284	20.4249	20.3537	20.0039	19.4548	18.9663	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0275	19.2607	19.5799	19.9719	20.2580	20.3965	20.4284	20.4249	20.3537	20.0039	19.4548	18.9663	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9549	0.9333	0.8984	0.8211	0.6959	0.5181	0.3662	0.4018	0.6183	0.8379	0.9290	0.9599	(94)
Useful gains	565.5297	614.0072	626.8502	614.3782	536.2121	393.0377	266.8678	279.3425	409.1146	509.1454	537.3214	548.8532	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1037.5493	1011.7139	921.4784	780.0171	602.9125	408.3613	269.7090	283.5514	440.5723	662.5018	870.3961	1040.2886	(97)
Space heating kWh													
	351.1826	267.2589	219.2033	119.2600	49.6251	0.0000	0.0000	0.0000	0.0000	114.0972	239.8138	365.6279	(98a)
Space heating requirement - total per year (kWh/year)												1726.0688	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	351.1826	267.2589	219.2033	119.2600	49.6251	0.0000	0.0000	0.0000	0.0000	114.0972	239.8138	365.6279	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1726.0688	
Space heating per m2											(98c) / (4) =	23.7489	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	351.1826	267.2589	219.2033	119.2600	49.6251	0.0000	0.0000	0.0000	0.0000	114.0972	239.8138	365.6279	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	526.7739	400.8883	328.8050	178.8900	74.4376	0.0000	0.0000	0.0000	0.0000	171.1457	359.7208	548.4418	
Space heating requirement													
	526.7739	400.8883	328.8050	178.8900	74.4376	0.0000	0.0000	0.0000	0.0000	171.1457	359.7208	548.4418	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	
Water heating fuel													
	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9032	-24.7478	-42.1903	-54.3464	-63.2831	-60.6270	-59.4769	-53.4801	-43.2885	-30.7805	-17.3978	-12.3224	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5955	-11.8305	-29.8051	-54.5176	-80.7077	-84.5250	-82.2640	-64.2624	-40.1739	-18.7163	-6.5523	-3.4266	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												2589.1032	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3917.1568	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												25.8910	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.9861	(330a)
Total electricity for the above, kWh/year												19.9861	(331)
Electricity for lighting (calculated in Appendix L)												193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5761.4653	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1735.0027	0.1555	107.3894	(367)
Electrical energy for heat distribution (space & water)	25.8910	0.0000	9.5450	(372)
Overall CO2 factor for heat network			0.0406	(386)
Total CO2 associated with community systems			264.0773	(373)
Space and water heating			264.0773	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	0.1320	-62.9388	
PV Unit electricity exported	-481.3770	0.1213	-58.4056	
Total			-121.3444	(380)
Total CO2, kg/year			173.4246	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.3900	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1735.0027	1.5758	1088.0033	(467)
Electrical energy for heat distribution (space & water)	25.8910	0.0000	100.3747	(472)
Overall CO2 factor for heat network			0.4268	(486)
Total CO2 associated with community systems			2777.0325	(473)
Space and water heating			2777.0325	(476)
Pumps, fans and electric keep-hot	19.9861	1.5128	30.2350	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	1.4877	-709.3875	
PV Unit electricity exported	-481.3770	0.4451	-214.2796	
Total			-923.6671	(480)
Total Primary energy kWh/year			2180.3054	(483)
Dwelling Primary energy Rate (DPER)			30.0000	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b) x	2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c) x	2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4185	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3243	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4135	0.4054	0.3973	0.3568	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3649	0.3811	(22b)
Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			7.2800	1.1450	8.3359			(27)
Heatloss floor			36.3400	0.1300	4.7242			(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.1800	14.8338			(29a)
500mm mineral wool	36.3400		36.3400	0.1100	3.9974			(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.9313			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	3.6500	0.0500	0.1825
E3 Sill	2.7400	0.0500	0.1370
E4 Jamb	14.8400	0.0500	0.7420
E5 Ground floor (normal)	18.7200	0.1600	2.9952
E6 Intermediate floor within a dwelling	18.7200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.7200	0.0600	1.1232
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	5.5000	0.0800	0.4400
P2 Party wall - Intermediate floor within a dwelling	5.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	5.5000	0.1200	0.6600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8399 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.7712 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.4047	34.2096	34.0184	33.1202	32.9522	32.1700	32.1700	32.0251	32.4713	32.9522	33.2921	33.6475	(38)
Heat transfer coeff	76.1759	75.9808	75.7896	74.8914	74.7234	73.9411	73.9411	73.7963	74.2424	74.7234	75.0633	75.4187	(39)
Average = Sum(39)m / 12 =												74.8906	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0481	1.0454	1.0428	1.0304	1.0281	1.0174	1.0174	1.0154	1.0215	1.0281	1.0328	1.0377	(40)
HLP (average)												1.0304	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	249.9662	221.0368	234.6117	205.6045	198.8885	178.7466	175.9929	183.1904	185.4473	207.3672	221.2297	247.1336	(62)
WWHRS	-28.7738	-25.4478	-26.6475	-22.0651	-20.5639	-17.5967	-16.4941	-17.5398	-18.2062	-21.4631	-24.3151	-28.2410	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
										Total per year (kWh/year) = Sum(64)m =		2241.8614	(64)
12Total per year (kWh/year)												2242	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	104.8969	93.1698	99.7915	89.4439	87.9135	80.5137	80.3008	82.6939	82.7417	90.7327	94.6393	103.9551	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	140.9904	138.6456	134.1284	124.2277	118.1634	111.8245	107.9311	111.1477	114.9190	121.9526	131.4435	139.7245	(72)
Total internal gains	523.5655	536.0247	513.4942	496.2155	471.9041	453.0758	436.2560	437.3612	450.4018	467.8135	495.5515	513.3220	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	19.6403	0.6300	0.7000	0.7700	29.0512	(76)
South	1.2200	46.7521	0.6300	0.7000	0.7700	17.4314	(78)
West	1.2200	19.6403	0.6300	0.7000	0.7700	7.3228	(80)

Solar gains	53.8055	99.7035	153.5481	212.0047	252.2788	255.6262	244.3978	214.4508	174.2762	115.2237	66.0163	44.9746	(83)
Total gains	577.3710	635.7282	667.0423	708.2202	724.1829	708.7020	680.6538	651.8119	624.6781	583.0372	561.5678	558.2966	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3060	43.4172	43.5268	44.0488	44.1478	44.6149	44.6149	44.7025	44.4338	44.1478	43.9479	43.7408	
alpha	3.8871	3.8945	3.9018	3.9366	3.9432	3.9743	3.9743	3.9802	3.9623	3.9432	3.9299	3.9161	
util living area	0.9741	0.9609	0.9387	0.8824	0.7809	0.6163	0.4644	0.5014	0.7127	0.8939	0.9575	0.9770	(86)
MIT	19.5207	19.7226	20.0131	20.4110	20.7289	20.9234	20.9805	20.9735	20.8593	20.4638	19.9418	19.4919	(87)
Th 2	20.0434	20.0457	20.0478	20.0581	20.0600	20.0689	20.0689	20.0706	20.0655	20.0600	20.0561	20.0521	(88)
util rest of house	0.9689	0.9530	0.9260	0.8576	0.7350	0.5425	0.3719	0.4081	0.6445	0.8665	0.9477	0.9723	(89)
MIT 2	18.3320	18.5872	18.9520	19.4446	19.8114	20.0153	20.0599	20.0574	19.9569	19.5178	18.8737	18.3016	(90)
Living area fraction									fLA = Living area / (4) =			0.3668	(91)
MIT	18.7680	19.0037	19.3413	19.7991	20.1480	20.3484	20.3976	20.3935	20.2879	19.8648	19.2655	18.7382	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7680	19.0037	19.3413	19.7991	20.1480	20.3484	20.3976	20.3935	20.2879	19.8648	19.2655	18.7382	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9597	0.9423	0.9145	0.8498	0.7396	0.5656	0.4053	0.4414	0.6618	0.8599	0.9373	0.9638	(94)
Useful gains	554.1097	599.0361	610.0335	601.8307	535.6184	400.8363	275.8511	287.7137	413.4292	501.3446	526.3683	538.0705	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1102.1140	1071.6086	973.2330	816.2508	631.2611	425.0408	280.7995	294.7018	459.4050	692.2961	913.1821	1096.4542	(97)
Space heating kWh	407.7152	317.5688	270.2204	154.3825	71.1582	0.0000	0.0000	0.0000	0.0000	142.0679	278.5059	415.4375	(98a)
Space heating requirement - total per year (kWh/year)												2057.0563	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	407.7152	317.5688	270.2204	154.3825	71.1582	0.0000	0.0000	0.0000	0.0000	142.0679	278.5059	415.4375	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2057.0563	
Space heating per m2											(98c) / (4) =	28.3029	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	407.7152	317.5688	270.2204	154.3825	71.1582	0.0000	0.0000	0.0000	0.0000	142.0679	278.5059	415.4375	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	441.7283	344.0615	292.7631	167.2616	77.0945	0.0000	0.0000	0.0000	0.0000	153.9198	301.7399	450.0948	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4120	85.1401	84.6481	83.6744	82.1755	79.8000	79.8000	79.8000	79.8000	83.4643	84.8370	85.4735	(217)
Fuel for water heating, kWh/month	258.9710	229.7261	245.6810	219.3495	217.0045	201.9422	199.8732	207.5821	209.5753	222.7349	232.1094	256.0942	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.6146	19.7468	17.7798	13.0262	10.0618	8.2206	9.1787	11.9309	15.4970	20.3329	22.9660	25.2988	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-34.1427	-48.1921	-69.3402	-78.0353	-84.2042	-78.6248	-77.6860	-73.3488	-65.6465	-55.1924	-37.5712	-29.5143	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.0663	-40.1520	-79.8860	-120.0915	-158.8866	-159.6687	-157.7568	-133.4905	-97.7594	-57.4135	-25.4553	-15.0706	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2228.6634	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2700.6435	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	198.6542	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1796.1956	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3417.7656	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2228.6634	0.2100	468.0193	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2700.6435	0.2100	567.1351	(264)
Space and water heating			1035.1545	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	198.6542	0.1443	28.6719	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	0.1346	-98.4313	
PV Unit electricity exported	-1064.6971	0.1259	-134.0169	
Total			-232.4482	(269)
Total CO2, kg/year			843.3075	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.6000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2228.6634	1.1300	2518.3897	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2700.6435	1.1300	3051.7272	(278)
Space and water heating			5570.1168	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	198.6542	1.5338	304.7025	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	1.4973	-1095.2830	
PV Unit electricity exported	-1064.6971	0.4620	-491.9332	
Total			-1587.2162	(283)
Total Primary energy kWh/year			4417.7039	(286)
Target Primary Energy Rate (TPER)			60.7800	(287)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.39	**TER**	11.60
Environmental	98 A	**% DER < TER**			79.40
CO_2 Emissions (t/year)	0.15	**DFEE**	32.26	**TFEE**	34.75
Compliance Check	See BREL	**% DFEE < TFEE**			7.18
% DPER < TPER	50.64	**DPER**	30.00	**TPER**	60.78

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3185	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2468	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3147	0.3085	0.3024	0.2715	0.2653	0.2345	0.2345	0.2283	0.2468	0.2653	0.2777	0.2900	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5495	0.5476	0.5457	0.5369	0.5352	0.5275	0.5275	0.5261	0.5305	0.5352	0.5386	0.5421	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005	(35)
Thermal bridges (User defined value 0.030 * total exposed area)		4.9323	(36)
Point Thermal bridges	(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.2906	32.1776	32.0668	31.5466	31.4493	30.9963	30.9963	30.9124	31.1708	31.4493	31.6462	31.8520	(38)
Heat transfer coeff	73.3597	73.2467	73.1359	72.6157	72.5184	72.0654	72.0654	71.9815	72.2399	72.5184	72.7153	72.9211	(39)
Average = Sum(39)m / 12 =												72.6153	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0094	1.0078	1.0063	0.9991	0.9978	0.9915	0.9915	0.9904	0.9939	0.9978	1.0005	1.0033	(40)
HLP (average)												0.9991	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 60.0096 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.4702	63.6744	61.7137	59.2732	57.0961	54.8336	54.3634	56.3200	58.3269	60.6504	63.1125	65.3783	(44)
Energy conte	103.6888	90.6715	94.8517	81.1421	76.8624	67.4243	65.7478	69.7360	71.9229	82.3020	89.9153	102.3666	(45)
Energy content (annual)										Total = Sum(45)m =		996.6312	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(62)

WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(64)
								Total per year (kWh/year) = Sum(64)m =			847.1365	(64)
12Total per year (kWh/year)											847	(64)	

Electric shower(s)

50.4049	44.9112	49.0413	46.7995	47.6777	45.4799	46.9959	47.6777	46.7995	49.0413	48.1191	50.4049	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 573.3528 (64a)

Heat gains from water heating, kWh/month

34.6351	30.4955	32.4163	28.9426	28.2527	25.6976	25.7204	26.7383	26.9835	29.7495	31.1368	34.3541	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	46.5525	45.3802	43.5703	40.1980	37.9740	35.6912	34.5704	35.9386	37.4771	39.9859	43.2455	46.1749	(72)
Total internal gains	426.1276	439.7593	419.9362	409.1858	388.7147	376.9424	362.8952	362.1520	372.9599	382.8469	404.3535	416.7724	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	19.6403	0.7300	0.7000	0.7700	33.6625	(76)
South	1.2200	46.7521	0.7300	0.7000	0.7700	20.1983	(78)
West	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(80)

Solar gains	62.3460	115.5295	177.9208	245.6563	292.3231	296.2018	283.1911	248.4906	201.9391	133.5132	76.4951	52.1134	(83)
Total gains	488.4737	555.2888	597.8569	654.8421	681.0378	673.1442	646.0863	610.6426	574.8991	516.3600	480.8487	468.8858	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	44.9685	45.0379	45.1061	45.4292	45.4902	45.7762	45.7762	45.8295	45.6656	45.4902	45.3670	45.2389	
alpha	3.9979	4.0025	4.0071	4.0286	4.0327	4.0517	4.0517	4.0553	4.0444	4.0327	4.0245	4.0159	
util living area	0.9846	0.9734	0.9535	0.8991	0.7974	0.6304	0.4764	0.5205	0.7409	0.9196	0.9730	0.9868	(86)

MIT	19.4333	19.6547	19.9666	20.3880	20.7226	20.9221	20.9804	20.9719	20.8467	20.4101	19.8544	19.3924	(87)
Th 2	20.0755	20.0768	20.0781	20.0841	20.0852	20.0904	20.0904	20.0914	20.0884	20.0852	20.0829	20.0806	(88)
util rest of house													
	0.9814	0.9679	0.9434	0.8770	0.7535	0.5576	0.3841	0.4266	0.6751	0.8973	0.9664	0.9841	(89)
MIT 2	18.6483	18.8675	19.1742	19.5819	19.8848	20.0474	20.0832	20.0803	19.9943	19.6111	19.0713	18.6116	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.9362	19.1562	19.4649	19.8776	20.1921	20.3682	20.4123	20.4074	20.3070	19.9042	19.3586	18.8980	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9362	19.1562	19.4649	19.8776	20.1921	20.3682	20.4123	20.4074	20.3070	19.9042	19.3586	18.8980	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9761	0.9610	0.9354	0.8713	0.7591	0.5808	0.4175	0.4602	0.6920	0.8921	0.9598	0.9793	(94)
Useful gains	476.8221	533.6102	559.2201	570.5454	516.9580	390.9736	269.7288	281.0180	397.8519	460.6557	461.5066	459.1979	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1073.7082	1044.2200	948.1965	797.1465	615.8319	415.6902	274.7349	288.4563	448.3907	674.7235	891.3847	1071.7964	(97)
Space heating kWh													
	444.0833	343.1298	289.3984	163.1528	73.5622	0.0000	0.0000	0.0000	0.0000	159.2664	309.5122	455.7733	(98a)
Space heating requirement - total per year (kWh/year)												2237.8785	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	444.0833	343.1298	289.3984	163.1528	73.5622	0.0000	0.0000	0.0000	0.0000	159.2664	309.5122	455.7733	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2237.8785	
Space heating per m2											(98c) / (4) =	30.7908	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	677.4144	533.2836	547.0591	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8309	0.8946	0.8707	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	562.8935	477.0793	476.2994	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	730.2120	701.3194	662.3353	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	120.4693	166.8346	138.4108	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	30.1173	41.7087	34.6027	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												106.4287	(107)
Energy for space heating												30.7908	(99)
Energy for space cooling												1.4643	(108)
Total												32.2552	(109)
Fabric Energy Efficiency (DFEE)												32.3	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor		36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

		m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)	
Number of open flues	0 * 20 =	0.0000	(6b)	
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)	
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)	
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)	
Number of blocked chimneys	0 * 20 =	0.0000	(6f)	
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)	
Number of passive vents	0 * 10 =	0.0000	(7b)	
Number of flueless gas fires	0 * 40 =	0.0000	(7c)	
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)	
Pressure test		Yes		
Pressure Test Method		Blower Door		
Measured/design AP50		5.0000	(17)	
Infiltration rate		0.4185	(18)	
Number of sides sheltered		3	(19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3243	(21)	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4135	0.4054	0.3973	0.3568	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3649	0.3811	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			7.2800	1.1450	8.3359			(27)
Heatloss floor			36.3400	0.1300	4.7242			(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.1800	14.8338			(29a)
500mm mineral wool	36.3400		36.3400	0.1100	3.9974			(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.9313			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	3.6500	0.0500	0.1825
E3 Sill	2.7400	0.0500	0.1370
E4 Jamb	14.8400	0.0500	0.7420
E5 Ground floor (normal)	18.7200	0.1600	2.9952
E6 Intermediate floor within a dwelling	18.7200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.7200	0.0600	1.1232
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	5.5000	0.0800	0.4400
P2 Party wall - Intermediate floor within a dwelling	5.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	5.5000	0.1200	0.6600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8399 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.7712 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.4047	34.2096	34.0184	33.1202	32.9522	32.1700	32.1700	32.0251	32.4713	32.9522	33.2921	33.6475	(38)
Heat transfer coeff	76.1759	75.9808	75.7896	74.8914	74.7234	73.9411	73.9411	73.7963	74.2424	74.7234	75.0633	75.4187	(39)
Average = Sum(39)m / 12 =												74.8906	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0481	1.0454	1.0428	1.0304	1.0281	1.0174	1.0174	1.0154	1.0215	1.0281	1.0328	1.0377	(40)
HLP (average)												1.0304	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 60.0096 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.4702	63.6744	61.7137	59.2732	57.0961	54.8336	54.3634	56.3200	58.3269	60.6504	63.1125	65.3783	(44)
Energy conte	103.6888	90.6715	94.8517	81.1421	76.8624	67.4243	65.7478	69.7360	71.9229	82.3020	89.9153	102.3666	(45)
Energy content (annual)										Total = Sum(45)m =		996.6312	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(64)
								Total per year (kWh/year) = Sum(64)m =			847.1365	(64)
12Total per year (kWh/year)											847	(64)	

Electric shower(s)

50.4049	44.9112	49.0413	46.7995	47.6777	45.4799	46.9959	47.6777	46.7995	49.0413	48.1191	50.4049	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				573.3528	(64a)

Heat gains from water heating, kWh/month

34.6351	30.4955	32.4163	28.9426	28.2527	25.6976	25.7204	26.7383	26.9835	29.7495	31.1368	34.3541	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)													
	46.5525	45.3802	43.5703	40.1980	37.9740	35.6912	34.5704	35.9386	37.4771	39.9859	43.2455	46.1749	(72)
Total internal gains													
	426.1276	439.7593	419.9362	409.1858	388.7147	376.9424	362.8952	362.1520	372.9599	382.8469	404.3535	416.7724	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	19.6403	0.6300	0.7000	0.7700	29.0512	(76)
South	1.2200	46.7521	0.6300	0.7000	0.7700	17.4314	(78)
West	1.2200	19.6403	0.6300	0.7000	0.7700	7.3228	(80)

Solar gains	53.8055	99.7035	153.5481	212.0047	252.2788	255.6262	244.3978	214.4508	174.2762	115.2237	66.0163	44.9746	(83)
Total gains	479.9331	539.4628	573.4842	621.1905	640.9935	632.5686	607.2930	576.6028	547.2362	498.0706	470.3699	461.7470	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3060	43.4172	43.5268	44.0488	44.1478	44.6149	44.6149	44.7025	44.4338	44.1478	43.9479	43.7408	
alpha	3.8871	3.8945	3.9018	3.9366	3.9432	3.9743	3.9743	3.9802	3.9623	3.9432	3.9299	3.9161	
util living area													
	0.9858	0.9765	0.9606	0.9158	0.8286	0.6703	0.5139	0.5571	0.7713	0.9301	0.9755	0.9877	(86)
MIT	19.3345	19.5472	19.8560	20.2937	20.6568	20.8965	20.9722	20.9616	20.8107	20.3424	19.7768	19.3051	(87)
Th 2	20.0434	20.0457	20.0478	20.0581	20.0600	20.0689	20.0689	20.0706	20.0655	20.0600	20.0561	20.0521	(88)
util rest of house													
	0.9827	0.9715	0.9517	0.8961	0.7873	0.5956	0.4143	0.4572	0.7066	0.9097	0.9694	0.9851	(89)
MIT 2	18.5268	18.7385	19.0439	19.4739	19.8085	20.0109	20.0586	20.0553	19.9475	19.5283	18.9752	18.5040	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.8231	19.0351	19.3418	19.7746	20.1196	20.3357	20.3937	20.3877	20.2642	19.8269	19.2692	18.7979	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8231	19.0351	19.3418	19.7746	20.1196	20.3357	20.3937	20.3877	20.2642	19.8269	19.2692	18.7979	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9776	0.9647	0.9436	0.8892	0.7902	0.6182	0.4501	0.4926	0.7217	0.9037	0.9629	0.9804	(94)
Useful gains	469.1756	520.4295	541.1549	552.3676	506.5082	391.0515	273.3508	284.0123	394.9171	450.0999	452.9016	452.6979	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1106.3081	1073.9997	973.2745	814.4159	629.1446	424.1071	280.5132	294.2801	457.6422	689.4660	913.4615	1100.9515	(97)
Space heating kWh													
	474.0266	371.9992	321.4969	188.6748	91.2415	0.0000	0.0000	0.0000	0.0000	178.0884	331.6032	482.3006	(98a)
Space heating requirement - total per year (kWh/year)												2439.4312	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	474.0266	371.9992	321.4969	188.6748	91.2415	0.0000	0.0000	0.0000	0.0000	178.0884	331.6032	482.3006	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2439.4312	
Space heating per m2											(98c) / (4) =	33.5640	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	695.0467	547.1644	560.8517	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7918	0.8643	0.8386	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	550.3351	472.8936	470.3361	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	682.7860	655.9765	622.5485	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	95.3646	136.2137	113.2460	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	23.8412	34.0534	28.3115	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												86.2061	(107)
Energy for space heating												33.5640	(99)
Energy for space cooling												1.1861	(108)
Total												34.7501	(109)
Fabric Energy Efficiency (TFEE)												34.8	(109)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.39	**TER**	11.60
Environmental	98 A	**% DER < TER**			79.40
CO_2 Emissions (t/year)	0.15	**DFEE**	32.26	**TFEE**	34.75
Compliance Check	See BREL	**% DFEE < TFEE**			7.18
% DPER < TPER	50.64	**DPER**	30.00	**TPER**	60.78

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 11875.9502	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	163.4005	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 4.9323 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 118.0387 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)											Total = Sum(45)m =	1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =	2611.4378	(64)
12Total per year (kWh/year)											2611	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)

Water heating gains (Table 5)

150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)

Total internal gains

529.9009	542.3600	519.8296	502.5508	478.2395	462.4112	445.5913	446.6965	459.7372	474.1489	501.8869	519.6574	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	19.6403	0.7300	0.7000	0.7700	33.6625	(76)
South	1.2200	46.7521	0.7300	0.7000	0.7700	20.1983	(78)
West	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(80)

Solar gains 62.3460	115.5295	177.9208	245.6563	292.3231	296.2018	283.1911	248.4906	201.9391	133.5132	76.4951	52.1134	(83)
Total gains 592.2469	657.8895	697.7504	748.2071	770.5625	758.6130	728.7825	695.1871	661.6764	607.6621	578.3820	571.7708	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9698	0.9526	0.9232	0.8534	0.7347	0.5640	0.4180	0.4552	0.6658	0.8720	0.9499	0.9736	(86)
MIT	19.7189	19.9202	20.1972	20.5449	20.8105	20.9510	20.9887	20.9838	20.9030	20.5685	20.0855	19.6663	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9639	0.9437	0.9086	0.8258	0.6875	0.4953	0.3366	0.3717	0.5991	0.8419	0.9389	0.9684	(89)
MIT 2	18.6269	18.8787	19.2223	19.6400	19.9380	20.0752	20.1038	20.1010	20.0355	19.6767	19.0895	18.5609	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.0275	19.2607	19.5799	19.9719	20.2580	20.3965	20.4284	20.4249	20.3537	20.0039	19.4548	18.9663	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0275	19.2607	19.5799	19.9719	20.2580	20.3965	20.4284	20.4249	20.3537	20.0039	19.4548	18.9663	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9549	0.9333	0.8984	0.8211	0.6959	0.5181	0.3662	0.4018	0.6183	0.8379	0.9290	0.9599	(94)
Useful gains	565.5297	614.0072	626.8502	614.3782	536.2121	393.0377	266.8678	279.3425	409.1146	509.1454	537.3214	548.8532	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1037.5493	1011.7139	921.4784	780.0171	602.9125	408.3613	269.7090	283.5514	440.5723	662.5018	870.3961	1040.2886	(97)
Space heating kWh													
	351.1826	267.2589	219.2033	119.2600	49.6251	0.0000	0.0000	0.0000	0.0000	114.0972	239.8138	365.6279	(98a)
Space heating requirement - total per year (kWh/year)												1726.0688	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	351.1826	267.2589	219.2033	119.2600	49.6251	0.0000	0.0000	0.0000	0.0000	114.0972	239.8138	365.6279	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1726.0688	
Space heating per m2											(98c) / (4) =	23.7489	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	351.1826	267.2589	219.2033	119.2600	49.6251	0.0000	0.0000	0.0000	0.0000	114.0972	239.8138	365.6279	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	526.7739	400.8883	328.8050	178.8900	74.4376	0.0000	0.0000	0.0000	0.0000	171.1457	359.7208	548.4418	
Space heating requirement													
	526.7739	400.8883	328.8050	178.8900	74.4376	0.0000	0.0000	0.0000	0.0000	171.1457	359.7208	548.4418	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	
Water heating fuel													
	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9032	-24.7478	-42.1903	-54.3464	-63.2831	-60.6270	-59.4769	-53.4801	-43.2885	-30.7805	-17.3978	-12.3224	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5955	-11.8305	-29.8051	-54.5176	-80.7077	-84.5250	-82.2640	-64.2624	-40.1739	-18.7163	-6.5523	-3.4266	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												2589.1032	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3917.1568	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												25.8910	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.9861	(330a)
Total electricity for the above, kWh/year												19.9861	(331)
Electricity for lighting (calculated in Appendix L)												193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5761.4653	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1735.0027	0.1555	107.3894	(367)
Electrical energy for heat distribution (space & water)	25.8910	0.0000	9.5450	(372)
Overall CO2 factor for heat network			0.0406	(386)
Total CO2 associated with community systems			264.0773	(373)
Space and water heating			264.0773	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	0.1320	-62.9388	
PV Unit electricity exported	-481.3770	0.1213	-58.4056	
Total			-121.3444	(380)
Total CO2, kg/year			173.4246	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.3900	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1735.0027	1.5758	1088.0033	(467)
Electrical energy for heat distribution (space & water)	25.8910	0.0000	100.3747	(472)
Overall CO2 factor for heat network			0.4268	(486)
Total CO2 associated with community systems			2777.0325	(473)
Space and water heating			2777.0325	(476)
Pumps, fans and electric keep-hot	19.9861	1.5128	30.2350	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	1.4877	-709.3875	
PV Unit electricity exported	-481.3770	0.4451	-214.2796	
Total			-923.6671	(480)
Total Primary energy kWh/year			2180.3054	(483)
Dwelling Primary energy Rate (DPER)			30.0000	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b) x	2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c) x	2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4185	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3243	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4135	0.4054	0.3973	0.3568	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3649	0.3811	(22b)
Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			7.2800	1.1450	8.3359			(27)
Heatloss floor			36.3400	0.1300	4.7242			(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.1800	14.8338			(29a)
500mm mineral wool	36.3400		36.3400	0.1100	3.9974			(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.9313			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	3.6500	0.0500	0.1825
E3 Sill	2.7400	0.0500	0.1370
E4 Jamb	14.8400	0.0500	0.7420
E5 Ground floor (normal)	18.7200	0.1600	2.9952
E6 Intermediate floor within a dwelling	18.7200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.7200	0.0600	1.1232
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	5.5000	0.0800	0.4400
P2 Party wall - Intermediate floor within a dwelling	5.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	5.5000	0.1200	0.6600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8399 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.7712 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.4047	34.2096	34.0184	33.1202	32.9522	32.1700	32.1700	32.0251	32.4713	32.9522	33.2921	33.6475	(38)
Heat transfer coeff	76.1759	75.9808	75.7896	74.8914	74.7234	73.9411	73.9411	73.7963	74.2424	74.7234	75.0633	75.4187	(39)
Average = Sum(39)m / 12 =												74.8906	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0481	1.0454	1.0428	1.0304	1.0281	1.0174	1.0174	1.0154	1.0215	1.0281	1.0328	1.0377	(40)
HLP (average)												1.0304	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	249.9662	221.0368	234.6117	205.6045	198.8885	178.7466	175.9929	183.1904	185.4473	207.3672	221.2297	247.1336	(62)
WWHRS	-28.7738	-25.4478	-26.6475	-22.0651	-20.5639	-17.5967	-16.4941	-17.5398	-18.2062	-21.4631	-24.3151	-28.2410	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
										Total per year (kWh/year) = Sum(64)m =		2241.8614	(64)
12Total per year (kWh/year)												2242	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	104.8969	93.1698	99.7915	89.4439	87.9135	80.5137	80.3008	82.6939	82.7417	90.7327	94.6393	103.9551	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	140.9904	138.6456	134.1284	124.2277	118.1634	111.8245	107.9311	111.1477	114.9190	121.9526	131.4435	139.7245	(72)
Total internal gains	523.5655	536.0247	513.4942	496.2155	471.9041	453.0758	436.2560	437.3612	450.4018	467.8135	495.5515	513.3220	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	19.6403	0.6300	0.7000	0.7700	29.0512	(76)
South	1.2200	46.7521	0.6300	0.7000	0.7700	17.4314	(78)
West	1.2200	19.6403	0.6300	0.7000	0.7700	7.3228	(80)

Solar gains	53.8055	99.7035	153.5481	212.0047	252.2788	255.6262	244.3978	214.4508	174.2762	115.2237	66.0163	44.9746	(83)
Total gains	577.3710	635.7282	667.0423	708.2202	724.1829	708.7020	680.6538	651.8119	624.6781	583.0372	561.5678	558.2966	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3060	43.4172	43.5268	44.0488	44.1478	44.6149	44.6149	44.7025	44.4338	44.1478	43.9479	43.7408	
alpha	3.8871	3.8945	3.9018	3.9366	3.9432	3.9743	3.9743	3.9802	3.9623	3.9432	3.9299	3.9161	
util living area	0.9741	0.9609	0.9387	0.8824	0.7809	0.6163	0.4644	0.5014	0.7127	0.8939	0.9575	0.9770	(86)
MIT	19.5207	19.7226	20.0131	20.4110	20.7289	20.9234	20.9805	20.9735	20.8593	20.4638	19.9418	19.4919	(87)
Th 2	20.0434	20.0457	20.0478	20.0581	20.0600	20.0689	20.0689	20.0706	20.0655	20.0600	20.0561	20.0521	(88)
util rest of house	0.9689	0.9530	0.9260	0.8576	0.7350	0.5425	0.3719	0.4081	0.6445	0.8665	0.9477	0.9723	(89)
MIT 2	18.3320	18.5872	18.9520	19.4446	19.8114	20.0153	20.0599	20.0574	19.9569	19.5178	18.8737	18.3016	(90)
Living area fraction									fLA = Living area / (4) =			0.3668	(91)
MIT	18.7680	19.0037	19.3413	19.7991	20.1480	20.3484	20.3976	20.3935	20.2879	19.8648	19.2655	18.7382	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7680	19.0037	19.3413	19.7991	20.1480	20.3484	20.3976	20.3935	20.2879	19.8648	19.2655	18.7382	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9597	0.9423	0.9145	0.8498	0.7396	0.5656	0.4053	0.4414	0.6618	0.8599	0.9373	0.9638	(94)
Useful gains	554.1097	599.0361	610.0335	601.8307	535.6184	400.8363	275.8511	287.7137	413.4292	501.3446	526.3683	538.0705	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1102.1140	1071.6086	973.2330	816.2508	631.2611	425.0408	280.7995	294.7018	459.4050	692.2961	913.1821	1096.4542	(97)
Space heating kWh	407.7152	317.5688	270.2204	154.3825	71.1582	0.0000	0.0000	0.0000	0.0000	142.0679	278.5059	415.4375	(98a)
Space heating requirement - total per year (kWh/year)												2057.0563	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	407.7152	317.5688	270.2204	154.3825	71.1582	0.0000	0.0000	0.0000	0.0000	142.0679	278.5059	415.4375	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2057.0563	
Space heating per m2											(98c) / (4) =	28.3029	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	407.7152	317.5688	270.2204	154.3825	71.1582	0.0000	0.0000	0.0000	0.0000	142.0679	278.5059	415.4375	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	441.7283	344.0615	292.7631	167.2616	77.0945	0.0000	0.0000	0.0000	0.0000	153.9198	301.7399	450.0948	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4120	85.1401	84.6481	83.6744	82.1755	79.8000	79.8000	79.8000	79.8000	83.4643	84.8370	85.4735	(217)
Fuel for water heating, kWh/month	258.9710	229.7261	245.6810	219.3495	217.0045	201.9422	199.8732	207.5821	209.5753	222.7349	232.1094	256.0942	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.6146	19.7468	17.7798	13.0262	10.0618	8.2206	9.1787	11.9309	15.4970	20.3329	22.9660	25.2988	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-34.1427	-48.1921	-69.3402	-78.0353	-84.2042	-78.6248	-77.6860	-73.3488	-65.6465	-55.1924	-37.5712	-29.5143	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.0663	-40.1520	-79.8860	-120.0915	-158.8866	-159.6687	-157.7568	-133.4905	-97.7594	-57.4135	-25.4553	-15.0706	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2228.6634	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2700.6435	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	198.6542	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1796.1956	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3417.7656	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2228.6634	0.2100	468.0193	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2700.6435	0.2100	567.1351	(264)
Space and water heating			1035.1545	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	198.6542	0.1443	28.6719	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	0.1346	-98.4313	
PV Unit electricity exported	-1064.6971	0.1259	-134.0169	
Total			-232.4482	(269)
Total CO2, kg/year			843.3075	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.6000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2228.6634	1.1300	2518.3897	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2700.6435	1.1300	3051.7272	(278)
Space and water heating			5570.1168	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	198.6542	1.5338	304.7025	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	1.4973	-1095.2830	
PV Unit electricity exported	-1064.6971	0.4620	-491.9332	
Total			-1587.2162	(283)
Total Primary energy kWh/year			4417.7039	(286)
Target Primary Energy Rate (TPER)			60.7800	(287)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.39	**TER**	11.60
Environmental	98 A	**% DER < TER**			79.40
CO_2 Emissions (t/year)	0.15	**DFEE**	32.26	**TFEE**	34.75
Compliance Check	See BREL	**% DFEE < TFEE**			7.18
% DPER < TPER	50.64	**DPER**	30.00	**TPER**	60.78

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 11875.9502	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	163.4005	(35)

Thermal bridges (User defined value 0.030 * total exposed area)												4.9323	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	41.0691	(37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3094	(42)
Hot water usage for mixer showers													
	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths													
	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses													
	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)											Total = Sum(45)m =	1960.5981	
Distribution loss (46)m = 0.15 x (45)m													
	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =		2611.4378	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)													
	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)
Total internal gains													
	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	19.6403	0.7300	0.7000	0.7700	33.6625	(76)
South	1.2200	46.7521	0.7300	0.7000	0.7700	20.1983	(78)
West	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(80)

Solar gains	62.3460	115.5295	177.9208	245.6563	292.3231	296.2018	283.1911	248.4906	201.9391	133.5132	76.4951	52.1134	(83)
Total gains	641.0946	692.0228	737.4137	773.5375	789.0184	764.7577	735.2153	703.6417	673.3447	633.6634	611.2577	616.9578	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area	0.9610	0.9447	0.9106	0.8417	0.7238	0.5602	0.4146	0.4502	0.6573	0.8584	0.9408	0.9661	(86)
MIT	19.8077	19.9778	20.2552	20.5717	20.8210	20.9522	20.9890	20.9845	20.9075	20.5984	20.1401	19.7501	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house	0.9537	0.9346	0.8942	0.8130	0.6762	0.4917	0.3337	0.3674	0.5907	0.8265	0.9283	0.9597	(89)
MIT 2	18.7376	18.9495	19.2916	19.6700	19.9483	20.0761	20.1039	20.1014	20.0391	19.7098	19.1560	18.6657	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.1301	19.3267	19.6451	20.0007	20.2684	20.3975	20.4286	20.4253	20.3577	20.0358	19.5170	19.0635	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1301	19.3267	19.6451	20.0007	20.2684	20.3975	20.4286	20.4253	20.3577	20.0358	19.5170	19.0635	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9438	0.9239	0.8843	0.8091	0.6852	0.5145	0.3631	0.3973	0.6102	0.8235	0.9182	0.9503	(94)
Useful gains	605.0488	639.3765	652.1063	625.8920	540.6287	393.4855	266.9708	279.5459	410.8611	521.8408	561.2602	586.2765	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1044.7817	1016.3608	926.0715	782.0460	603.6439	408.4310	269.7250	283.5830	440.8520	664.7509	874.7761	1047.1300	(97)
Space heating kWh	327.1613	253.3334	203.8301	112.4308	46.8833	0.0000	0.0000	0.0000	0.0000	106.3251	225.7315	342.8750	(98a)
Space heating requirement - total per year (kWh/year)												1618.5706	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	327.1613	253.3334	203.8301	112.4308	46.8833	0.0000	0.0000	0.0000	0.0000	106.3251	225.7315	342.8750	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1618.5706	
Space heating per m2											(98c) / (4) =	22.2698	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	327.1613	253.3334	203.8301	112.4308	46.8833	0.0000	0.0000	0.0000	0.0000	106.3251	225.7315	342.8750 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	490.7420	380.0001	305.7452	168.6463	70.3250	0.0000	0.0000	0.0000	0.0000	159.4877	338.5972	514.3125
Space heating requirement												
	490.7420	380.0001	305.7452	168.6463	70.3250	0.0000	0.0000	0.0000	0.0000	159.4877	338.5972	514.3125 (307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement												
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233
Water heating fuel												
	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233 (310)

Cooling System Energy Efficiency Ratio	0.0000	(314)

Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9032	-24.7478	-42.1903	-54.3464	-63.2831	-60.6270	-59.4769	-53.4801	-43.2885	-30.7805	-17.3978	-12.3224	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5955	-11.8305	-29.8051	-54.5176	-80.7077	-84.5250	-82.2640	-64.2624	-40.1739	-18.7163	-6.5523	-3.4266	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2427.8559	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3917.1568	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	24.2786	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
Total electricity for the above, kWh/year	19.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5600.2180	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2427.8559	4.4400	107.7968	(340a)
Space heating total			107.7968	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3917.1568	4.4400	173.9218	(342a)
Water heating total			173.9218	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	16.4900	3.2957	(349)
Energy for lighting	193.4401	16.4900	31.8983	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	16.4900	-78.6316	
PV Unit electricity exported	-481.3770	5.5900	-26.9090	
Total			-105.5405	(352)
Total energy cost			303.3720	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.9281	(357)
SAP value	84.9562	
SAP rating (Section 12)	85	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1692.0034	0.1555	100.6989	(367)
Electrical energy for heat distribution (space & water)	24.2786	0.0000	9.2941	(372)
Overall CO2 factor for heat network			0.0405	(386)
Total CO2 associated with community systems			257.1359	(373)
Space and water heating			257.1359	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	0.1320	-62.9388	
PV Unit electricity exported	-481.3770	0.1213	-58.4056	
Total			-121.3444	(380)
Total CO2, kg/year			166.4832	(383)
CO2 emissions per m2			2.2900	(384)
EI value			98.1043	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b) x	2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c) x	2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 72.6800						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor (20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =		0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11875.9502 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

Thermal bridges (User defined value 0.030 * total exposed area) 4.9323 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)

Average = Sum(39)m / 12 = 70.4500

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 118.0387 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =		2611.4378	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)													
	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)
Total internal gains													
	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	23.7835	0.7300	0.7000	0.7700	40.7638	(76)
South	1.2200	54.0600	0.7300	0.7000	0.7700	23.3555	(78)
West	1.2200	23.7835	0.7300	0.7000	0.7700	10.2752	(80)

Solar gains	74.3946	122.6177	186.2329	260.3509	298.7480	324.9059	304.7294	272.3724	223.2097	149.5564	89.9365	62.5313	(83)
Total gains	653.1431	699.1110	745.7259	788.2321	795.4433	793.4618	756.7535	727.5235	694.6153	649.7066	624.6991	627.3756	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9562	0.9397	0.8988	0.8223	0.6940	0.4982	0.3595	0.3917	0.6209	0.8322	0.9313	0.9622	(86)
MIT	19.8706	20.0296	20.3276	20.6254	20.8555	20.9717	20.9942	20.9917	20.9283	20.6665	20.2144	19.8112	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9480	0.9287	0.8802	0.7906	0.6428	0.4277	0.2791	0.3090	0.5517	0.7952	0.9167	0.9550	(89)
MIT 2	18.8166	19.0140	19.3796	19.7314	19.9837	20.0914	20.1068	20.1055	20.0572	19.7868	19.2473	18.7425	(90)
Living area fraction									fLA = Living area / (4) =			0.3668	(91)
MIT	19.2032	19.3865	19.7274	20.0593	20.3035	20.4143	20.4323	20.4306	20.3767	20.1095	19.6021	19.1345	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2032	19.3865	19.7274	20.0593	20.3035	20.4143	20.4323	20.4306	20.3767	20.1095	19.6021	19.1345	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9378	0.9180	0.8711	0.7887	0.6545	0.4524	0.3085	0.3392	0.5733	0.7952	0.9069	0.9452	(94)
Useful gains	612.5215	641.7586	649.6041	621.6800	520.6318	358.9308	233.4577	246.7594	398.2371	516.6780	566.5337	592.9734	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	1028.7961	999.4399	896.6423	757.9945	570.8920	367.3458	234.7616	248.7300	421.0609	634.7163	852.5898	1031.0004	(97)
Space heating kWh													
	309.7084	240.3618	183.7964	98.1464	37.3936	0.0000	0.0000	0.0000	0.0000	87.8205	205.9604	325.8921	(98a)
Space heating requirement - total per year (kWh/year)												1489.0795	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	309.7084	240.3618	183.7964	98.1464	37.3936	0.0000	0.0000	0.0000	0.0000	87.8205	205.9604	325.8921	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1489.0795	
Space heating per m2										(98c) / (4) =		20.4882	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	309.7084	240.3618	183.7964	98.1464	37.3936	0.0000	0.0000	0.0000	0.0000	87.8205	205.9604	325.8921	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	464.5625	360.5427	275.6946	147.2196	56.0904	0.0000	0.0000	0.0000	0.0000	131.7308	308.9405	488.8381	
Space heating requirement													
	464.5625	360.5427	275.6946	147.2196	56.0904	0.0000	0.0000	0.0000	0.0000	131.7308	308.9405	488.8381	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	
Water heating fuel													
	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.7988	-26.5546	-44.3894	-57.0811	-64.6020	-64.1536	-62.3425	-56.9881	-46.9012	-34.2077	-20.4034	-14.8306	(333a)

Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.1997	-13.4106	-32.8557	-60.4920	-84.6385	-96.9652	-92.1477	-74.2535	-47.4476	-22.7886	-8.6270	-4.6681	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2233.6193	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3917.1568	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	22.3362	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
Total electricity for the above, kWh/year	19.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5309.4553	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2233.6193	6.5500	146.3021	(340a)
Space heating total			146.3021	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3917.1568	6.5500	256.5738	(342a)
Water heating total			256.5738	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	28.4300	5.6821	(349)
Energy for lighting	193.4401	28.4300	54.9950	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.2528	28.4300	-145.0649	
PV Unit electricity exported	-544.4942	5.8100	-31.6351	
Total			-176.7000	(352)
Total energy cost			390.8529	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1640.2070	0.1559	92.8784	(367)
Electrical energy for heat distribution (space & water)	22.3362	0.0000	9.0008	(372)
Overall CO2 factor for heat network			0.0405	(386)
Total CO2 associated with community systems			249.0222	(373)
Space and water heating			249.0222	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.2528	0.1323	-67.5052	
PV Unit electricity exported	-544.4942	0.1214	-66.0897	
Total			-133.5948	(380)
Total CO2, kg/year			146.1191	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1640.2070	1.5773	939.4838	(467)
Electrical energy for heat distribution (space & water)	22.3362	0.0000	94.8052	(472)
Overall CO2 factor for heat network			0.4264	(486)
Total CO2 associated with community systems			2622.9434	(473)
Space and water heating			2622.9434	(476)
Pumps, fans and electric keep-hot	19.9861	1.5128	30.2350	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.2528	1.4888	-759.6722	
PV Unit electricity exported	-544.4942	0.4453	-242.4386	
Total			-1002.1108	(480)
Total Primary energy kWh/year			1947.7726	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Be Green

Current energy efficiency rating: B 85
Current environmental impact rating: A 98

N Solar water heating — Recommended
U Solar photovoltaic panels — Already installed
V2 Wind turbine — Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.4	-£ 47	-26 kg (17.8%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£47	0.36 kg/m²	B 86	A 98
Total Savings	£47	0.36 kg/m²		

Potential energy efficiency rating: B 86
Potential environmental impact rating: A 98

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£61	£83	-£23
Community scheme	£507	£438	£69
Space heating	£256	£279	-£23
Water heating	£257	£188	£69
Lighting	£55	£55	£0
Generated (PV)	-£177	-£178	£1
Total cost of fuels	£391	£343	£47
Total cost of uses	£391	£344	£47
Delivered energy	73 kWh/m²	60 kWh/m²	13 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	2 kg/m²	2 kg/m²	0 kg/m²
Primary energy	27 kWh/m²	23 kWh/m²	4 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330 (1b) - (3b)	
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		4.9323 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3094	(42)
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												624.1873	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												624.1873	
Solar input	-0.0000	-16.2194	-58.0608	-80.0094	-105.2873	-97.2929	-96.7392	-84.2620	-57.6788	-28.6375	-0.0000	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.6481	212.6591	185.2328	133.9970	102.2831	89.8555	87.9356	107.6103	136.1704	187.4116	229.6316	255.8155	(64)
									Total per year (kWh/year) = Sum(64)m =			1987.2506	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757 (71)
Water heating gains (Table 5)												
	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599 (72)
Total internal gains												
	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	19.6403	0.7300	0.7000	0.7700	33.6625	(76)
South	1.2200	46.7521	0.7300	0.7000	0.7700	20.1983	(78)
West	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(80)

Solar gains	62.3460	115.5295	177.9208	245.6563	292.3231	296.2018	283.1911	248.4906	201.9391	133.5132	76.4951	52.1134 (83)
Total gains	641.0946	692.0228	737.4137	773.5375	789.0184	764.7577	735.2153	703.6417	673.3447	633.6634	611.2577	616.9578 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217
util living area												
	0.9610	0.9447	0.9106	0.8417	0.7238	0.5602	0.4146	0.4502	0.6573	0.8584	0.9408	0.9661 (86)
MIT	19.8077	19.9778	20.2552	20.5717	20.8210	20.9522	20.9890	20.9845	20.9075	20.5984	20.1401	19.7501 (87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090 (88)
util rest of house												
	0.9537	0.9346	0.8942	0.8130	0.6762	0.4917	0.3337	0.3674	0.5907	0.8265	0.9283	0.9597 (89)
MIT 2	18.7376	18.9495	19.2916	19.6700	19.9483	20.0761	20.1039	20.1014	20.0391	19.7098	19.1560	18.6657 (90)
Living area fraction										fLA = Living area / (4) =		0.3668 (91)
MIT	19.1301	19.3267	19.6451	20.0007	20.2684	20.3975	20.4286	20.4253	20.3577	20.0358	19.5170	19.0635 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1301	19.3267	19.6451	20.0007	20.2684	20.3975	20.4286	20.4253	20.3577	20.0358	19.5170	19.0635 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9438	0.9239	0.8843	0.8091	0.6852	0.5145	0.3631	0.3973	0.6102	0.8235	0.9182	0.9503	(94)
Useful gains	605.0488	639.3765	652.1063	625.8920	540.6287	393.4855	266.9708	279.5459	410.8611	521.8408	561.2602	586.2765	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1044.7817	1016.3608	926.0715	782.0460	603.6439	408.4310	269.7250	283.5830	440.8520	664.7509	874.7761	1047.1300	(97)
Space heating kWh													
	327.1613	253.3334	203.8301	112.4308	46.8833	0.0000	0.0000	0.0000	0.0000	106.3251	225.7315	342.8750	(98a)
Space heating requirement - total per year (kWh/year)												1618.5706	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	327.1613	253.3334	203.8301	112.4308	46.8833	0.0000	0.0000	0.0000	0.0000	106.3251	225.7315	342.8750	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1618.5706	
Space heating per m2											(98c) / (4) =	22.2698	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	327.1613	253.3334	203.8301	112.4308	46.8833	0.0000	0.0000	0.0000	0.0000	106.3251	225.7315	342.8750	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	490.7420	380.0001	305.7452	168.6463	70.3250	0.0000	0.0000	0.0000	0.0000	159.4877	338.5972	514.3125	
Space heating requirement													
	490.7420	380.0001	305.7452	168.6463	70.3250	0.0000	0.0000	0.0000	0.0000	159.4877	338.5972	514.3125	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	212.6591	185.2328	133.9970	102.2831	89.8555	87.9356	107.6103	136.1704	187.4116	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	318.9886	277.8492	200.9955	153.4247	134.7833	131.9034	161.4154	204.2556	281.1174	344.4473	383.7233	
Water heating fuel													
	387.9721	318.9886	277.8492	200.9955	153.4247	134.7833	131.9034	161.4154	204.2556	281.1174	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	8.4920	7.6702	8.4920	8.2180	8.4920	8.2180	8.4920	8.4920	8.2180	8.4920	8.2180	8.4920	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9541	-24.8708	-42.4882	-54.8798	-64.0812	-61.5030	-60.3713	-54.2093	-43.7560	-31.0030	-17.4758	-12.3621	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5447	-11.7075	-29.5072	-53.9842	-79.9096	-83.6490	-81.3696	-63.5332	-39.7064	-18.4938	-6.4743	-3.3869	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2427.8559	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2980.8759	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	24.2786	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4743.9371	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2427.8559	4.4400	107.7968	(340a)
Space heating total			107.7968	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2980.8759	4.4400	132.3509	(342a)
Water heating total			132.3509	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	16.4900	3.2957	(349)
Pump for solar water heating	80.0000	16.4900	13.1920	(349)
Energy for lighting	193.4401	16.4900	31.8983	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-481.9545	16.4900	-79.4743	
PV Unit electricity exported	-476.2665	5.5900	-26.6233	
Total			-106.0976	(352)
Total energy cost			274.4361	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8395 (357)
SAP value		86.3911
SAP rating (Section 12)		86 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1442.3285	0.1555	100.6989	(367)
Electrical energy for heat distribution (space & water)	24.2786	0.0000	8.1001	(372)
Overall CO2 factor for heat network			0.0414	(386)
Total CO2 associated with community systems			224.1020	(373)
Space and water heating			224.1020	(376)
Pumps, fans and electric keep-hot	99.9861	0.1387	13.8693	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-481.9545	0.1319	-63.5856	
PV Unit electricity exported	-476.2665	0.1213	-57.7895	
Total			-121.3751	(380)
Total CO2, kg/year			144.5156	(383)
CO2 emissions per m2			1.9900	(384)
EI value			98.3544	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330 (1b) - (3b)	
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		4.9323 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.3094	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day)	118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	

Distribution loss (46)m = 0.15 x (45)m

30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)

Water storage loss:

Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												698.3818	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												698.3818	
Solar input	-0.2882	-19.8943	-63.0504	-86.9122	-108.6771	-108.6071	-105.7317	-94.9883	-67.4759	-37.8323	-4.9243	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	258.3599	208.9842	180.2432	127.0942	98.8933	78.5413	78.9431	96.8840	126.3733	178.2168	224.7072	255.8155	(64)
									Total per year (kWh/year) = Sum(64)m =			1913.0561	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month													
	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)													
	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)
Total internal gains													
	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	23.7835	0.7300	0.7000	0.7700	40.7638	(76)
South	1.2200	54.0600	0.7300	0.7000	0.7700	23.3555	(78)
West	1.2200	23.7835	0.7300	0.7000	0.7700	10.2752	(80)

Solar gains	74.3946	122.6177	186.2329	260.3509	298.7480	324.9059	304.7294	272.3724	223.2097	149.5564	89.9365	62.5313	(83)
Total gains	653.1431	699.1110	745.7259	788.2321	795.4433	793.4618	756.7535	727.5235	694.6153	649.7066	624.6991	627.3756	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9562	0.9397	0.8988	0.8223	0.6940	0.4982	0.3595	0.3917	0.6209	0.8322	0.9313	0.9622	(86)
MIT	19.8706	20.0296	20.3276	20.6254	20.8555	20.9717	20.9942	20.9917	20.9283	20.6665	20.2144	19.8112	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9480	0.9287	0.8802	0.7906	0.6428	0.4277	0.2791	0.3090	0.5517	0.7952	0.9167	0.9550	(89)
MIT 2	18.8166	19.0140	19.3796	19.7314	19.9837	20.0914	20.1068	20.1055	20.0572	19.7868	19.2473	18.7425	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.2032	19.3865	19.7274	20.0593	20.3035	20.4143	20.4323	20.4306	20.3767	20.1095	19.6021	19.1345	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2032	19.3865	19.7274	20.0593	20.3035	20.4143	20.4323	20.4306	20.3767	20.1095	19.6021	19.1345	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9378	0.9180	0.8711	0.7887	0.6545	0.4524	0.3085	0.3392	0.5733	0.7952	0.9069	0.9452	(94)
Useful gains	612.5215	641.7586	649.6041	621.6800	520.6318	358.9308	233.4577	246.7594	398.2371	516.6780	566.5337	592.9734	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	1028.7961	999.4399	896.6423	757.9945	570.8920	367.3458	234.7616	248.7300	421.0609	634.7163	852.5898	1031.0004	(97)
Space heating kWh													
	309.7084	240.3618	183.7964	98.1464	37.3936	0.0000	0.0000	0.0000	0.0000	87.8205	205.9604	325.8921	(98a)
Space heating requirement - total per year (kWh/year)												1489.0795	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	309.7084	240.3618	183.7964	98.1464	37.3936	0.0000	0.0000	0.0000	0.0000	87.8205	205.9604	325.8921	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1489.0795	
Space heating per m2											(98c) / (4) =	20.4882	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement													
	309.7084	240.3618	183.7964	98.1464	37.3936	0.0000	0.0000	0.0000	0.0000	87.8205	205.9604	325.8921	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	464.5625	360.5427	275.6946	147.2196	56.0904	0.0000	0.0000	0.0000	0.0000	131.7308	308.9405	488.8381	
Space heating requirement													
	464.5625	360.5427	275.6946	147.2196	56.0904	0.0000	0.0000	0.0000	0.0000	131.7308	308.9405	488.8381	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement													
	258.3599	208.9842	180.2432	127.0942	98.8933	78.5413	78.9431	96.8840	126.3733	178.2168	224.7072	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.5399	313.4764	270.3648	190.6413	148.3399	117.8120	118.4147	145.3260	189.5599	267.3252	337.0608	383.7233	
Water heating fuel													
	387.5399	313.4764	270.3648	190.6413	148.3399	117.8120	118.4147	145.3260	189.5599	267.3252	337.0608	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	8.4920	7.6702	8.4920	8.2180	8.4920	8.2180	8.4920	8.4920	8.2180	8.4920	8.2180	8.4920	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.8663	-26.6927	-44.7143	-57.6640	-65.4319	-65.1316	-63.3225	-57.8097	-47.4406	-34.4735	-20.5043	-14.8840	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.1321	-13.2725	-32.5307	-59.9091	-83.8086	-95.9871	-91.1676	-73.4319	-46.9082	-22.5228	-8.5261	-4.6148	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2233.6193	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2869.5841	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	22.3362	(313)
Space cooling fuel	0.0000	(321)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4341.8827	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2233.6193	6.5500	146.3021	(340a)
Space heating total			146.3021	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2869.5841	6.5500	187.9578	(342a)
Water heating total			187.9578	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	28.4300	5.6821	(349)
Pump for solar water heating	80.0000	28.4300	22.7440	(349)
Energy for lighting	193.4401	28.4300	54.9950	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-515.9355	28.4300	-146.6805	
PV Unit electricity exported	-538.8116	5.8100	-31.3050	
Total			-177.9854	(352)
Total energy cost			343.6955	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1360.8542	0.1559	92.8784	(367)
Electrical energy for heat distribution (space & water)	22.3362	0.0000	7.6631	(372)
Overall CO2 factor for heat network			0.0415	(386)
Total CO2 associated with community systems			212.0128	(373)
Space and water heating			212.0128	(376)
Pumps, fans and electric keep-hot	99.9861	0.1387	13.8693	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-515.9355	0.1322	-68.2250	
PV Unit electricity exported	-538.8116	0.1214	-65.4032	
Total			-133.6282	(380)
Total CO2, kg/year			120.1733	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1360.8542	1.5773	939.4838	(467)
Electrical energy for heat distribution (space & water)	22.3362	0.0000	79.3891	(472)
Overall CO2 factor for heat network			0.4304	(486)
Total CO2 associated with community systems			2196.4304	(473)
Space and water heating			2196.4304	(476)
Pumps, fans and electric keep-hot	99.9861	1.5128	151.2590	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-515.9355	1.4886	-768.0122	
PV Unit electricity exported	-538.8116	0.4453	-239.9213	
Total			-1007.9335	(480)
Total Primary energy kWh/year			1636.4609	(483)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	13.54	**TER**	12.07
Environmental	89 B	**% DER < TER**			-12.18
CO_2 Emissions (t/year)	0.93	**DFEE**	32.26	**TFEE**	34.75
Compliance Check	See BREL	**% DFEE < TFEE**			7.18
% DPER < TPER	-20.09	**DPER**	76.02	**TPER**	63.30

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		11875.9502	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							163.4005	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 4.9323 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)											Total = Sum(45)m =	1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2447	12.8548	14.2078	13.6980	14.1221	13.6336	14.0671	14.0844	13.6497	14.1424	13.7355	14.2379	(61)
Total heat required for water heating calculated for each month	217.6159	191.8059	202.2246	174.2107	166.4156	147.2883	143.4652	150.6799	154.0051	174.9147	189.8734	214.7766	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	217.6159	191.8059	202.2246	174.2107	166.4156	147.2883	143.4652	150.6799	154.0051	174.9147	189.8734	214.7766	(64)
										Total per year (kWh/year) = Sum(64)m =		2127.2759	(64)
12Total per year (kWh/year)												2127	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	71.1821	62.7149	66.0675	56.7950	54.1681	47.8486	46.5416	48.9391	50.0806	56.9924	61.9997	70.2386	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	95.6749	93.3258	88.8004	78.8819	72.8066	66.4564	62.5559	65.7783	69.5564	76.6027	86.1107	94.4067	(72)
Total internal gains	478.2500	490.7049	468.1663	450.8697	426.5474	407.7076	390.8808	391.9918	405.0393	422.4636	450.2187	468.0042	(73)

6. Solar gains

[Jan]

	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	19.6403	0.7300	0.7000	0.7700	33.6625	(76)
South	1.2200	46.7521	0.7300	0.7000	0.7700	20.1983	(78)
West	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	62.3460	115.5295	177.9208	245.6563	292.3231	296.2018	283.1911	248.4906	201.9391	133.5132	76.4951	52.1134	(83)
Total gains	540.5960	606.2344	646.0871	696.5260	718.8704	703.9094	674.0719	640.4823	606.9784	555.9768	526.7139	520.1176	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													

	0.9777	0.9633	0.9385	0.8766	0.7657	0.5996	0.4496	0.4904	0.7069	0.8978	0.9626	0.9808	(86)
MIT	19.6214	19.8293	20.1167	20.4854	20.7772	20.9388	20.9852	20.9788	20.8786	20.5032	19.9953	19.5673	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9732	0.9561	0.9261	0.8517	0.7202	0.5290	0.3630	0.4019	0.6407	0.8718	0.9539	0.9769	(89)
MIT 2	18.5047	18.7662	19.1251	19.5727	19.9052	20.0661	20.1021	20.0984	20.0149	19.6033	18.9787	18.4363	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.9143	19.1562	19.4888	19.9075	20.2250	20.3862	20.4260	20.4213	20.3317	19.9334	19.3516	18.8512	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.7643	19.0062	19.3388	19.7575	20.0750	20.2362	20.2760	20.2713	20.1817	19.7834	19.2016	18.7012	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9642	0.9448	0.9131	0.8405	0.7183	0.5396	0.3796	0.4185	0.6465	0.8605	0.9426	0.9686	(94)
Useful gains	521.2318	572.7420	589.9384	585.4292	516.3995	379.8049	255.8611	268.0353	392.4160	478.4336	496.4911	503.8034	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1019.0099	993.7803	904.4942	764.9115	590.0214	397.0701	258.9772	272.7354	428.4592	646.9702	852.5544	1021.6077	(97)
Space heating kWh													
	370.3468	282.9377	234.0295	129.2273	54.7747	0.0000	0.0000	0.0000	0.0000	125.3913	256.3655	385.2464	(98a)
Space heating requirement - total per year (kWh/year)												1838.3193	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	370.3468	282.9377	234.0295	129.2273	54.7747	0.0000	0.0000	0.0000	0.0000	125.3913	256.3655	385.2464	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1838.3193	
Space heating per m2											(98c) / (4) =	25.2933	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	370.3468	282.9377	234.0295	129.2273	54.7747	0.0000	0.0000	0.0000	0.0000	125.3913	256.3655	385.2464	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	416.1200	317.9076	262.9544	145.1992	61.5446	0.0000	0.0000	0.0000	0.0000	140.8890	288.0512	432.8612	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	217.6159	191.8059	202.2246	174.2107	166.4156	147.2883	143.4652	150.6799	154.0051	174.9147	189.8734	214.7766	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.3631	88.3053	88.2038	88.0160	87.7149	87.3000	87.3000	87.3000	87.3000	88.0019	88.2686	88.3839	(217)
Fuel for water heating, kWh/month													
	246.2746	217.2077	229.2697	197.9308	189.7233	168.7151	164.3358	172.6001	176.4091	198.7625	215.1086	243.0041	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	9.0016	8.1304	9.0016	8.7112	9.0016	8.7112	9.0016	9.0016	8.7112	9.0016	8.7112	9.0016	(231)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2065.5273	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2419.3414	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	105.9861	(231)
Electricity for lighting (calculated in Appendix L)	193.4401	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4784.2949	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2065.5273	0.2100	433.7607	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2419.3414	0.2100	508.0617	(264)
Space and water heating			941.8224	(265)
Pumps, fans and electric keep-hot	105.9861	0.1387	14.7016	(267)
Energy for lighting	193.4401	0.1443	27.9194	(268)
Total CO2, kg/year			984.4434	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.5400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2065.5273	1.1300	2334.0458	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2419.3414	1.1300	2733.8558	(278)
Space and water heating			5067.9016	(279)
Pumps, fans and electric keep-hot	105.9861	1.5128	160.3358	(281)
Energy for lighting	193.4401	1.5338	296.7049	(282)
Total Primary energy kWh/year			5524.9423	(286)
Dwelling Primary energy Rate (DPER)			76.0200	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b) x	2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c) x	2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4185	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3243	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4135	0.4054	0.3973	0.3568	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3649	0.3811	(22b)
Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			7.2800	1.1450	8.3359			(27)
Heatloss floor			36.3400	0.1300	4.7242			(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.1800	14.8338			(29a)
500mm mineral wool	36.3400		36.3400	0.1100	3.9974			(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.9313			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	3.6500	0.0500	0.1825
E3	Sill	2.7400	0.0500	0.1370
E4	Jamb	14.8400	0.0500	0.7420
E5	Ground floor (normal)	18.7200	0.1600	2.9952
E6	Intermediate floor within a dwelling	18.7200	0.0000	0.0000
E10	Eaves (insulation at ceiling level)	18.7200	0.0600	1.1232
E16	Corner (normal)	10.4000	0.0900	0.9360
E18	Party wall between dwellings	10.4000	0.0600	0.6240
P1	Party wall - Ground floor	5.5000	0.0800	0.4400
P2	Party wall - Intermediate floor within a dwelling	5.5000	0.0000	0.0000
P4	Party wall - Roof (insulation at ceiling level)	5.5000	0.1200	0.6600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8399 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 41.7712 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.4047	34.2096	34.0184	33.1202	32.9522	32.1700	32.1700	32.0251	32.4713	32.9522	33.2921	33.6475	(38)
Heat transfer coeff	76.1759	75.9808	75.7896	74.8914	74.7234	73.9411	73.9411	73.7963	74.2424	74.7234	75.0633	75.4187	(39)

Average = Sum(39)m / 12 = 74.8906

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0481	1.0454	1.0428	1.0304	1.0281	1.0174	1.0174	1.0154	1.0215	1.0281	1.0328	1.0377	(40)
HLP (average)												1.0304	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 118.0387 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	254.3302	224.9785	238.9757	209.8278	203.2525	182.9698	180.3569	187.5544	189.6706	211.7312	225.4529	251.4976	(62)
WWHRS	-28.7738	-25.4478	-26.6475	-22.0651	-20.5639	-17.5967	-16.4941	-17.5398	-18.2062	-21.4631	-24.3151	-28.2410	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	225.5564	199.5307	212.3282	187.7626	182.6886	165.3731	163.8628	170.0145	171.4643	190.2681	201.1378	223.2567	(64)
										Total per year (kWh/year) = Sum(64)m =		2293.2440	(64)
12Total per year (kWh/year)												2293	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	80.3607	71.0081	75.2553	65.6992	63.3773	56.7690	55.7646	58.1577	58.9970	66.1965	70.8946	79.4189	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	108.0117	105.6668	101.1496	91.2489	85.1846	78.8458	74.9524	78.1690	81.9402	88.9738	98.4647	106.7458	(72)
Total internal gains	490.5867	503.0459	480.5155	463.2367	438.9253	420.0970	403.2772	404.3824	417.4231	434.8348	462.5727	480.3432	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	19.6403	0.6300	0.7000	0.7700	29.0512	(76)
South	1.2200	46.7521	0.6300	0.7000	0.7700	17.4314	(78)
West	1.2200	19.6403	0.6300	0.7000	0.7700	7.3228	(80)

Solar gains	53.8055	99.7035	153.5481	212.0047	252.2788	255.6262	244.3978	214.4508	174.2762	115.2237	66.0163	44.9746 (83)
Total gains	544.3922	602.7494	634.0635	675.2415	691.2041	675.7232	647.6750	618.8332	591.6993	550.0585	528.5891	525.3178 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3060	43.4172	43.5268	44.0488	44.1478	44.6149	44.6149	44.7025	44.4338	44.1478	43.9479	43.7408	
alpha	3.8871	3.8945	3.9018	3.9366	3.9432	3.9743	3.9743	3.9802	3.9623	3.9432	3.9299	3.9161	
util living area	0.9785	0.9667	0.9469	0.8955	0.7998	0.6389	0.4856	0.5247	0.7373	0.9087	0.9647	0.9811	(86)
MIT	19.4587	19.6638	19.9594	20.3687	20.7023	20.9129	20.9772	20.9689	20.8404	20.4190	19.8837	19.4291	(87)
Th 2	20.0434	20.0457	20.0478	20.0581	20.0600	20.0689	20.0689	20.0706	20.0655	20.0600	20.0561	20.0521	(88)
util rest of house	0.9741	0.9599	0.9356	0.8725	0.7555	0.5646	0.3899	0.4284	0.6702	0.8839	0.9563	0.9772	(89)
MIT 2	18.2542	18.5142	18.8867	19.3958	19.7844	20.0072	20.0583	20.0550	19.9406	19.4666	18.8019	18.2225	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.6960	18.9359	19.2802	19.7527	20.1211	20.3394	20.3954	20.3902	20.2707	19.8160	19.1987	18.6651	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6960	18.9359	19.2802	19.7527	20.1211	20.3394	20.3954	20.3902	20.2707	19.8160	19.1987	18.6651	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9658	0.9498	0.9244	0.8640	0.7586	0.5872	0.4243	0.4625	0.6861	0.8763	0.9465	0.9695	(94)
Useful gains	525.7653	572.4937	586.1340	583.3793	524.3765	396.7984	274.8146	286.2292	405.9384	482.0117	500.2898	509.3075	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1096.6288	1066.4594	968.6039	812.7723	629.2549	424.3786	280.6326	294.4632	458.1262	688.6489	908.1697	1090.9385	(97)
Space heating kWh	424.7225	331.9449	284.5576	165.1630	78.0296	0.0000	0.0000	0.0000	0.0000	153.7381	293.6735	432.7334	(98a)
Space heating requirement - total per year (kWh/year)												2164.5626	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	424.7225	331.9449	284.5576	165.1630	78.0296	0.0000	0.0000	0.0000	0.0000	153.7381	293.6735	432.7334	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2164.5626	
Space heating per m2										(98c) / (4) =		29.7821	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.4000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	424.7225	331.9449	284.5576	165.1630	78.0296	0.0000	0.0000	0.0000	0.0000	153.7381	293.6735	432.7334	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	459.6564	359.2477	307.9628	178.7478	84.4476	0.0000	0.0000	0.0000	0.0000	166.3832	317.8285	468.3262	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	225.5564	199.5307	212.3282	187.7626	182.6886	165.3731	163.8628	170.0145	171.4643	190.2681	201.1378	223.2567	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.7158	85.4637	85.0095	84.1077	82.6942	80.3000	80.3000	80.3000	80.3000	83.9285	85.1912	85.7736	(217)
Fuel for water heating, kWh/month	263.1444	233.4684	249.7699	223.2407	220.9207	205.9441	204.0633	211.7242	213.5297	226.7027	236.1016	260.2860	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.6146	19.7468	17.7798	13.0262	10.0618	8.2206	9.1787	11.9309	15.4970	20.3329	22.9660	25.2988	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-34.1427	-48.1921	-69.3402	-78.0353	-84.2042	-78.6248	-77.6860	-73.3488	-65.6465	-55.1924	-37.5712	-29.5143	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.0663	-40.1520	-79.8860	-120.0915	-158.8866	-159.6687	-157.7568	-133.4905	-97.7594	-57.4135	-25.4553	-15.0706	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	2342.6002 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	80.3000
Water heating fuel used	2748.8958 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	198.6542 (232)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1796.1956	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3579.9547	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2342.6002	0.2100	491.9460	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2748.8958	0.2100	577.2681	(264)
Space and water heating			1069.2142	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	198.6542	0.1443	28.6719	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	0.1346	-98.4313	
PV Unit electricity exported	-1064.6971	0.1259	-134.0169	
Total			-232.4482	(269)
Total CO2, kg/year			877.3672	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.0700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2342.6002	1.1300	2647.1383	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2748.8958	1.1300	3106.2522	(278)
Space and water heating			5753.3905	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	198.6542	1.5338	304.7025	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	1.4973	-1095.2830	
PV Unit electricity exported	-1064.6971	0.4620	-491.9332	
Total			-1587.2162	(283)
Total Primary energy kWh/year			4600.9775	(286)
Target Primary Energy Rate (TPER)			63.3000	(287)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	13.54	**TER**	12.07
Environmental	89 B	**% DER < TER**			-12.18
CO_2 Emissions (t/year)	0.93	**DFEE**	32.26	**TFEE**	34.75
Compliance Check	See BREL	**% DFEE < TFEE**			7.18
% DPER < TPER	-20.09	**DPER**	76.02	**TPER**	63.30

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		3 * 10 =	30.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1685	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.3185	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2468	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3147	0.3085	0.3024	0.2715	0.2653	0.2345	0.2345	0.2283	0.2468	0.2653	0.2777	0.2900	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5495	0.5476	0.5457	0.5369	0.5352	0.5275	0.5275	0.5261	0.5305	0.5352	0.5386	0.5421	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		11875.9502	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							163.4005	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							4.9323	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.2906	32.1776	32.0668	31.5466	31.4493	30.9963	30.9963	30.9124	31.1708	31.4493	31.6462	31.8520	(38)
Heat transfer coeff	73.3597	73.2467	73.1359	72.6157	72.5184	72.0654	72.0654	71.9815	72.2399	72.5184	72.7153	72.9211	(39)
Average = Sum(39)m / 12 =												72.6153	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0094	1.0078	1.0063	0.9991	0.9978	0.9915	0.9915	0.9904	0.9939	0.9978	1.0005	1.0033	(40)
HLP (average)												0.9991	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 60.0096 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.4702	63.6744	61.7137	59.2732	57.0961	54.8336	54.3634	56.3200	58.3269	60.6504	63.1125	65.3783	(44)
Energy conte	103.6888	90.6715	94.8517	81.1421	76.8624	67.4243	65.7478	69.7360	71.9229	82.3020	89.9153	102.3666	(45)
Energy content (annual)										Total = Sum(45)m =		996.6312	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(62)

WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(64)
								Total per year (kWh/year) = Sum(64)m =			847.1365	(64)
12Total per year (kWh/year)											847	(64)	

Electric shower(s)

50.4049	44.9112	49.0413	46.7995	47.6777	45.4799	46.9959	47.6777	46.7995	49.0413	48.1191	50.4049	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 573.3528 (64a)

Heat gains from water heating, kWh/month

34.6351	30.4955	32.4163	28.9426	28.2527	25.6976	25.7204	26.7383	26.9835	29.7495	31.1368	34.3541	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	46.5525	45.3802	43.5703	40.1980	37.9740	35.6912	34.5704	35.9386	37.4771	39.9859	43.2455	46.1749	(72)
Total internal gains	426.1276	439.7593	419.9362	409.1858	388.7147	376.9424	362.8952	362.1520	372.9599	382.8469	404.3535	416.7724	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	19.6403	0.7300	0.7000	0.7700	33.6625	(76)
South	1.2200	46.7521	0.7300	0.7000	0.7700	20.1983	(78)
West	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(80)

Solar gains	62.3460	115.5295	177.9208	245.6563	292.3231	296.2018	283.1911	248.4906	201.9391	133.5132	76.4951	52.1134	(83)
Total gains	488.4737	555.2888	597.8569	654.8421	681.0378	673.1442	646.0863	610.6426	574.8991	516.3600	480.8487	468.8858	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	44.9685	45.0379	45.1061	45.4292	45.4902	45.7762	45.7762	45.8295	45.6656	45.4902	45.3670	45.2389	
alpha	3.9979	4.0025	4.0071	4.0286	4.0327	4.0517	4.0517	4.0553	4.0444	4.0327	4.0245	4.0159	
util living area	0.9846	0.9734	0.9535	0.8991	0.7974	0.6304	0.4764	0.5205	0.7409	0.9196	0.9730	0.9868	(86)

MIT	19.4333	19.6547	19.9666	20.3880	20.7226	20.9221	20.9804	20.9719	20.8467	20.4101	19.8544	19.3924	(87)
Th 2	20.0755	20.0768	20.0781	20.0841	20.0852	20.0904	20.0904	20.0914	20.0884	20.0852	20.0829	20.0806	(88)
util rest of house													
	0.9814	0.9679	0.9434	0.8770	0.7535	0.5576	0.3841	0.4266	0.6751	0.8973	0.9664	0.9841	(89)
MIT 2	18.6483	18.8675	19.1742	19.5819	19.8848	20.0474	20.0832	20.0803	19.9943	19.6111	19.0713	18.6116	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.9362	19.1562	19.4649	19.8776	20.1921	20.3682	20.4123	20.4074	20.3070	19.9042	19.3586	18.8980	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9362	19.1562	19.4649	19.8776	20.1921	20.3682	20.4123	20.4074	20.3070	19.9042	19.3586	18.8980	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9761	0.9610	0.9354	0.8713	0.7591	0.5808	0.4175	0.4602	0.6920	0.8921	0.9598	0.9793	(94)
Useful gains	476.8221	533.6102	559.2201	570.5454	516.9580	390.9736	269.7288	281.0180	397.8519	460.6557	461.5066	459.1979	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1073.7082	1044.2200	948.1965	797.1465	615.8319	415.6902	274.7349	288.4563	448.3907	674.7235	891.3847	1071.7964	(97)
Space heating kWh													
	444.0833	343.1298	289.3984	163.1528	73.5622	0.0000	0.0000	0.0000	0.0000	159.2664	309.5122	455.7733	(98a)
Space heating requirement - total per year (kWh/year)												2237.8785	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	444.0833	343.1298	289.3984	163.1528	73.5622	0.0000	0.0000	0.0000	0.0000	159.2664	309.5122	455.7733	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2237.8785	
Space heating per m2											(98c) / (4) =	30.7908	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	677.4144	533.2836	547.0591	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8309	0.8946	0.8707	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	562.8935	477.0793	476.2994	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	730.2120	701.3194	662.3353	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	120.4693	166.8346	138.4108	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	30.1173	41.7087	34.6027	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												106.4287	(107)
Energy for space heating												30.7908	(99)
Energy for space cooling												1.4643	(108)
Total												32.2552	(109)
Fabric Energy Efficiency (DFEE)												32.3	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor		36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

		m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)	
Number of open flues	0 * 20 =	0.0000	(6b)	
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)	
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)	
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)	
Number of blocked chimneys	0 * 20 =	0.0000	(6f)	
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)	
Number of passive vents	0 * 10 =	0.0000	(7b)	
Number of flueless gas fires	0 * 40 =	0.0000	(7c)	
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)	
Pressure test		Yes		
Pressure Test Method		Blower Door		
Measured/design AP50		5.0000	(17)	
Infiltration rate		0.4185	(18)	
Number of sides sheltered		3	(19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3243	(21)	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4135	0.4054	0.3973	0.3568	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3649	0.3811	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			7.2800	1.1450	8.3359			(27)
Heatloss floor			36.3400	0.1300	4.7242			(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.1800	14.8338			(29a)
500mm mineral wool	36.3400		36.3400	0.1100	3.9974			(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.9313			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	3.6500	0.0500	0.1825
E3 Sill	2.7400	0.0500	0.1370
E4 Jamb	14.8400	0.0500	0.7420
E5 Ground floor (normal)	18.7200	0.1600	2.9952
E6 Intermediate floor within a dwelling	18.7200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.7200	0.0600	1.1232
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	5.5000	0.0800	0.4400
P2 Party wall - Intermediate floor within a dwelling	5.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	5.5000	0.1200	0.6600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8399 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.7712 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.4047	34.2096	34.0184	33.1202	32.9522	32.1700	32.1700	32.0251	32.4713	32.9522	33.2921	33.6475	(38)
Heat transfer coeff	76.1759	75.9808	75.7896	74.8914	74.7234	73.9411	73.9411	73.7963	74.2424	74.7234	75.0633	75.4187	(39)
Average = Sum(39)m / 12 =												74.8906	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0481	1.0454	1.0428	1.0304	1.0281	1.0174	1.0174	1.0154	1.0215	1.0281	1.0328	1.0377	(40)
HLP (average)												1.0304	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 60.0096 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.4702	63.6744	61.7137	59.2732	57.0961	54.8336	54.3634	56.3200	58.3269	60.6504	63.1125	65.3783	(44)
Energy conte	103.6888	90.6715	94.8517	81.1421	76.8624	67.4243	65.7478	69.7360	71.9229	82.3020	89.9153	102.3666	(45)
Energy content (annual)										Total = Sum(45)m =		996.6312	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(64)
								Total per year (kWh/year) = Sum(64)m =			847.1365	(64)
12Total per year (kWh/year)											847	(64)	

Electric shower(s)

50.4049	44.9112	49.0413	46.7995	47.6777	45.4799	46.9959	47.6777	46.7995	49.0413	48.1191	50.4049	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				573.3528	(64a)

Heat gains from water heating, kWh/month

34.6351	30.4955	32.4163	28.9426	28.2527	25.6976	25.7204	26.7383	26.9835	29.7495	31.1368	34.3541	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)													
	46.5525	45.3802	43.5703	40.1980	37.9740	35.6912	34.5704	35.9386	37.4771	39.9859	43.2455	46.1749	(72)
Total internal gains													
	426.1276	439.7593	419.9362	409.1858	388.7147	376.9424	362.8952	362.1520	372.9599	382.8469	404.3535	416.7724	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	19.6403	0.6300	0.7000	0.7700	29.0512	(76)
South	1.2200	46.7521	0.6300	0.7000	0.7700	17.4314	(78)
West	1.2200	19.6403	0.6300	0.7000	0.7700	7.3228	(80)

Solar gains	53.8055	99.7035	153.5481	212.0047	252.2788	255.6262	244.3978	214.4508	174.2762	115.2237	66.0163	44.9746	(83)
Total gains	479.9331	539.4628	573.4842	621.1905	640.9935	632.5686	607.2930	576.6028	547.2362	498.0706	470.3699	461.7470	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3060	43.4172	43.5268	44.0488	44.1478	44.6149	44.6149	44.7025	44.4338	44.1478	43.9479	43.7408	
alpha	3.8871	3.8945	3.9018	3.9366	3.9432	3.9743	3.9743	3.9802	3.9623	3.9432	3.9299	3.9161	
util living area													
	0.9858	0.9765	0.9606	0.9158	0.8286	0.6703	0.5139	0.5571	0.7713	0.9301	0.9755	0.9877	(86)
MIT	19.3345	19.5472	19.8560	20.2937	20.6568	20.8965	20.9722	20.9616	20.8107	20.3424	19.7768	19.3051	(87)
Th 2	20.0434	20.0457	20.0478	20.0581	20.0600	20.0689	20.0689	20.0706	20.0655	20.0600	20.0561	20.0521	(88)
util rest of house													
	0.9827	0.9715	0.9517	0.8961	0.7873	0.5956	0.4143	0.4572	0.7066	0.9097	0.9694	0.9851	(89)
MIT 2	18.5268	18.7385	19.0439	19.4739	19.8085	20.0109	20.0586	20.0553	19.9475	19.5283	18.9752	18.5040	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.8231	19.0351	19.3418	19.7746	20.1196	20.3357	20.3937	20.3877	20.2642	19.8269	19.2692	18.7979	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8231	19.0351	19.3418	19.7746	20.1196	20.3357	20.3937	20.3877	20.2642	19.8269	19.2692	18.7979	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9776	0.9647	0.9436	0.8892	0.7902	0.6182	0.4501	0.4926	0.7217	0.9037	0.9629	0.9804	(94)
Useful gains	469.1756	520.4295	541.1549	552.3676	506.5082	391.0515	273.3508	284.0123	394.9171	450.0999	452.9016	452.6979	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1106.3081	1073.9997	973.2745	814.4159	629.1446	424.1071	280.5132	294.2801	457.6422	689.4660	913.4615	1100.9515	(97)
Space heating kWh													
	474.0266	371.9992	321.4969	188.6748	91.2415	0.0000	0.0000	0.0000	0.0000	178.0884	331.6032	482.3006	(98a)
Space heating requirement - total per year (kWh/year)												2439.4312	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	474.0266	371.9992	321.4969	188.6748	91.2415	0.0000	0.0000	0.0000	0.0000	178.0884	331.6032	482.3006	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2439.4312	
Space heating per m2											(98c) / (4) =	33.5640	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	695.0467	547.1644	560.8517	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7918	0.8643	0.8386	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	550.3351	472.8936	470.3361	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	682.7860	655.9765	622.5485	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	95.3646	136.2137	113.2460	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	23.8412	34.0534	28.3115	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												86.2061	(107)
Energy for space heating												33.5640	(99)
Energy for space cooling												1.1861	(108)
Total												34.7501	(109)
Fabric Energy Efficiency (TFEE)												34.8	(109)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	13.54	**TER**	12.07
Environmental	89 B	**% DER < TER**			-12.18
CO_2 Emissions (t/year)	0.93	**DFEE**	32.26	**TFEE**	34.75
Compliance Check	See BREL	**% DFEE < TFEE**			7.18
% DPER < TPER	-20.09	**DPER**	76.02	**TPER**	63.30

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		11875.9502	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							163.4005	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 4.9323 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)											Total = Sum(45)m =	1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2447	12.8548	14.2078	13.6980	14.1221	13.6336	14.0671	14.0844	13.6497	14.1424	13.7355	14.2379	(61)
Total heat required for water heating calculated for each month	217.6159	191.8059	202.2246	174.2107	166.4156	147.2883	143.4652	150.6799	154.0051	174.9147	189.8734	214.7766	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	217.6159	191.8059	202.2246	174.2107	166.4156	147.2883	143.4652	150.6799	154.0051	174.9147	189.8734	214.7766	(64)
										Total per year (kWh/year) = Sum(64)m =		2127.2759	(64)
12Total per year (kWh/year)												2127	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	71.1821	62.7149	66.0675	56.7950	54.1681	47.8486	46.5416	48.9391	50.0806	56.9924	61.9997	70.2386	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	95.6749	93.3258	88.8004	78.8819	72.8066	66.4564	62.5559	65.7783	69.5564	76.6027	86.1107	94.4067	(72)
Total internal gains	478.2500	490.7049	468.1663	450.8697	426.5474	407.7076	390.8808	391.9918	405.0393	422.4636	450.2187	468.0042	(73)

6. Solar gains

[Jan]

	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	19.6403	0.7300	0.7000	0.7700	33.6625	(76)
South	1.2200	46.7521	0.7300	0.7000	0.7700	20.1983	(78)
West	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	62.3460	115.5295	177.9208	245.6563	292.3231	296.2018	283.1911	248.4906	201.9391	133.5132	76.4951	52.1134	(83)
Total gains	540.5960	606.2344	646.0871	696.5260	718.8704	703.9094	674.0719	640.4823	606.9784	555.9768	526.7139	520.1176	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													

	0.9777	0.9633	0.9385	0.8766	0.7657	0.5996	0.4496	0.4904	0.7069	0.8978	0.9626	0.9808	(86)
MIT	19.6214	19.8293	20.1167	20.4854	20.7772	20.9388	20.9852	20.9788	20.8786	20.5032	19.9953	19.5673	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9732	0.9561	0.9261	0.8517	0.7202	0.5290	0.3630	0.4019	0.6407	0.8718	0.9539	0.9769	(89)
MIT 2	18.5047	18.7662	19.1251	19.5727	19.9052	20.0661	20.1021	20.0984	20.0149	19.6033	18.9787	18.4363	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.9143	19.1562	19.4888	19.9075	20.2250	20.3862	20.4260	20.4213	20.3317	19.9334	19.3516	18.8512	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.7643	19.0062	19.3388	19.7575	20.0750	20.2362	20.2760	20.2713	20.1817	19.7834	19.2016	18.7012	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9642	0.9448	0.9131	0.8405	0.7183	0.5396	0.3796	0.4185	0.6465	0.8605	0.9426	0.9686	(94)
Useful gains	521.2318	572.7420	589.9384	585.4292	516.3995	379.8049	255.8611	268.0353	392.4160	478.4336	496.4911	503.8034	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1019.0099	993.7803	904.4942	764.9115	590.0214	397.0701	258.9772	272.7354	428.4592	646.9702	852.5544	1021.6077	(97)
Space heating kWh													
	370.3468	282.9377	234.0295	129.2273	54.7747	0.0000	0.0000	0.0000	0.0000	125.3913	256.3655	385.2464	(98a)
Space heating requirement - total per year (kWh/year)												1838.3193	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	370.3468	282.9377	234.0295	129.2273	54.7747	0.0000	0.0000	0.0000	0.0000	125.3913	256.3655	385.2464	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1838.3193	
Space heating per m2											(98c) / (4) =	25.2933	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	370.3468	282.9377	234.0295	129.2273	54.7747	0.0000	0.0000	0.0000	0.0000	125.3913	256.3655	385.2464	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	416.1200	317.9076	262.9544	145.1992	61.5446	0.0000	0.0000	0.0000	0.0000	140.8890	288.0512	432.8612	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	217.6159	191.8059	202.2246	174.2107	166.4156	147.2883	143.4652	150.6799	154.0051	174.9147	189.8734	214.7766	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.3631	88.3053	88.2038	88.0160	87.7149	87.3000	87.3000	87.3000	87.3000	88.0019	88.2686	88.3839	(217)
Fuel for water heating, kWh/month													
	246.2746	217.2077	229.2697	197.9308	189.7233	168.7151	164.3358	172.6001	176.4091	198.7625	215.1086	243.0041	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	9.0016	8.1304	9.0016	8.7112	9.0016	8.7112	9.0016	9.0016	8.7112	9.0016	8.7112	9.0016	(231)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2065.5273	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2419.3414	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	105.9861	(231)
Electricity for lighting (calculated in Appendix L)	193.4401	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4784.2949	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2065.5273	0.2100	433.7607	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2419.3414	0.2100	508.0617	(264)
Space and water heating			941.8224	(265)
Pumps, fans and electric keep-hot	105.9861	0.1387	14.7016	(267)
Energy for lighting	193.4401	0.1443	27.9194	(268)
Total CO2, kg/year			984.4434	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.5400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2065.5273	1.1300	2334.0458	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2419.3414	1.1300	2733.8558	(278)
Space and water heating			5067.9016	(279)
Pumps, fans and electric keep-hot	105.9861	1.5128	160.3358	(281)
Energy for lighting	193.4401	1.5338	296.7049	(282)
Total Primary energy kWh/year			5524.9423	(286)
Dwelling Primary energy Rate (DPER)			76.0200	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b) x	2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c) x	2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4185	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3243	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4135	0.4054	0.3973	0.3568	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3649	0.3811	(22b)
Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			7.2800	1.1450	8.3359			(27)
Heatloss floor			36.3400	0.1300	4.7242			(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.1800	14.8338			(29a)
500mm mineral wool	36.3400		36.3400	0.1100	3.9974			(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.9313			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	3.6500	0.0500	0.1825
E3	Sill	2.7400	0.0500	0.1370
E4	Jamb	14.8400	0.0500	0.7420
E5	Ground floor (normal)	18.7200	0.1600	2.9952
E6	Intermediate floor within a dwelling	18.7200	0.0000	0.0000
E10	Eaves (insulation at ceiling level)	18.7200	0.0600	1.1232
E16	Corner (normal)	10.4000	0.0900	0.9360
E18	Party wall between dwellings	10.4000	0.0600	0.6240
P1	Party wall - Ground floor	5.5000	0.0800	0.4400
P2	Party wall - Intermediate floor within a dwelling	5.5000	0.0000	0.0000
P4	Party wall - Roof (insulation at ceiling level)	5.5000	0.1200	0.6600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8399 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 41.7712 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.4047	34.2096	34.0184	33.1202	32.9522	32.1700	32.1700	32.0251	32.4713	32.9522	33.2921	33.6475	(38)
Heat transfer coeff	76.1759	75.9808	75.7896	74.8914	74.7234	73.9411	73.9411	73.7963	74.2424	74.7234	75.0633	75.4187	(39)

Average = Sum(39)m / 12 = 74.8906

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0481	1.0454	1.0428	1.0304	1.0281	1.0174	1.0174	1.0154	1.0215	1.0281	1.0328	1.0377	(40)
HLP (average)												1.0304	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 118.0387 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	254.3302	224.9785	238.9757	209.8278	203.2525	182.9698	180.3569	187.5544	189.6706	211.7312	225.4529	251.4976	(62)
WWHRS	-28.7738	-25.4478	-26.6475	-22.0651	-20.5639	-17.5967	-16.4941	-17.5398	-18.2062	-21.4631	-24.3151	-28.2410	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	225.5564	199.5307	212.3282	187.7626	182.6886	165.3731	163.8628	170.0145	171.4643	190.2681	201.1378	223.2567	(64)
										Total per year (kWh/year) = Sum(64)m =		2293.2440	(64)
12Total per year (kWh/year)												2293	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	80.3607	71.0081	75.2553	65.6992	63.3773	56.7690	55.7646	58.1577	58.9970	66.1965	70.8946	79.4189	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	108.0117	105.6668	101.1496	91.2489	85.1846	78.8458	74.9524	78.1690	81.9402	88.9738	98.4647	106.7458	(72)
Total internal gains	490.5867	503.0459	480.5155	463.2367	438.9253	420.0970	403.2772	404.3824	417.4231	434.8348	462.5727	480.3432	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	19.6403	0.6300	0.7000	0.7700	29.0512	(76)
South	1.2200	46.7521	0.6300	0.7000	0.7700	17.4314	(78)
West	1.2200	19.6403	0.6300	0.7000	0.7700	7.3228	(80)

Solar gains	53.8055	99.7035	153.5481	212.0047	252.2788	255.6262	244.3978	214.4508	174.2762	115.2237	66.0163	44.9746 (83)
Total gains	544.3922	602.7494	634.0635	675.2415	691.2041	675.7232	647.6750	618.8332	591.6993	550.0585	528.5891	525.3178 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3060	43.4172	43.5268	44.0488	44.1478	44.6149	44.6149	44.7025	44.4338	44.1478	43.9479	43.7408	
alpha	3.8871	3.8945	3.9018	3.9366	3.9432	3.9743	3.9743	3.9802	3.9623	3.9432	3.9299	3.9161	
util living area	0.9785	0.9667	0.9469	0.8955	0.7998	0.6389	0.4856	0.5247	0.7373	0.9087	0.9647	0.9811	(86)
MIT	19.4587	19.6638	19.9594	20.3687	20.7023	20.9129	20.9772	20.9689	20.8404	20.4190	19.8837	19.4291	(87)
Th 2	20.0434	20.0457	20.0478	20.0581	20.0600	20.0689	20.0689	20.0706	20.0655	20.0600	20.0561	20.0521	(88)
util rest of house	0.9741	0.9599	0.9356	0.8725	0.7555	0.5646	0.3899	0.4284	0.6702	0.8839	0.9563	0.9772	(89)
MIT 2	18.2542	18.5142	18.8867	19.3958	19.7844	20.0072	20.0583	20.0550	19.9406	19.4666	18.8019	18.2225	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.6960	18.9359	19.2802	19.7527	20.1211	20.3394	20.3954	20.3902	20.2707	19.8160	19.1987	18.6651	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6960	18.9359	19.2802	19.7527	20.1211	20.3394	20.3954	20.3902	20.2707	19.8160	19.1987	18.6651	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9658	0.9498	0.9244	0.8640	0.7586	0.5872	0.4243	0.4625	0.6861	0.8763	0.9465	0.9695	(94)
Useful gains	525.7653	572.4937	586.1340	583.3793	524.3765	396.7984	274.8146	286.2292	405.9384	482.0117	500.2898	509.3075	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1096.6288	1066.4594	968.6039	812.7723	629.2549	424.3786	280.6326	294.4632	458.1262	688.6489	908.1697	1090.9385	(97)
Space heating kWh	424.7225	331.9449	284.5576	165.1630	78.0296	0.0000	0.0000	0.0000	0.0000	153.7381	293.6735	432.7334	(98a)
Space heating requirement - total per year (kWh/year)												2164.5626	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	424.7225	331.9449	284.5576	165.1630	78.0296	0.0000	0.0000	0.0000	0.0000	153.7381	293.6735	432.7334	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2164.5626	
Space heating per m2										(98c) / (4) =		29.7821	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.4000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	424.7225	331.9449	284.5576	165.1630	78.0296	0.0000	0.0000	0.0000	0.0000	153.7381	293.6735	432.7334	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	459.6564	359.2477	307.9628	178.7478	84.4476	0.0000	0.0000	0.0000	0.0000	166.3832	317.8285	468.3262	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	225.5564	199.5307	212.3282	187.7626	182.6886	165.3731	163.8628	170.0145	171.4643	190.2681	201.1378	223.2567	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.7158	85.4637	85.0095	84.1077	82.6942	80.3000	80.3000	80.3000	80.3000	83.9285	85.1912	85.7736	(217)
Fuel for water heating, kWh/month	263.1444	233.4684	249.7699	223.2407	220.9207	205.9441	204.0633	211.7242	213.5297	226.7027	236.1016	260.2860	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.6146	19.7468	17.7798	13.0262	10.0618	8.2206	9.1787	11.9309	15.4970	20.3329	22.9660	25.2988	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-34.1427	-48.1921	-69.3402	-78.0353	-84.2042	-78.6248	-77.6860	-73.3488	-65.6465	-55.1924	-37.5712	-29.5143	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.0663	-40.1520	-79.8860	-120.0915	-158.8866	-159.6687	-157.7568	-133.4905	-97.7594	-57.4135	-25.4553	-15.0706	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	2342.6002 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	80.3000
Water heating fuel used	2748.8958 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	198.6542 (232)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1796.1956	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3579.9547	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2342.6002	0.2100	491.9460	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2748.8958	0.2100	577.2681	(264)
Space and water heating			1069.2142	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	198.6542	0.1443	28.6719	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	0.1346	-98.4313	
PV Unit electricity exported	-1064.6971	0.1259	-134.0169	
Total			-232.4482	(269)
Total CO2, kg/year			877.3672	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.0700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2342.6002	1.1300	2647.1383	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2748.8958	1.1300	3106.2522	(278)
Space and water heating			5753.3905	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	198.6542	1.5338	304.7025	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	1.4973	-1095.2830	
PV Unit electricity exported	-1064.6971	0.4620	-491.9332	
Total			-1587.2162	(283)
Total Primary energy kWh/year			4600.9775	(286)
Target Primary Energy Rate (TPER)			63.3000	(287)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	13.54	**TER**	12.07
Environmental	89 B	**% DER < TER**			-12.18
CO_2 Emissions (t/year)	0.93	**DFEE**	32.26	**TFEE**	34.75
Compliance Check	See BREL	**% DFEE < TFEE**			7.18
% DPER < TPER	-20.09	**DPER**	76.02	**TPER**	63.30

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 11875.9502	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	163.4005	(35)

Thermal bridges (User defined value 0.030 * total exposed area)												4.9323	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	41.0691	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3094	(42)
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)											Total = Sum(45)m =	1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2447	12.8548	14.2078	13.6980	14.1221	13.6336	14.0671	14.0844	13.6497	14.1424	13.7355	14.2379	(61)
Total heat required for water heating calculated for each month	217.6159	191.8059	202.2246	174.2107	166.4156	147.2883	143.4652	150.6799	154.0051	174.9147	189.8734	214.7766	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	217.6159	191.8059	202.2246	174.2107	166.4156	147.2883	143.4652	150.6799	154.0051	174.9147	189.8734	214.7766	(64)
										Total per year (kWh/year) = Sum(64)m =		2127.2759	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	71.1821	62.7149	66.0675	56.7950	54.1681	47.8486	46.5416	48.9391	50.0806	56.9924	61.9997	70.2386	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	95.6749	93.3258	88.8004	78.8819	72.8066	66.4564	62.5559	65.7783	69.5564	76.6027	86.1107	94.4067	(72)
Total internal gains	527.0977	524.8382	507.8297	476.2001	445.0032	413.8523	397.3135	400.4463	416.7076	448.4649	483.0945	513.1911	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	19.6403	0.7300	0.7000	0.7700	33.6625	(76)
South	1.2200	46.7521	0.7300	0.7000	0.7700	20.1983	(78)
West	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(80)

Solar gains	62.3460	115.5295	177.9208	245.6563	292.3231	296.2018	283.1911	248.4906	201.9391	133.5132	76.4951	52.1134	(83)
Total gains	589.4437	640.3676	685.7504	721.8563	737.3263	710.0541	680.5047	648.9369	618.6467	581.9781	559.5896	565.3046	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area	0.9702	0.9564	0.9269	0.8653	0.7546	0.5955	0.4456	0.4847	0.6979	0.8850	0.9547	0.9746	(86)

MIT	19.7137	19.8899	20.1790	20.5154	20.7897	20.9403	20.9857	20.9797	20.8843	20.5370	20.0533	19.6541	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house	0.9645	0.9481	0.9128	0.8391	0.7084	0.5251	0.3597	0.3969	0.6315	0.8569	0.9446	0.9696	(89)
MIT 2	18.6204	18.8413	19.2004	19.6068	19.9176	20.0672	20.1023	20.0989	20.0198	19.6416	19.0500	18.5455	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.0214	19.2259	19.5594	19.9401	20.2375	20.3875	20.4264	20.4220	20.3369	19.9700	19.4180	18.9522	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.8714	19.0759	19.4094	19.7901	20.0875	20.2375	20.2764	20.2720	20.1869	19.8200	19.2680	18.8022	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9541	0.9360	0.8995	0.8285	0.7072	0.5357	0.3762	0.4134	0.6377	0.8463	0.9326	0.9599	(94)
Useful gains	562.3624	599.3635	616.8394	598.0306	521.4262	380.3426	255.9853	268.2842	394.5242	492.5077	521.8454	542.6599	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1026.5574	998.6918	909.4640	767.2042	590.9002	397.1616	258.9995	272.7795	428.8244	649.5513	857.2368	1028.7218	(97)
Space heating kWh	345.3611	268.3486	217.7127	121.8050	51.6887	0.0000	0.0000	0.0000	0.0000	116.8404	241.4818	361.6300	(98a)
Space heating requirement - total per year (kWh/year)												1724.8683	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	345.3611	268.3486	217.7127	121.8050	51.6887	0.0000	0.0000	0.0000	0.0000	116.8404	241.4818	361.6300	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1724.8683	
Space heating per m2											(98c) / (4) =	23.7324	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	345.3611	268.3486	217.7127	121.8050	51.6887	0.0000	0.0000	0.0000	0.0000	116.8404	241.4818	361.6300	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	388.0462	301.5153	244.6210	136.8595	58.0771	0.0000	0.0000	0.0000	0.0000	131.2814	271.3279	406.3259	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	217.6159	191.8059	202.2246	174.2107	166.4156	147.2883	143.4652	150.6799	154.0051	174.9147	189.8734	214.7766	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.3351	88.2834	88.1732	87.9916	87.6970	87.3000	87.3000	87.3000	87.3000	87.9729	88.2436	88.3589	(217)
Fuel for water heating, kWh/month	246.3528	217.2615	229.3494	197.9857	189.7621	168.7151	164.3358	172.6001	176.4091	198.8278	215.1696	243.0730	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	9.0016	8.1304	9.0016	8.7112	9.0016	8.7112	9.0016	9.0016	8.7112	9.0016	8.7112	9.0016	(231)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1938.0543	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2419.8419	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	105.9861	(231)
Electricity for lighting (calculated in Appendix L)	193.4401	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4657.3225	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1938.0543	3.6400	70.5452	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2419.8419	3.6400	88.0822	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	105.9861	16.4900	17.4771	(249)
Energy for lighting	193.4401	16.4900	31.8983	(250)
Additional standing charges			92.0000	(251)
Total energy cost			300.0028	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9178	(257)
SAP value		85.1232	
SAP rating (Section 12)		85	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1938.0543	0.2100	406.9914	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2419.8419	0.2100	508.1668	(264)
Space and water heating			915.1582	(265)
Pumps, fans and electric keep-hot	105.9861	0.1387	14.7016	(267)
Energy for lighting	193.4401	0.1443	27.9194	(268)
Total CO2, kg/year			957.7792	(272)
CO2 emissions per m2			13.1800	(273)
EI value			89.0939	
EI rating			89	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b) x	2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c) x	2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		4.9323 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3094 (42)
Hot water usage for mixer showers												
	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994 (42a)
Hot water usage for baths												
	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978 (42b)
Hot water usage for other uses												
	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805 (42c)
Average daily hot water use (litres/day)												118.0387 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m													
	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2447	12.8548	14.2078	13.6980	14.1221	13.6336	14.0671	14.0844	13.6497	14.1424	13.7355	14.2379	(61)
Total heat required for water heating calculated for each month													
	217.6159	191.8059	202.2246	174.2107	166.4156	147.2883	143.4652	150.6799	154.0051	174.9147	189.8734	214.7766	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	217.6159	191.8059	202.2246	174.2107	166.4156	147.2883	143.4652	150.6799	154.0051	174.9147	189.8734	214.7766	(64)
										Total per year (kWh/year) = Sum(64)m =		2127.2759	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	71.1821	62.7149	66.0675	56.7950	54.1681	47.8486	46.5416	48.9391	50.0806	56.9924	61.9997	70.2386	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)													
	95.6749	93.3258	88.8004	78.8819	72.8066	66.4564	62.5559	65.7783	69.5564	76.6027	86.1107	94.4067	(72)
Total internal gains													
	527.0977	524.8382	507.8297	476.2001	445.0032	413.8523	397.3135	400.4463	416.7076	448.4649	483.0945	513.1911	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W	
East	4.8400	23.7835	0.7300	0.7000	0.7700	40.7638	(76)
South	1.2200	54.0600	0.7300	0.7000	0.7700	23.3555	(78)
West	1.2200	23.7835	0.7300	0.7000	0.7700	10.2752	(80)

Solar gains	74.3946	122.6177	186.2329	260.3509	298.7480	324.9059	304.7294	272.3724	223.2097	149.5564	89.9365	62.5313	(83)
Total gains	601.4922	647.4559	694.0626	736.5509	743.7512	738.7583	702.0430	672.8187	639.9173	598.0213	573.0310	575.7224	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area	0.9663	0.9522	0.9166	0.8472	0.7255	0.5305	0.3863	0.4217	0.6605	0.8613	0.9468	0.9713	(86)
MIT	19.7784	19.9434	20.2551	20.5739	20.8291	20.9645	20.9925	20.9891	20.9099	20.6119	20.1308	19.7167	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house	0.9597	0.9430	0.9004	0.8179	0.6751	0.4570	0.3004	0.3335	0.5906	0.8279	0.9348	0.9657	(89)
MIT 2	18.7021	18.9084	19.2938	19.6748	19.9587	20.0865	20.1061	20.1044	20.0427	19.7280	19.1463	18.6247	(90)
Living area fraction									fLA = Living area / (4) =			0.3668	(91)
MIT	19.0969	19.2880	19.6464	20.0046	20.2780	20.4086	20.4312	20.4289	20.3608	20.0522	19.5075	19.0252	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.9469	19.1380	19.4964	19.8546	20.1280	20.2586	20.2812	20.2789	20.2108	19.9022	19.3575	18.8752	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9487	0.9306	0.8872	0.8086	0.6763	0.4697	0.3173	0.3506	0.5990	0.8191	0.9223	0.9555	(94)
Useful gains	570.6566	602.5032	615.7787	595.5388	502.9974	347.0111	222.7341	235.9103	383.3348	489.8210	528.5145	550.0781	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	1010.7385	981.9345	880.3710	743.5706	558.5248	356.3760	224.1171	238.0446	409.3712	620.1161	835.3572	1012.7344	(97)
Space heating kWh	327.4209	254.9779	196.8567	106.5829	41.3124	0.0000	0.0000	0.0000	0.0000	96.9396	220.9268	344.2163	(98a)
Space heating requirement - total per year (kWh/year)												1589.2333	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	327.4209	254.9779	196.8567	106.5829	41.3124	0.0000	0.0000	0.0000	0.0000	96.9396	220.9268	344.2163	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1589.2333	
Space heating per m2											(98c) / (4) =	21.8662	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	89.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	327.4209	254.9779	196.8567	106.5829	41.3124	0.0000	0.0000	0.0000	0.0000	96.9396	220.9268	344.2163	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	367.8887	286.4920	221.1873	119.7561	46.4184	0.0000	0.0000	0.0000	0.0000	108.9208	248.2323	386.7599	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	217.6159	191.8059	202.2246	174.2107	166.4156	147.2883	143.4652	150.6799	154.0051	174.9147	189.8734	214.7766	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.3134	88.2621	88.1304	87.9376	87.6329	87.3000	87.3000	87.3000	87.3000	87.8987	88.2061	88.3391	(217)
Fuel for water heating, kWh/month	246.4134	217.3138	229.4607	198.1073	189.9009	168.7151	164.3358	172.6001	176.4091	198.9958	215.2611	243.1276	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	9.0016	8.1304	9.0016	8.7112	9.0016	8.7112	9.0016	9.0016	8.7112	9.0016	8.7112	9.0016	(231)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1785.6554	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2420.6406	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	105.9861	(231)
Electricity for lighting (calculated in Appendix L)	193.4401	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4505.7223	(238)

10a. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1785.6554	6.5500	116.9604	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2420.6406	6.5500	158.5520	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	105.9861	28.4300	30.1319	(249)
Energy for lighting	193.4401	28.4300	54.9950	(250)
Additional standing charges			104.0000	(251)
Total energy cost			464.6393	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1785.6554	0.2100	374.9876	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2420.6406	0.2100	508.3345	(264)
Space and water heating			883.3222	(265)
Pumps, fans and electric keep-hot	105.9861	0.1387	14.7016	(267)
Energy for lighting	193.4401	0.1443	27.9194	(268)
Total CO2, kg/year			925.9431	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1785.6554	1.1300	2017.7906	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2420.6406	1.1300	2735.3239	(278)
Space and water heating			4753.1145	(279)
Pumps, fans and electric keep-hot	105.9861	1.5128	160.3358	(281)
Energy for lighting	193.4401	1.5338	296.7049	(282)
Total Primary energy kWh/year			5210.1553	(286)

SAP 10 EPC IMPROVEMENTS

Rev C - Be Lean

Current energy efficiency rating: B 85
Current environmental impact rating: B 89

N	Solar water heating	SAP increase too small
U	Solar photovoltaic panels	Recommended
V2	Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
U Solar photovoltaic panels	+ 8.7	-£ 279	-242 kg (26.2%)

Measures omitted - SAP change or cost saving too small:

N Solar water heating	+ 0.6	-£ 26	-147 kg (15.8%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar photovoltaic panels	£279	3.33 kg/m²	A 94	A 92
Total Savings	£279	3.33 kg/m²		

Potential energy efficiency rating: A 94
Potential environmental impact rating: A 92

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£85	£85	£0
Mains gas	£380	£380	£0

Space heating	£251	£251	£0
Water heating	£159	£159	£0
Lighting	£55	£55	£0
Generated (PV)	-£0	-£279	£279
Total cost of fuels	£465	£186	£279
Total cost of uses	£465	£186	£279
Delivered energy	62 kWh/m²	36 kWh/m²	26 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.7 tonnes	0.2 tonnes
CO2 emissions per m²	13 kg/m²	9 kg/m²	3 kg/m²
Primary energy	72 kWh/m²	49 kWh/m²	23 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b)	x 2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c)	x 2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	178.0660	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		4.9323 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3094 (42)
Hot water usage for mixer showers												
	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994 (42a)
Hot water usage for baths												
	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978 (42b)
Hot water usage for other uses												
	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805 (42c)
Average daily hot water use (litres/day)												118.0387 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m													
	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2447	12.8548	14.2078	13.6980	14.1221	13.6336	14.0671	14.0844	13.6497	14.1424	13.7355	14.2379	(61)
Total heat required for water heating calculated for each month													
	217.6159	191.8059	202.2246	174.2107	166.4156	147.2883	143.4652	150.6799	154.0051	174.9147	189.8734	214.7766	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	217.6159	191.8059	202.2246	174.2107	166.4156	147.2883	143.4652	150.6799	154.0051	174.9147	189.8734	214.7766	(64)
										Total per year (kWh/year) = Sum(64)m =		2127.2759	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	71.1821	62.7149	66.0675	56.7950	54.1681	47.8486	46.5416	48.9391	50.0806	56.9924	61.9997	70.2386	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)													
	95.6749	93.3258	88.8004	78.8819	72.8066	66.4564	62.5559	65.7783	69.5564	76.6027	86.1107	94.4067	(72)
Total internal gains													
	527.0977	524.8382	507.8297	476.2001	445.0032	413.8523	397.3135	400.4463	416.7076	448.4649	483.0945	513.1911	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	19.6403	0.7300	0.7000	0.7700	33.6625	(76)
South	1.2200	46.7521	0.7300	0.7000	0.7700	20.1983	(78)
West	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(80)

Solar gains	62.3460	115.5295	177.9208	245.6563	292.3231	296.2018	283.1911	248.4906	201.9391	133.5132	76.4951	52.1134	(83)
Total gains	589.4437	640.3676	685.7504	721.8563	737.3263	710.0541	680.5047	648.9369	618.6467	581.9781	559.5896	565.3046	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9702	0.9564	0.9269	0.8653	0.7546	0.5955	0.4456	0.4847	0.6979	0.8850	0.9547	0.9746	(86)
MIT	19.7137	19.8899	20.1790	20.5154	20.7897	20.9403	20.9857	20.9797	20.8843	20.5370	20.0533	19.6541	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9645	0.9481	0.9128	0.8391	0.7084	0.5251	0.3597	0.3969	0.6315	0.8569	0.9446	0.9696	(89)
MIT 2	18.6204	18.8413	19.2004	19.6068	19.9176	20.0672	20.1023	20.0989	20.0198	19.6416	19.0500	18.5455	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.0214	19.2259	19.5594	19.9401	20.2375	20.3875	20.4264	20.4220	20.3369	19.9700	19.4180	18.9522	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.8714	19.0759	19.4094	19.7901	20.0875	20.2375	20.2764	20.2720	20.1869	19.8200	19.2680	18.8022	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9541	0.9360	0.8995	0.8285	0.7072	0.5357	0.3762	0.4134	0.6377	0.8463	0.9326	0.9599	(94)
Useful gains	562.3624	599.3635	616.8394	598.0306	521.4262	380.3426	255.9853	268.2842	394.5242	492.5077	521.8454	542.6599	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1026.5574	998.6918	909.4640	767.2042	590.9002	397.1616	258.9995	272.7795	428.8244	649.5513	857.2368	1028.7218	(97)
Space heating kWh	345.3611	268.3486	217.7127	121.8050	51.6887	0.0000	0.0000	0.0000	0.0000	116.8404	241.4818	361.6300	(98a)
Space heating requirement - total per year (kWh/year)												1724.8683	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	345.3611	268.3486	217.7127	121.8050	51.6887	0.0000	0.0000	0.0000	0.0000	116.8404	241.4818	361.6300	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1724.8683	
Space heating per m2											(98c) / (4) =	23.7324	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	345.3611	268.3486	217.7127	121.8050	51.6887	0.0000	0.0000	0.0000	0.0000	116.8404	241.4818	361.6300	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	388.0462	301.5153	244.6210	136.8595	58.0771	0.0000	0.0000	0.0000	0.0000	131.2814	271.3279	406.3259	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	217.6159	191.8059	202.2246	174.2107	166.4156	147.2883	143.4652	150.6799	154.0051	174.9147	189.8734	214.7766	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.3351	88.2834	88.1732	87.9916	87.6970	87.3000	87.3000	87.3000	87.3000	87.9729	88.2436	88.3589	(217)
Fuel for water heating, kWh/month													
	246.3528	217.2615	229.3494	197.9857	189.7621	168.7151	164.3358	172.6001	176.4091	198.8278	215.1696	243.0730	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	9.0016	8.1304	9.0016	8.7112	9.0016	8.7112	9.0016	9.0016	8.7112	9.0016	8.7112	9.0016	(231)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-32.6033	-46.4286	-67.4820	-76.6841	-83.2843	-77.9683	-77.0038	-72.4031	-64.3023	-53.4627	-36.0040	-28.1264	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-17.4833	-37.1514	-74.8642	-114.0880	-152.3985	-153.7454	-151.6477	-127.3709	-92.1608	-53.3832	-23.4058	-13.7875	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1938.0543	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2419.8419	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	105.9861	(231)
Electricity for lighting (calculated in Appendix L)	193.4401	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1727.2394	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2930.0831	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1938.0543	3.6400	70.5452	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2419.8419	3.6400	88.0822	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)

Pumps, fans and electric keep-hot	105.9861	16.4900	17.4771	(249)
Energy for lighting	193.4401	16.4900	31.8983	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-715.7529	16.4900	-118.0277	
PV Unit electricity exported	-1011.4865	5.5900	-56.5421	
Total			-174.5697	(252)
Total energy cost			125.4331	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.3837	(257)
SAP value		93.7799	
SAP rating (Section 12)		94	(258)
SAP band		A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1938.0543	0.2100	406.9914	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2419.8419	0.2100	508.1668	(264)
Space and water heating			915.1582	(265)
Pumps, fans and electric keep-hot	105.9861	0.1387	14.7016	(267)
Energy for lighting	193.4401	0.1443	27.9194	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-715.7529	0.1344	-96.1768	
PV Unit electricity exported	-1011.4865	0.1255	-126.9720	
Total			-223.1487	(269)
Total CO2, kg/year			734.6304	(272)
CO2 emissions per m2			10.1100	(273)
EI value			91.6349	
EI rating			92	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11875.9502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 4.9323 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2447	12.8548	14.2078	13.6980	14.1221	13.6336	14.0671	14.0844	13.6497	14.1424	13.7355	14.2379	(61)
Total heat required for water heating calculated for each month	217.6159	191.8059	202.2246	174.2107	166.4156	147.2883	143.4652	150.6799	154.0051	174.9147	189.8734	214.7766	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	217.6159	191.8059	202.2246	174.2107	166.4156	147.2883	143.4652	150.6799	154.0051	174.9147	189.8734	214.7766	(64)
									Total per year (kWh/year) = Sum(64)m =			2127.2759	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	71.1821	62.7149	66.0675	56.7950	54.1681	47.8486	46.5416	48.9391	50.0806	56.9924	61.9997	70.2386	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	95.6749	93.3258	88.8004	78.8819	72.8066	66.4564	62.5559	65.7783	69.5564	76.6027	86.1107	94.4067	(72)
Total internal gains	527.0977	524.8382	507.8297	476.2001	445.0032	413.8523	397.3135	400.4463	416.7076	448.4649	483.0945	513.1911	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

				W/m2	or Table 6b	or Table 6c	Table 6d					
East			4.8400	23.7835	0.7300	0.7000	0.7700					40.7638 (76)
South			1.2200	54.0600	0.7300	0.7000	0.7700					23.3555 (78)
West			1.2200	23.7835	0.7300	0.7000	0.7700					10.2752 (80)
Solar gains	74.3946	122.6177	186.2329	260.3509	298.7480	324.9059	304.7294	272.3724	223.2097	149.5564	89.9365	62.5313 (83)
Total gains	601.4922	647.4559	694.0626	736.5509	743.7512	738.7583	702.0430	672.8187	639.9173	598.0213	573.0310	575.7224 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area	0.9663	0.9522	0.9166	0.8472	0.7255	0.5305	0.3863	0.4217	0.6605	0.8613	0.9468	0.9713	(86)
MIT	19.7784	19.9434	20.2551	20.5739	20.8291	20.9645	20.9925	20.9891	20.9099	20.6119	20.1308	19.7167	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house	0.9597	0.9430	0.9004	0.8179	0.6751	0.4570	0.3004	0.3335	0.5906	0.8279	0.9348	0.9657	(89)
MIT 2	18.7021	18.9084	19.2938	19.6748	19.9587	20.0865	20.1061	20.1044	20.0427	19.7280	19.1463	18.6247	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.0969	19.2880	19.6464	20.0046	20.2780	20.4086	20.4312	20.4289	20.3608	20.0522	19.5075	19.0252	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.9469	19.1380	19.4964	19.8546	20.1280	20.2586	20.2812	20.2789	20.2108	19.9022	19.3575	18.8752	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9487	0.9306	0.8872	0.8086	0.6763	0.4697	0.3173	0.3506	0.5990	0.8191	0.9223	0.9555	(94)
Useful gains	570.6566	602.5032	615.7787	595.5388	502.9974	347.0111	222.7341	235.9103	383.3348	489.8210	528.5145	550.0781	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	1010.7385	981.9345	880.3710	743.5706	558.5248	356.3760	224.1171	238.0446	409.3712	620.1161	835.3572	1012.7344	(97)
Space heating kWh	327.4209	254.9779	196.8567	106.5829	41.3124	0.0000	0.0000	0.0000	0.0000	96.9396	220.9268	344.2163	(98a)
Space heating requirement - total per year (kWh/year)												1589.2333	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	327.4209	254.9779	196.8567	106.5829	41.3124	0.0000	0.0000	0.0000	0.0000	96.9396	220.9268	344.2163	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1589.2333	
Space heating per m2											(98c) / (4) =	21.8662	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	327.4209	254.9779	196.8567	106.5829	41.3124	0.0000	0.0000	0.0000	0.0000	96.9396	220.9268	344.2163	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	367.8887	286.4920	221.1873	119.7561	46.4184	0.0000	0.0000	0.0000	0.0000	108.9208	248.2323	386.7599	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	217.6159	191.8059	202.2246	174.2107	166.4156	147.2883	143.4652	150.6799	154.0051	174.9147	189.8734	214.7766	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.3134	88.2621	88.1304	87.9376	87.6329	87.3000	87.3000	87.3000	87.3000	87.8987	88.2061	88.3391	(217)
Fuel for water heating, kWh/month	246.4134	217.3138	229.4607	198.1073	189.9009	168.7151	164.3358	172.6001	176.4091	198.9958	215.2611	243.1276	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	9.0016	8.1304	9.0016	8.7112	9.0016	8.7112	9.0016	9.0016	8.7112	9.0016	8.7112	9.0016	(231)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-37.3305	-48.3731	-69.4108	-79.1087	-84.1807	-81.1765	-79.5326	-75.6260	-67.8526	-57.4531	-40.5169	-32.4339	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-22.3789	-40.2895	-79.6202	-123.2673	-156.9873	-173.3248	-166.8290	-143.5937	-105.1861	-62.2023	-29.2741	-17.8062	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1785.6554	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	87.3000	
Water heating fuel used	2420.6406	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	105.9861	(231)
Electricity for lighting (calculated in Appendix L)	193.4401	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1873.7550	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2631.9673	(238)

10a. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1785.6554	6.5500	116.9604	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2420.6406	6.5500	158.5520	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	105.9861	28.4300	30.1319	(249)
Energy for lighting	193.4401	28.4300	54.9950	(250)
Additional standing charges			104.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-752.9954	28.4300	-214.0766	
PV Unit electricity exported	-1120.7595	5.8100	-65.1161	
Total			-279.1927	(252)
Total energy cost			185.4465	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1785.6554	0.2100	374.9876	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2420.6406	0.2100	508.3345	(264)
Space and water heating			883.3222	(265)
Pumps, fans and electric keep-hot	105.9861	0.1387	14.7016	(267)
Energy for lighting	193.4401	0.1443	27.9194	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-752.9954	0.1347	-101.4047	
PV Unit electricity exported	-1120.7595	0.1256	-140.7705	
Total			-242.1752	(269)
Total CO2, kg/year			683.7680	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1785.6554	1.1300	2017.7906	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2420.6406	1.1300	2735.3239	(278)
Space and water heating			4753.1145	(279)
Pumps, fans and electric keep-hot	105.9861	1.5128	160.3358	(281)
Energy for lighting	193.4401	1.5338	296.7049	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-752.9954	1.4977	-1127.7641	
PV Unit electricity exported	-1120.7595	0.4610	-516.6275	
Total			-1644.3915	(283)
Total Primary energy kWh/year			3565.7638	(286)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.39	**TER**	11.60
Environmental	98 A	**% DER < TER**			79.40
CO_2 Emissions (t/year)	0.15	**DFEE**	32.26	**TFEE**	34.75
Compliance Check	See BREL	**% DFEE < TFEE**			7.18
% DPER < TPER	50.64	**DPER**	30.00	**TPER**	60.78

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =	11875.9502			(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							163.4005	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 4.9323 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 118.0387 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)											Total = Sum(45)m =	1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =	2611.4378	(64)
12Total per year (kWh/year)											2611	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)

Water heating gains (Table 5)

150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)

Total internal gains

529.9009	542.3600	519.8296	502.5508	478.2395	462.4112	445.5913	446.6965	459.7372	474.1489	501.8869	519.6574	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	19.6403	0.7300	0.7000	0.7700	33.6625	(76)
South	1.2200	46.7521	0.7300	0.7000	0.7700	20.1983	(78)
West	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(80)

Solar gains 62.3460	115.5295	177.9208	245.6563	292.3231	296.2018	283.1911	248.4906	201.9391	133.5132	76.4951	52.1134	(83)
Total gains 592.2469	657.8895	697.7504	748.2071	770.5625	758.6130	728.7825	695.1871	661.6764	607.6621	578.3820	571.7708	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9698	0.9526	0.9232	0.8534	0.7347	0.5640	0.4180	0.4552	0.6658	0.8720	0.9499	0.9736	(86)
MIT	19.7189	19.9202	20.1972	20.5449	20.8105	20.9510	20.9887	20.9838	20.9030	20.5685	20.0855	19.6663	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9639	0.9437	0.9086	0.8258	0.6875	0.4953	0.3366	0.3717	0.5991	0.8419	0.9389	0.9684	(89)
MIT 2	18.6269	18.8787	19.2223	19.6400	19.9380	20.0752	20.1038	20.1010	20.0355	19.6767	19.0895	18.5609	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.0275	19.2607	19.5799	19.9719	20.2580	20.3965	20.4284	20.4249	20.3537	20.0039	19.4548	18.9663	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0275	19.2607	19.5799	19.9719	20.2580	20.3965	20.4284	20.4249	20.3537	20.0039	19.4548	18.9663	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9549	0.9333	0.8984	0.8211	0.6959	0.5181	0.3662	0.4018	0.6183	0.8379	0.9290	0.9599	(94)
Useful gains	565.5297	614.0072	626.8502	614.3782	536.2121	393.0377	266.8678	279.3425	409.1146	509.1454	537.3214	548.8532	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1037.5493	1011.7139	921.4784	780.0171	602.9125	408.3613	269.7090	283.5514	440.5723	662.5018	870.3961	1040.2886	(97)
Space heating kWh													
	351.1826	267.2589	219.2033	119.2600	49.6251	0.0000	0.0000	0.0000	0.0000	114.0972	239.8138	365.6279	(98a)
Space heating requirement - total per year (kWh/year)												1726.0688	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	351.1826	267.2589	219.2033	119.2600	49.6251	0.0000	0.0000	0.0000	0.0000	114.0972	239.8138	365.6279	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1726.0688	
Space heating per m2											(98c) / (4) =	23.7489	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	351.1826	267.2589	219.2033	119.2600	49.6251	0.0000	0.0000	0.0000	0.0000	114.0972	239.8138	365.6279	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	526.7739	400.8883	328.8050	178.8900	74.4376	0.0000	0.0000	0.0000	0.0000	171.1457	359.7208	548.4418	
Space heating requirement													
	526.7739	400.8883	328.8050	178.8900	74.4376	0.0000	0.0000	0.0000	0.0000	171.1457	359.7208	548.4418	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	
Water heating fuel													
	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9032	-24.7478	-42.1903	-54.3464	-63.2831	-60.6270	-59.4769	-53.4801	-43.2885	-30.7805	-17.3978	-12.3224	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5955	-11.8305	-29.8051	-54.5176	-80.7077	-84.5250	-82.2640	-64.2624	-40.1739	-18.7163	-6.5523	-3.4266	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												2589.1032	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3917.1568	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												25.8910	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.9861	(330a)
Total electricity for the above, kWh/year												19.9861	(331)
Electricity for lighting (calculated in Appendix L)												193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5761.4653	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1735.0027	0.1555	107.3894	(367)
Electrical energy for heat distribution (space & water)	25.8910	0.0000	9.5450	(372)
Overall CO2 factor for heat network			0.0406	(386)
Total CO2 associated with community systems			264.0773	(373)
Space and water heating			264.0773	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	0.1320	-62.9388	
PV Unit electricity exported	-481.3770	0.1213	-58.4056	
Total			-121.3444	(380)
Total CO2, kg/year			173.4246	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.3900	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1735.0027	1.5758	1088.0033	(467)
Electrical energy for heat distribution (space & water)	25.8910	0.0000	100.3747	(472)
Overall CO2 factor for heat network			0.4268	(486)
Total CO2 associated with community systems			2777.0325	(473)
Space and water heating			2777.0325	(476)
Pumps, fans and electric keep-hot	19.9861	1.5128	30.2350	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	1.4877	-709.3875	
PV Unit electricity exported	-481.3770	0.4451	-214.2796	
Total			-923.6671	(480)
Total Primary energy kWh/year			2180.3054	(483)
Dwelling Primary energy Rate (DPER)			30.0000	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b) x	2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c) x	2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4185	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3243	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4135	0.4054	0.3973	0.3568	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3649	0.3811	(22b)
Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			7.2800	1.1450	8.3359			(27)
Heatloss floor			36.3400	0.1300	4.7242			(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.1800	14.8338			(29a)
500mm mineral wool	36.3400		36.3400	0.1100	3.9974			(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.9313			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	3.6500	0.0500	0.1825
E3 Sill	2.7400	0.0500	0.1370
E4 Jamb	14.8400	0.0500	0.7420
E5 Ground floor (normal)	18.7200	0.1600	2.9952
E6 Intermediate floor within a dwelling	18.7200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.7200	0.0600	1.1232
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	5.5000	0.0800	0.4400
P2 Party wall - Intermediate floor within a dwelling	5.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	5.5000	0.1200	0.6600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8399 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.7712 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.4047	34.2096	34.0184	33.1202	32.9522	32.1700	32.1700	32.0251	32.4713	32.9522	33.2921	33.6475	(38)
Heat transfer coeff	76.1759	75.9808	75.7896	74.8914	74.7234	73.9411	73.9411	73.7963	74.2424	74.7234	75.0633	75.4187	(39)
Average = Sum(39)m / 12 =												74.8906	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0481	1.0454	1.0428	1.0304	1.0281	1.0174	1.0174	1.0154	1.0215	1.0281	1.0328	1.0377	(40)
HLP (average)												1.0304	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	249.9662	221.0368	234.6117	205.6045	198.8885	178.7466	175.9929	183.1904	185.4473	207.3672	221.2297	247.1336	(62)
WWHRS	-28.7738	-25.4478	-26.6475	-22.0651	-20.5639	-17.5967	-16.4941	-17.5398	-18.2062	-21.4631	-24.3151	-28.2410	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
										Total per year (kWh/year) = Sum(64)m =		2241.8614	(64)
12Total per year (kWh/year)												2242	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	104.8969	93.1698	99.7915	89.4439	87.9135	80.5137	80.3008	82.6939	82.7417	90.7327	94.6393	103.9551	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	140.9904	138.6456	134.1284	124.2277	118.1634	111.8245	107.9311	111.1477	114.9190	121.9526	131.4435	139.7245	(72)
Total internal gains	523.5655	536.0247	513.4942	496.2155	471.9041	453.0758	436.2560	437.3612	450.4018	467.8135	495.5515	513.3220	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	19.6403	0.6300	0.7000	0.7700	29.0512	(76)
South	1.2200	46.7521	0.6300	0.7000	0.7700	17.4314	(78)
West	1.2200	19.6403	0.6300	0.7000	0.7700	7.3228	(80)

Solar gains	53.8055	99.7035	153.5481	212.0047	252.2788	255.6262	244.3978	214.4508	174.2762	115.2237	66.0163	44.9746	(83)
Total gains	577.3710	635.7282	667.0423	708.2202	724.1829	708.7020	680.6538	651.8119	624.6781	583.0372	561.5678	558.2966	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3060	43.4172	43.5268	44.0488	44.1478	44.6149	44.6149	44.7025	44.4338	44.1478	43.9479	43.7408	
alpha	3.8871	3.8945	3.9018	3.9366	3.9432	3.9743	3.9743	3.9802	3.9623	3.9432	3.9299	3.9161	
util living area	0.9741	0.9609	0.9387	0.8824	0.7809	0.6163	0.4644	0.5014	0.7127	0.8939	0.9575	0.9770	(86)
MIT	19.5207	19.7226	20.0131	20.4110	20.7289	20.9234	20.9805	20.9735	20.8593	20.4638	19.9418	19.4919	(87)
Th 2	20.0434	20.0457	20.0478	20.0581	20.0600	20.0689	20.0689	20.0706	20.0655	20.0600	20.0561	20.0521	(88)
util rest of house	0.9689	0.9530	0.9260	0.8576	0.7350	0.5425	0.3719	0.4081	0.6445	0.8665	0.9477	0.9723	(89)
MIT 2	18.3320	18.5872	18.9520	19.4446	19.8114	20.0153	20.0599	20.0574	19.9569	19.5178	18.8737	18.3016	(90)
Living area fraction									fLA = Living area / (4) =			0.3668	(91)
MIT	18.7680	19.0037	19.3413	19.7991	20.1480	20.3484	20.3976	20.3935	20.2879	19.8648	19.2655	18.7382	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7680	19.0037	19.3413	19.7991	20.1480	20.3484	20.3976	20.3935	20.2879	19.8648	19.2655	18.7382	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9597	0.9423	0.9145	0.8498	0.7396	0.5656	0.4053	0.4414	0.6618	0.8599	0.9373	0.9638	(94)
Useful gains	554.1097	599.0361	610.0335	601.8307	535.6184	400.8363	275.8511	287.7137	413.4292	501.3446	526.3683	538.0705	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1102.1140	1071.6086	973.2330	816.2508	631.2611	425.0408	280.7995	294.7018	459.4050	692.2961	913.1821	1096.4542	(97)
Space heating kWh	407.7152	317.5688	270.2204	154.3825	71.1582	0.0000	0.0000	0.0000	0.0000	142.0679	278.5059	415.4375	(98a)
Space heating requirement - total per year (kWh/year)												2057.0563	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	407.7152	317.5688	270.2204	154.3825	71.1582	0.0000	0.0000	0.0000	0.0000	142.0679	278.5059	415.4375	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2057.0563	
Space heating per m2											(98c) / (4) =	28.3029	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	407.7152	317.5688	270.2204	154.3825	71.1582	0.0000	0.0000	0.0000	0.0000	142.0679	278.5059	415.4375	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	441.7283	344.0615	292.7631	167.2616	77.0945	0.0000	0.0000	0.0000	0.0000	153.9198	301.7399	450.0948	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4120	85.1401	84.6481	83.6744	82.1755	79.8000	79.8000	79.8000	79.8000	83.4643	84.8370	85.4735	(217)
Fuel for water heating, kWh/month	258.9710	229.7261	245.6810	219.3495	217.0045	201.9422	199.8732	207.5821	209.5753	222.7349	232.1094	256.0942	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.6146	19.7468	17.7798	13.0262	10.0618	8.2206	9.1787	11.9309	15.4970	20.3329	22.9660	25.2988	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-34.1427	-48.1921	-69.3402	-78.0353	-84.2042	-78.6248	-77.6860	-73.3488	-65.6465	-55.1924	-37.5712	-29.5143	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.0663	-40.1520	-79.8860	-120.0915	-158.8866	-159.6687	-157.7568	-133.4905	-97.7594	-57.4135	-25.4553	-15.0706	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2228.6634	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2700.6435	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	198.6542	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1796.1956	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3417.7656	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2228.6634	0.2100	468.0193	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2700.6435	0.2100	567.1351	(264)
Space and water heating			1035.1545	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	198.6542	0.1443	28.6719	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	0.1346	-98.4313	
PV Unit electricity exported	-1064.6971	0.1259	-134.0169	
Total			-232.4482	(269)
Total CO2, kg/year			843.3075	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.6000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2228.6634	1.1300	2518.3897	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2700.6435	1.1300	3051.7272	(278)
Space and water heating			5570.1168	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	198.6542	1.5338	304.7025	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	1.4973	-1095.2830	
PV Unit electricity exported	-1064.6971	0.4620	-491.9332	
Total			-1587.2162	(283)
Total Primary energy kWh/year			4417.7039	(286)
Target Primary Energy Rate (TPER)			60.7800	(287)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.39	**TER**	11.60
Environmental	98 A	**% DER < TER**			79.40
CO_2 Emissions (t/year)	0.15	**DFEE**	32.26	**TFEE**	34.75
Compliance Check	See BREL	**% DFEE < TFEE**			7.18
% DPER < TPER	50.64	**DPER**	30.00	**TPER**	60.78

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3185	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2468	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3147	0.3085	0.3024	0.2715	0.2653	0.2345	0.2345	0.2283	0.2468	0.2653	0.2777	0.2900	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5495	0.5476	0.5457	0.5369	0.5352	0.5275	0.5275	0.5261	0.5305	0.5352	0.5386	0.5421	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005	(35)
Thermal bridges (User defined value 0.030 * total exposed area)		4.9323	(36)
Point Thermal bridges	(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.2906	32.1776	32.0668	31.5466	31.4493	30.9963	30.9963	30.9124	31.1708	31.4493	31.6462	31.8520	(38)
Heat transfer coeff	73.3597	73.2467	73.1359	72.6157	72.5184	72.0654	72.0654	71.9815	72.2399	72.5184	72.7153	72.9211	(39)
Average = Sum(39)m / 12 =												72.6153	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0094	1.0078	1.0063	0.9991	0.9978	0.9915	0.9915	0.9904	0.9939	0.9978	1.0005	1.0033	(40)
HLP (average)												0.9991	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 60.0096 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.4702	63.6744	61.7137	59.2732	57.0961	54.8336	54.3634	56.3200	58.3269	60.6504	63.1125	65.3783	(44)
Energy conte	103.6888	90.6715	94.8517	81.1421	76.8624	67.4243	65.7478	69.7360	71.9229	82.3020	89.9153	102.3666	(45)
Energy content (annual)										Total = Sum(45)m =		996.6312	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(62)

WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(64)
								Total per year (kWh/year) = Sum(64)m =			847.1365	(64)
12Total per year (kWh/year)											847	(64)	

Electric shower(s)

50.4049	44.9112	49.0413	46.7995	47.6777	45.4799	46.9959	47.6777	46.7995	49.0413	48.1191	50.4049	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 573.3528 (64a)

Heat gains from water heating, kWh/month

34.6351	30.4955	32.4163	28.9426	28.2527	25.6976	25.7204	26.7383	26.9835	29.7495	31.1368	34.3541	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	46.5525	45.3802	43.5703	40.1980	37.9740	35.6912	34.5704	35.9386	37.4771	39.9859	43.2455	46.1749	(72)
Total internal gains	426.1276	439.7593	419.9362	409.1858	388.7147	376.9424	362.8952	362.1520	372.9599	382.8469	404.3535	416.7724	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	19.6403	0.7300	0.7000	0.7700	33.6625	(76)
South	1.2200	46.7521	0.7300	0.7000	0.7700	20.1983	(78)
West	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(80)

Solar gains	62.3460	115.5295	177.9208	245.6563	292.3231	296.2018	283.1911	248.4906	201.9391	133.5132	76.4951	52.1134	(83)
Total gains	488.4737	555.2888	597.8569	654.8421	681.0378	673.1442	646.0863	610.6426	574.8991	516.3600	480.8487	468.8858	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	44.9685	45.0379	45.1061	45.4292	45.4902	45.7762	45.7762	45.8295	45.6656	45.4902	45.3670	45.2389	
alpha	3.9979	4.0025	4.0071	4.0286	4.0327	4.0517	4.0517	4.0553	4.0444	4.0327	4.0245	4.0159	
util living area	0.9846	0.9734	0.9535	0.8991	0.7974	0.6304	0.4764	0.5205	0.7409	0.9196	0.9730	0.9868	(86)

MIT	19.4333	19.6547	19.9666	20.3880	20.7226	20.9221	20.9804	20.9719	20.8467	20.4101	19.8544	19.3924	(87)
Th 2	20.0755	20.0768	20.0781	20.0841	20.0852	20.0904	20.0904	20.0914	20.0884	20.0852	20.0829	20.0806	(88)
util rest of house													
	0.9814	0.9679	0.9434	0.8770	0.7535	0.5576	0.3841	0.4266	0.6751	0.8973	0.9664	0.9841	(89)
MIT 2	18.6483	18.8675	19.1742	19.5819	19.8848	20.0474	20.0832	20.0803	19.9943	19.6111	19.0713	18.6116	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.9362	19.1562	19.4649	19.8776	20.1921	20.3682	20.4123	20.4074	20.3070	19.9042	19.3586	18.8980	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9362	19.1562	19.4649	19.8776	20.1921	20.3682	20.4123	20.4074	20.3070	19.9042	19.3586	18.8980	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9761	0.9610	0.9354	0.8713	0.7591	0.5808	0.4175	0.4602	0.6920	0.8921	0.9598	0.9793	(94)
Useful gains	476.8221	533.6102	559.2201	570.5454	516.9580	390.9736	269.7288	281.0180	397.8519	460.6557	461.5066	459.1979	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1073.7082	1044.2200	948.1965	797.1465	615.8319	415.6902	274.7349	288.4563	448.3907	674.7235	891.3847	1071.7964	(97)
Space heating kWh													
	444.0833	343.1298	289.3984	163.1528	73.5622	0.0000	0.0000	0.0000	0.0000	159.2664	309.5122	455.7733	(98a)
Space heating requirement - total per year (kWh/year)												2237.8785	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	444.0833	343.1298	289.3984	163.1528	73.5622	0.0000	0.0000	0.0000	0.0000	159.2664	309.5122	455.7733	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2237.8785	
Space heating per m2											(98c) / (4) =	30.7908	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	677.4144	533.2836	547.0591	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8309	0.8946	0.8707	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	562.8935	477.0793	476.2994	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	730.2120	701.3194	662.3353	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	120.4693	166.8346	138.4108	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	30.1173	41.7087	34.6027	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												106.4287	(107)
Energy for space heating												30.7908	(99)
Energy for space cooling												1.4643	(108)
Total												32.2552	(109)
Fabric Energy Efficiency (DFEE)												32.3	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor		36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

		m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)	
Number of open flues	0 * 20 =	0.0000	(6b)	
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)	
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)	
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)	
Number of blocked chimneys	0 * 20 =	0.0000	(6f)	
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)	
Number of passive vents	0 * 10 =	0.0000	(7b)	
Number of flueless gas fires	0 * 40 =	0.0000	(7c)	
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)	
Pressure test		Yes		
Pressure Test Method		Blower Door		
Measured/design AP50		5.0000	(17)	
Infiltration rate		0.4185	(18)	
Number of sides sheltered		3	(19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3243	(21)	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4135	0.4054	0.3973	0.3568	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3649	0.3811	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			7.2800	1.1450	8.3359			(27)
Heatloss floor			36.3400	0.1300	4.7242			(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.1800	14.8338			(29a)
500mm mineral wool	36.3400		36.3400	0.1100	3.9974			(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.9313			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	3.6500	0.0500	0.1825
E3 Sill	2.7400	0.0500	0.1370
E4 Jamb	14.8400	0.0500	0.7420
E5 Ground floor (normal)	18.7200	0.1600	2.9952
E6 Intermediate floor within a dwelling	18.7200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.7200	0.0600	1.1232
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	5.5000	0.0800	0.4400
P2 Party wall - Intermediate floor within a dwelling	5.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	5.5000	0.1200	0.6600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8399 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.7712 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.4047	34.2096	34.0184	33.1202	32.9522	32.1700	32.1700	32.0251	32.4713	32.9522	33.2921	33.6475	(38)
Heat transfer coeff	76.1759	75.9808	75.7896	74.8914	74.7234	73.9411	73.9411	73.7963	74.2424	74.7234	75.0633	75.4187	(39)
Average = Sum(39)m / 12 =												74.8906	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0481	1.0454	1.0428	1.0304	1.0281	1.0174	1.0174	1.0154	1.0215	1.0281	1.0328	1.0377	(40)
HLP (average)												1.0304	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 60.0096 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.4702	63.6744	61.7137	59.2732	57.0961	54.8336	54.3634	56.3200	58.3269	60.6504	63.1125	65.3783	(44)
Energy conte	103.6888	90.6715	94.8517	81.1421	76.8624	67.4243	65.7478	69.7360	71.9229	82.3020	89.9153	102.3666	(45)
Energy content (annual)										Total = Sum(45)m =		996.6312	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(64)
								Total per year (kWh/year) = Sum(64)m =			847.1365	(64)
12Total per year (kWh/year)											847	(64)	

Electric shower(s)

50.4049	44.9112	49.0413	46.7995	47.6777	45.4799	46.9959	47.6777	46.7995	49.0413	48.1191	50.4049	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				573.3528	(64a)

Heat gains from water heating, kWh/month

34.6351	30.4955	32.4163	28.9426	28.2527	25.6976	25.7204	26.7383	26.9835	29.7495	31.1368	34.3541	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)													
	46.5525	45.3802	43.5703	40.1980	37.9740	35.6912	34.5704	35.9386	37.4771	39.9859	43.2455	46.1749	(72)
Total internal gains													
	426.1276	439.7593	419.9362	409.1858	388.7147	376.9424	362.8952	362.1520	372.9599	382.8469	404.3535	416.7724	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	19.6403	0.6300	0.7000	0.7700	29.0512	(76)
South	1.2200	46.7521	0.6300	0.7000	0.7700	17.4314	(78)
West	1.2200	19.6403	0.6300	0.7000	0.7700	7.3228	(80)

Solar gains	53.8055	99.7035	153.5481	212.0047	252.2788	255.6262	244.3978	214.4508	174.2762	115.2237	66.0163	44.9746	(83)
Total gains	479.9331	539.4628	573.4842	621.1905	640.9935	632.5686	607.2930	576.6028	547.2362	498.0706	470.3699	461.7470	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3060	43.4172	43.5268	44.0488	44.1478	44.6149	44.6149	44.7025	44.4338	44.1478	43.9479	43.7408	
alpha	3.8871	3.8945	3.9018	3.9366	3.9432	3.9743	3.9743	3.9802	3.9623	3.9432	3.9299	3.9161	
util living area													
	0.9858	0.9765	0.9606	0.9158	0.8286	0.6703	0.5139	0.5571	0.7713	0.9301	0.9755	0.9877	(86)
MIT	19.3345	19.5472	19.8560	20.2937	20.6568	20.8965	20.9722	20.9616	20.8107	20.3424	19.7768	19.3051	(87)
Th 2	20.0434	20.0457	20.0478	20.0581	20.0600	20.0689	20.0689	20.0706	20.0655	20.0600	20.0561	20.0521	(88)
util rest of house													
	0.9827	0.9715	0.9517	0.8961	0.7873	0.5956	0.4143	0.4572	0.7066	0.9097	0.9694	0.9851	(89)
MIT 2	18.5268	18.7385	19.0439	19.4739	19.8085	20.0109	20.0586	20.0553	19.9475	19.5283	18.9752	18.5040	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.8231	19.0351	19.3418	19.7746	20.1196	20.3357	20.3937	20.3877	20.2642	19.8269	19.2692	18.7979	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8231	19.0351	19.3418	19.7746	20.1196	20.3357	20.3937	20.3877	20.2642	19.8269	19.2692	18.7979	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9776	0.9647	0.9436	0.8892	0.7902	0.6182	0.4501	0.4926	0.7217	0.9037	0.9629	0.9804	(94)
Useful gains	469.1756	520.4295	541.1549	552.3676	506.5082	391.0515	273.3508	284.0123	394.9171	450.0999	452.9016	452.6979	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1106.3081	1073.9997	973.2745	814.4159	629.1446	424.1071	280.5132	294.2801	457.6422	689.4660	913.4615	1100.9515	(97)
Space heating kWh													
	474.0266	371.9992	321.4969	188.6748	91.2415	0.0000	0.0000	0.0000	0.0000	178.0884	331.6032	482.3006	(98a)
Space heating requirement - total per year (kWh/year)												2439.4312	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	474.0266	371.9992	321.4969	188.6748	91.2415	0.0000	0.0000	0.0000	0.0000	178.0884	331.6032	482.3006	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2439.4312	
Space heating per m2											(98c) / (4) =	33.5640	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	695.0467	547.1644	560.8517	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7918	0.8643	0.8386	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	550.3351	472.8936	470.3361	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	682.7860	655.9765	622.5485	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	95.3646	136.2137	113.2460	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	23.8412	34.0534	28.3115	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												86.2061	(107)
Energy for space heating												33.5640	(99)
Energy for space cooling												1.1861	(108)
Total												34.7501	(109)
Fabric Energy Efficiency (TFEE)												34.8	(109)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.39	**TER**	11.60
Environmental	98 A	**% DER < TER**			79.40
CO_2 Emissions (t/year)	0.15	**DFEE**	32.26	**TFEE**	34.75
Compliance Check	See BREL	**% DFEE < TFEE**			7.18
% DPER < TPER	50.64	**DPER**	30.00	**TPER**	60.78

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =	11875.9502			(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							163.4005	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 4.9323 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 118.0387 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)											Total = Sum(45)m =	1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =	2611.4378	(64)
12Total per year (kWh/year)											2611	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)

Water heating gains (Table 5)

150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)

Total internal gains

529.9009	542.3600	519.8296	502.5508	478.2395	462.4112	445.5913	446.6965	459.7372	474.1489	501.8869	519.6574	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	19.6403	0.7300	0.7000	0.7700	33.6625	(76)
South	1.2200	46.7521	0.7300	0.7000	0.7700	20.1983	(78)
West	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(80)

Solar gains 62.3460	115.5295	177.9208	245.6563	292.3231	296.2018	283.1911	248.4906	201.9391	133.5132	76.4951	52.1134	(83)
Total gains 592.2469	657.8895	697.7504	748.2071	770.5625	758.6130	728.7825	695.1871	661.6764	607.6621	578.3820	571.7708	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9698	0.9526	0.9232	0.8534	0.7347	0.5640	0.4180	0.4552	0.6658	0.8720	0.9499	0.9736	(86)
MIT	19.7189	19.9202	20.1972	20.5449	20.8105	20.9510	20.9887	20.9838	20.9030	20.5685	20.0855	19.6663	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9639	0.9437	0.9086	0.8258	0.6875	0.4953	0.3366	0.3717	0.5991	0.8419	0.9389	0.9684	(89)
MIT 2	18.6269	18.8787	19.2223	19.6400	19.9380	20.0752	20.1038	20.1010	20.0355	19.6767	19.0895	18.5609	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.0275	19.2607	19.5799	19.9719	20.2580	20.3965	20.4284	20.4249	20.3537	20.0039	19.4548	18.9663	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0275	19.2607	19.5799	19.9719	20.2580	20.3965	20.4284	20.4249	20.3537	20.0039	19.4548	18.9663	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9549	0.9333	0.8984	0.8211	0.6959	0.5181	0.3662	0.4018	0.6183	0.8379	0.9290	0.9599	(94)
Useful gains	565.5297	614.0072	626.8502	614.3782	536.2121	393.0377	266.8678	279.3425	409.1146	509.1454	537.3214	548.8532	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1037.5493	1011.7139	921.4784	780.0171	602.9125	408.3613	269.7090	283.5514	440.5723	662.5018	870.3961	1040.2886	(97)
Space heating kWh													
	351.1826	267.2589	219.2033	119.2600	49.6251	0.0000	0.0000	0.0000	0.0000	114.0972	239.8138	365.6279	(98a)
Space heating requirement - total per year (kWh/year)												1726.0688	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	351.1826	267.2589	219.2033	119.2600	49.6251	0.0000	0.0000	0.0000	0.0000	114.0972	239.8138	365.6279	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1726.0688	
Space heating per m2											(98c) / (4) =	23.7489	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	351.1826	267.2589	219.2033	119.2600	49.6251	0.0000	0.0000	0.0000	0.0000	114.0972	239.8138	365.6279	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	526.7739	400.8883	328.8050	178.8900	74.4376	0.0000	0.0000	0.0000	0.0000	171.1457	359.7208	548.4418	
Space heating requirement													
	526.7739	400.8883	328.8050	178.8900	74.4376	0.0000	0.0000	0.0000	0.0000	171.1457	359.7208	548.4418	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	
Water heating fuel													
	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9032	-24.7478	-42.1903	-54.3464	-63.2831	-60.6270	-59.4769	-53.4801	-43.2885	-30.7805	-17.3978	-12.3224	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5955	-11.8305	-29.8051	-54.5176	-80.7077	-84.5250	-82.2640	-64.2624	-40.1739	-18.7163	-6.5523	-3.4266	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												2589.1032	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3917.1568	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												25.8910	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.9861	(330a)
Total electricity for the above, kWh/year												19.9861	(331)
Electricity for lighting (calculated in Appendix L)												193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5761.4653	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1735.0027	0.1555	107.3894	(367)
Electrical energy for heat distribution (space & water)	25.8910	0.0000	9.5450	(372)
Overall CO2 factor for heat network			0.0406	(386)
Total CO2 associated with community systems			264.0773	(373)
Space and water heating			264.0773	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	0.1320	-62.9388	
PV Unit electricity exported	-481.3770	0.1213	-58.4056	
Total			-121.3444	(380)
Total CO2, kg/year			173.4246	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.3900	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1735.0027	1.5758	1088.0033	(467)
Electrical energy for heat distribution (space & water)	25.8910	0.0000	100.3747	(472)
Overall CO2 factor for heat network			0.4268	(486)
Total CO2 associated with community systems			2777.0325	(473)
Space and water heating			2777.0325	(476)
Pumps, fans and electric keep-hot	19.9861	1.5128	30.2350	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	1.4877	-709.3875	
PV Unit electricity exported	-481.3770	0.4451	-214.2796	
Total			-923.6671	(480)
Total Primary energy kWh/year			2180.3054	(483)
Dwelling Primary energy Rate (DPER)			30.0000	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b) x	2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c) x	2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4185	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3243	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4135	0.4054	0.3973	0.3568	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3649	0.3811	(22b)
Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			7.2800	1.1450	8.3359			(27)
Heatloss floor			36.3400	0.1300	4.7242			(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.1800	14.8338			(29a)
500mm mineral wool	36.3400		36.3400	0.1100	3.9974			(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.9313			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	3.6500	0.0500	0.1825
E3 Sill	2.7400	0.0500	0.1370
E4 Jamb	14.8400	0.0500	0.7420
E5 Ground floor (normal)	18.7200	0.1600	2.9952
E6 Intermediate floor within a dwelling	18.7200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.7200	0.0600	1.1232
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	5.5000	0.0800	0.4400
P2 Party wall - Intermediate floor within a dwelling	5.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	5.5000	0.1200	0.6600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8399 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.7712 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.4047	34.2096	34.0184	33.1202	32.9522	32.1700	32.1700	32.0251	32.4713	32.9522	33.2921	33.6475	(38)
Heat transfer coeff	76.1759	75.9808	75.7896	74.8914	74.7234	73.9411	73.9411	73.7963	74.2424	74.7234	75.0633	75.4187	(39)
Average = Sum(39)m / 12 =												74.8906	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0481	1.0454	1.0428	1.0304	1.0281	1.0174	1.0174	1.0154	1.0215	1.0281	1.0328	1.0377	(40)
HLP (average)												1.0304	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	249.9662	221.0368	234.6117	205.6045	198.8885	178.7466	175.9929	183.1904	185.4473	207.3672	221.2297	247.1336	(62)
WWHRS	-28.7738	-25.4478	-26.6475	-22.0651	-20.5639	-17.5967	-16.4941	-17.5398	-18.2062	-21.4631	-24.3151	-28.2410	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
										Total per year (kWh/year) = Sum(64)m =		2241.8614	(64)
12Total per year (kWh/year)												2242	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	104.8969	93.1698	99.7915	89.4439	87.9135	80.5137	80.3008	82.6939	82.7417	90.7327	94.6393	103.9551	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	140.9904	138.6456	134.1284	124.2277	118.1634	111.8245	107.9311	111.1477	114.9190	121.9526	131.4435	139.7245	(72)
Total internal gains	523.5655	536.0247	513.4942	496.2155	471.9041	453.0758	436.2560	437.3612	450.4018	467.8135	495.5515	513.3220	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	19.6403	0.6300	0.7000	0.7700	29.0512	(76)
South	1.2200	46.7521	0.6300	0.7000	0.7700	17.4314	(78)
West	1.2200	19.6403	0.6300	0.7000	0.7700	7.3228	(80)

Solar gains	53.8055	99.7035	153.5481	212.0047	252.2788	255.6262	244.3978	214.4508	174.2762	115.2237	66.0163	44.9746	(83)
Total gains	577.3710	635.7282	667.0423	708.2202	724.1829	708.7020	680.6538	651.8119	624.6781	583.0372	561.5678	558.2966	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3060	43.4172	43.5268	44.0488	44.1478	44.6149	44.6149	44.7025	44.4338	44.1478	43.9479	43.7408	
alpha	3.8871	3.8945	3.9018	3.9366	3.9432	3.9743	3.9743	3.9802	3.9623	3.9432	3.9299	3.9161	
util living area	0.9741	0.9609	0.9387	0.8824	0.7809	0.6163	0.4644	0.5014	0.7127	0.8939	0.9575	0.9770	(86)
MIT	19.5207	19.7226	20.0131	20.4110	20.7289	20.9234	20.9805	20.9735	20.8593	20.4638	19.9418	19.4919	(87)
Th 2	20.0434	20.0457	20.0478	20.0581	20.0600	20.0689	20.0689	20.0706	20.0655	20.0600	20.0561	20.0521	(88)
util rest of house	0.9689	0.9530	0.9260	0.8576	0.7350	0.5425	0.3719	0.4081	0.6445	0.8665	0.9477	0.9723	(89)
MIT 2	18.3320	18.5872	18.9520	19.4446	19.8114	20.0153	20.0599	20.0574	19.9569	19.5178	18.8737	18.3016	(90)
Living area fraction									fLA = Living area / (4) =			0.3668	(91)
MIT	18.7680	19.0037	19.3413	19.7991	20.1480	20.3484	20.3976	20.3935	20.2879	19.8648	19.2655	18.7382	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7680	19.0037	19.3413	19.7991	20.1480	20.3484	20.3976	20.3935	20.2879	19.8648	19.2655	18.7382	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9597	0.9423	0.9145	0.8498	0.7396	0.5656	0.4053	0.4414	0.6618	0.8599	0.9373	0.9638	(94)
Useful gains	554.1097	599.0361	610.0335	601.8307	535.6184	400.8363	275.8511	287.7137	413.4292	501.3446	526.3683	538.0705	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1102.1140	1071.6086	973.2330	816.2508	631.2611	425.0408	280.7995	294.7018	459.4050	692.2961	913.1821	1096.4542	(97)
Space heating kWh	407.7152	317.5688	270.2204	154.3825	71.1582	0.0000	0.0000	0.0000	0.0000	142.0679	278.5059	415.4375	(98a)
Space heating requirement - total per year (kWh/year)												2057.0563	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	407.7152	317.5688	270.2204	154.3825	71.1582	0.0000	0.0000	0.0000	0.0000	142.0679	278.5059	415.4375	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2057.0563	
Space heating per m2											(98c) / (4) =	28.3029	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	407.7152	317.5688	270.2204	154.3825	71.1582	0.0000	0.0000	0.0000	0.0000	142.0679	278.5059	415.4375	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	441.7283	344.0615	292.7631	167.2616	77.0945	0.0000	0.0000	0.0000	0.0000	153.9198	301.7399	450.0948	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4120	85.1401	84.6481	83.6744	82.1755	79.8000	79.8000	79.8000	79.8000	83.4643	84.8370	85.4735	(217)
Fuel for water heating, kWh/month	258.9710	229.7261	245.6810	219.3495	217.0045	201.9422	199.8732	207.5821	209.5753	222.7349	232.1094	256.0942	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.6146	19.7468	17.7798	13.0262	10.0618	8.2206	9.1787	11.9309	15.4970	20.3329	22.9660	25.2988	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-34.1427	-48.1921	-69.3402	-78.0353	-84.2042	-78.6248	-77.6860	-73.3488	-65.6465	-55.1924	-37.5712	-29.5143	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.0663	-40.1520	-79.8860	-120.0915	-158.8866	-159.6687	-157.7568	-133.4905	-97.7594	-57.4135	-25.4553	-15.0706	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2228.6634	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2700.6435	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	198.6542	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1796.1956	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3417.7656	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2228.6634	0.2100	468.0193	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2700.6435	0.2100	567.1351	(264)
Space and water heating			1035.1545	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	198.6542	0.1443	28.6719	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	0.1346	-98.4313	
PV Unit electricity exported	-1064.6971	0.1259	-134.0169	
Total			-232.4482	(269)
Total CO2, kg/year			843.3075	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.6000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2228.6634	1.1300	2518.3897	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2700.6435	1.1300	3051.7272	(278)
Space and water heating			5570.1168	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	198.6542	1.5338	304.7025	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	1.4973	-1095.2830	
PV Unit electricity exported	-1064.6971	0.4620	-491.9332	
Total			-1587.2162	(283)
Total Primary energy kWh/year			4417.7039	(286)
Target Primary Energy Rate (TPER)			60.7800	(287)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.39	**TER**	11.60
Environmental	98 A	**% DER < TER**			79.40
CO_2 Emissions (t/year)	0.15	**DFEE**	32.26	**TFEE**	34.75
Compliance Check	See BREL	**% DFEE < TFEE**			7.18
% DPER < TPER	50.64	**DPER**	30.00	**TPER**	60.78

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				3	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =	11875.9502			(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							163.4005	(35)

Thermal bridges (User defined value 0.030 * total exposed area)												4.9323	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	41.0691	(37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3094	(42)
Hot water usage for mixer showers													
	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths													
	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses													
	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)											Total = Sum(45)m =	1960.5981	
Distribution loss (46)m = 0.15 x (45)m													
	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =		2611.4378	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)													
	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)
Total internal gains													
	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	19.6403	0.7300	0.7000	0.7700	33.6625	(76)
South	1.2200	46.7521	0.7300	0.7000	0.7700	20.1983	(78)
West	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(80)

Solar gains	62.3460	115.5295	177.9208	245.6563	292.3231	296.2018	283.1911	248.4906	201.9391	133.5132	76.4951	52.1134	(83)
Total gains	641.0946	692.0228	737.4137	773.5375	789.0184	764.7577	735.2153	703.6417	673.3447	633.6634	611.2577	616.9578	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area	0.9610	0.9447	0.9106	0.8417	0.7238	0.5602	0.4146	0.4502	0.6573	0.8584	0.9408	0.9661	(86)
MIT	19.8077	19.9778	20.2552	20.5717	20.8210	20.9522	20.9890	20.9845	20.9075	20.5984	20.1401	19.7501	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house	0.9537	0.9346	0.8942	0.8130	0.6762	0.4917	0.3337	0.3674	0.5907	0.8265	0.9283	0.9597	(89)
MIT 2	18.7376	18.9495	19.2916	19.6700	19.9483	20.0761	20.1039	20.1014	20.0391	19.7098	19.1560	18.6657	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.1301	19.3267	19.6451	20.0007	20.2684	20.3975	20.4286	20.4253	20.3577	20.0358	19.5170	19.0635	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1301	19.3267	19.6451	20.0007	20.2684	20.3975	20.4286	20.4253	20.3577	20.0358	19.5170	19.0635	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9438	0.9239	0.8843	0.8091	0.6852	0.5145	0.3631	0.3973	0.6102	0.8235	0.9182	0.9503	(94)
Useful gains	605.0488	639.3765	652.1063	625.8920	540.6287	393.4855	266.9708	279.5459	410.8611	521.8408	561.2602	586.2765	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1044.7817	1016.3608	926.0715	782.0460	603.6439	408.4310	269.7250	283.5830	440.8520	664.7509	874.7761	1047.1300	(97)
Space heating kWh	327.1613	253.3334	203.8301	112.4308	46.8833	0.0000	0.0000	0.0000	0.0000	106.3251	225.7315	342.8750	(98a)
Space heating requirement - total per year (kWh/year)												1618.5706	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	327.1613	253.3334	203.8301	112.4308	46.8833	0.0000	0.0000	0.0000	0.0000	106.3251	225.7315	342.8750	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1618.5706	
Space heating per m2											(98c) / (4) =	22.2698	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	327.1613	253.3334	203.8301	112.4308	46.8833	0.0000	0.0000	0.0000	0.0000	106.3251	225.7315	342.8750 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	490.7420	380.0001	305.7452	168.6463	70.3250	0.0000	0.0000	0.0000	0.0000	159.4877	338.5972	514.3125
Space heating requirement												
	490.7420	380.0001	305.7452	168.6463	70.3250	0.0000	0.0000	0.0000	0.0000	159.4877	338.5972	514.3125 (307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement												
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233
Water heating fuel												
	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233 (310)

Cooling System Energy Efficiency Ratio	0.0000	(314)

Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9032	-24.7478	-42.1903	-54.3464	-63.2831	-60.6270	-59.4769	-53.4801	-43.2885	-30.7805	-17.3978	-12.3224	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5955	-11.8305	-29.8051	-54.5176	-80.7077	-84.5250	-82.2640	-64.2624	-40.1739	-18.7163	-6.5523	-3.4266	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2427.8559	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3917.1568	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	24.2786	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
Total electricity for the above, kWh/year	19.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5600.2180	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2427.8559	4.4400	107.7968	(340a)
Space heating total			107.7968	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3917.1568	4.4400	173.9218	(342a)
Water heating total			173.9218	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	16.4900	3.2957	(349)
Energy for lighting	193.4401	16.4900	31.8983	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	16.4900	-78.6316	
PV Unit electricity exported	-481.3770	5.5900	-26.9090	
Total			-105.5405	(352)
Total energy cost			303.3720	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.9281	(357)
SAP value	84.9562	
SAP rating (Section 12)	85	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1692.0034	0.1555	100.6989	(367)
Electrical energy for heat distribution (space & water)	24.2786	0.0000	9.2941	(372)
Overall CO2 factor for heat network			0.0405	(386)
Total CO2 associated with community systems			257.1359	(373)
Space and water heating			257.1359	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	0.1320	-62.9388	
PV Unit electricity exported	-481.3770	0.1213	-58.4056	
Total			-121.3444	(380)
Total CO2, kg/year			166.4832	(383)
CO2 emissions per m2			2.2900	(384)
EI value			98.1043	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b) x	2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c) x	2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 72.6800						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor (20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =		0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11875.9502 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

Thermal bridges (User defined value 0.030 * total exposed area) 4.9323 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)

Average = Sum(39)m / 12 = 70.4500

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 118.0387 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =		2611.4378	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657 (69)

Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757 (71)

Water heating gains (Table 5)

150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599 (72)

Total internal gains

578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	23.7835	0.7300	0.7000	0.7700	40.7638	(76)
South	1.2200	54.0600	0.7300	0.7000	0.7700	23.3555	(78)
West	1.2200	23.7835	0.7300	0.7000	0.7700	10.2752	(80)

Solar gains	74.3946	122.6177	186.2329	260.3509	298.7480	324.9059	304.7294	272.3724	223.2097	149.5564	89.9365	62.5313 (83)
Total gains	653.1431	699.1110	745.7259	788.2321	795.4433	793.4618	756.7535	727.5235	694.6153	649.7066	624.6991	627.3756 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9562	0.9397	0.8988	0.8223	0.6940	0.4982	0.3595	0.3917	0.6209	0.8322	0.9313	0.9622	(86)
MIT	19.8706	20.0296	20.3276	20.6254	20.8555	20.9717	20.9942	20.9917	20.9283	20.6665	20.2144	19.8112	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9480	0.9287	0.8802	0.7906	0.6428	0.4277	0.2791	0.3090	0.5517	0.7952	0.9167	0.9550	(89)
MIT 2	18.8166	19.0140	19.3796	19.7314	19.9837	20.0914	20.1068	20.1055	20.0572	19.7868	19.2473	18.7425	(90)
Living area fraction									fLA = Living area / (4) =			0.3668	(91)
MIT	19.2032	19.3865	19.7274	20.0593	20.3035	20.4143	20.4323	20.4306	20.3767	20.1095	19.6021	19.1345	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2032	19.3865	19.7274	20.0593	20.3035	20.4143	20.4323	20.4306	20.3767	20.1095	19.6021	19.1345	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9378	0.9180	0.8711	0.7887	0.6545	0.4524	0.3085	0.3392	0.5733	0.7952	0.9069	0.9452	(94)
Useful gains	612.5215	641.7586	649.6041	621.6800	520.6318	358.9308	233.4577	246.7594	398.2371	516.6780	566.5337	592.9734	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	1028.7961	999.4399	896.6423	757.9945	570.8920	367.3458	234.7616	248.7300	421.0609	634.7163	852.5898	1031.0004	(97)
Space heating kWh													
	309.7084	240.3618	183.7964	98.1464	37.3936	0.0000	0.0000	0.0000	0.0000	87.8205	205.9604	325.8921	(98a)
Space heating requirement - total per year (kWh/year)												1489.0795	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	309.7084	240.3618	183.7964	98.1464	37.3936	0.0000	0.0000	0.0000	0.0000	87.8205	205.9604	325.8921	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1489.0795	
Space heating per m2											(98c) / (4) =	20.4882	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)											0.0000	(301)
Fraction of space heat from community system											1.0000	(302)
Fraction of heat from community Heat pump-Space and Water											1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating											1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating											1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system											1.5000	(306)
Efficiency of secondary/supplementary heating system, %											0.0000	(208)
Space heating:												
Space heating requirement												
309.7084	240.3618	183.7964	98.1464	37.3936	0.0000	0.0000	0.0000	0.0000	87.8205	205.9604	325.8921	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a 464.5625	360.5427	275.6946	147.2196	56.0904	0.0000	0.0000	0.0000	0.0000	131.7308	308.9405	488.8381	
Space heating requirement												
464.5625	360.5427	275.6946	147.2196	56.0904	0.0000	0.0000	0.0000	0.0000	131.7308	308.9405	488.8381	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)											0.0000	(308)
Space heating fuel for secondary/supplementary system												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating												
Annual water heating requirement												
258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a 387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	
Water heating fuel												
387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio											0.0000	(314)
Space coolin 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa 1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting 23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m -17.7988	-26.5546	-44.3894	-57.0811	-64.6020	-64.1536	-62.3425	-56.9881	-46.9012	-34.2077	-20.4034	-14.8306	(333a)

Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.1997	-13.4106	-32.8557	-60.4920	-84.6385	-96.9652	-92.1477	-74.2535	-47.4476	-22.7886	-8.6270	-4.6681	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2233.6193	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3917.1568	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	22.3362	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
Total electricity for the above, kWh/year	19.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5309.4553	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2233.6193	6.5500	146.3021	(340a)
Space heating total			146.3021	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3917.1568	6.5500	256.5738	(342a)
Water heating total			256.5738	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	28.4300	5.6821	(349)
Energy for lighting	193.4401	28.4300	54.9950	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.2528	28.4300	-145.0649	
PV Unit electricity exported	-544.4942	5.8100	-31.6351	
Total			-176.7000	(352)
Total energy cost			390.8529	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1640.2070	0.1559	92.8784	(367)
Electrical energy for heat distribution (space & water)	22.3362	0.0000	9.0008	(372)
Overall CO2 factor for heat network			0.0405	(386)
Total CO2 associated with community systems			249.0222	(373)
Space and water heating			249.0222	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.2528	0.1323	-67.5052	
PV Unit electricity exported	-544.4942	0.1214	-66.0897	
Total			-133.5948	(380)
Total CO2, kg/year			146.1191	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1640.2070	1.5773	939.4838	(467)
Electrical energy for heat distribution (space & water)	22.3362	0.0000	94.8052	(472)
Overall CO2 factor for heat network			0.4264	(486)
Total CO2 associated with community systems			2622.9434	(473)
Space and water heating			2622.9434	(476)
Pumps, fans and electric keep-hot	19.9861	1.5128	30.2350	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.2528	1.4888	-759.6722	
PV Unit electricity exported	-544.4942	0.4453	-242.4386	
Total			-1002.1108	(480)
Total Primary energy kWh/year			1947.7726	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - East

Current energy efficiency rating: B 85
Current environmental impact rating: A 98

N Solar water heating — Recommended
U Solar photovoltaic panels — Already installed
V2 Wind turbine — Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.4	-£ 47	-26 kg (17.8%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£47	0.36 kg/m²	B 86	A 98
Total Savings	£47	0.36 kg/m²		

Potential energy efficiency rating: B 86
Potential environmental impact rating: A 98

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£61	£83	-£23
Community scheme	£507	£438	£69
Space heating	£256	£279	-£23
Water heating	£257	£188	£69
Lighting	£55	£55	£0
Generated (PV)	-£177	-£178	£1
Total cost of fuels	£391	£343	£47
Total cost of uses	£391	£344	£47
Delivered energy	73 kWh/m²	60 kWh/m²	13 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	2 kg/m²	2 kg/m²	0 kg/m²
Primary energy	27 kWh/m²	23 kWh/m²	4 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330 (1b) - (3b)	
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		4.9323 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3094	(42)
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												624.1873	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												624.1873	
Solar input	-0.0000	-16.2194	-58.0608	-80.0094	-105.2873	-97.2929	-96.7392	-84.2620	-57.6788	-28.6375	-0.0000	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.6481	212.6591	185.2328	133.9970	102.2831	89.8555	87.9356	107.6103	136.1704	187.4116	229.6316	255.8155	(64)
									Total per year (kWh/year) = Sum(64)m =			1987.2506	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757 (71)
Water heating gains (Table 5)												
	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599 (72)
Total internal gains												
	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	19.6403	0.7300	0.7000	0.7700	33.6625	(76)
South	1.2200	46.7521	0.7300	0.7000	0.7700	20.1983	(78)
West	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(80)

Solar gains	62.3460	115.5295	177.9208	245.6563	292.3231	296.2018	283.1911	248.4906	201.9391	133.5132	76.4951	52.1134 (83)
Total gains	641.0946	692.0228	737.4137	773.5375	789.0184	764.7577	735.2153	703.6417	673.3447	633.6634	611.2577	616.9578 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217
util living area												
	0.9610	0.9447	0.9106	0.8417	0.7238	0.5602	0.4146	0.4502	0.6573	0.8584	0.9408	0.9661 (86)
MIT	19.8077	19.9778	20.2552	20.5717	20.8210	20.9522	20.9890	20.9845	20.9075	20.5984	20.1401	19.7501 (87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090 (88)
util rest of house												
	0.9537	0.9346	0.8942	0.8130	0.6762	0.4917	0.3337	0.3674	0.5907	0.8265	0.9283	0.9597 (89)
MIT 2	18.7376	18.9495	19.2916	19.6700	19.9483	20.0761	20.1039	20.1014	20.0391	19.7098	19.1560	18.6657 (90)
Living area fraction										fLA = Living area / (4) =		0.3668 (91)
MIT	19.1301	19.3267	19.6451	20.0007	20.2684	20.3975	20.4286	20.4253	20.3577	20.0358	19.5170	19.0635 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1301	19.3267	19.6451	20.0007	20.2684	20.3975	20.4286	20.4253	20.3577	20.0358	19.5170	19.0635 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9438	0.9239	0.8843	0.8091	0.6852	0.5145	0.3631	0.3973	0.6102	0.8235	0.9182	0.9503	(94)
Useful gains	605.0488	639.3765	652.1063	625.8920	540.6287	393.4855	266.9708	279.5459	410.8611	521.8408	561.2602	586.2765	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1044.7817	1016.3608	926.0715	782.0460	603.6439	408.4310	269.7250	283.5830	440.8520	664.7509	874.7761	1047.1300	(97)
Space heating kWh													
	327.1613	253.3334	203.8301	112.4308	46.8833	0.0000	0.0000	0.0000	0.0000	106.3251	225.7315	342.8750	(98a)
Space heating requirement - total per year (kWh/year)												1618.5706	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	327.1613	253.3334	203.8301	112.4308	46.8833	0.0000	0.0000	0.0000	0.0000	106.3251	225.7315	342.8750	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1618.5706	
Space heating per m2											(98c) / (4) =	22.2698	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	327.1613	253.3334	203.8301	112.4308	46.8833	0.0000	0.0000	0.0000	0.0000	106.3251	225.7315	342.8750	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	490.7420	380.0001	305.7452	168.6463	70.3250	0.0000	0.0000	0.0000	0.0000	159.4877	338.5972	514.3125	
Space heating requirement													
	490.7420	380.0001	305.7452	168.6463	70.3250	0.0000	0.0000	0.0000	0.0000	159.4877	338.5972	514.3125	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	212.6591	185.2328	133.9970	102.2831	89.8555	87.9356	107.6103	136.1704	187.4116	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	318.9886	277.8492	200.9955	153.4247	134.7833	131.9034	161.4154	204.2556	281.1174	344.4473	383.7233	
Water heating fuel													
	387.9721	318.9886	277.8492	200.9955	153.4247	134.7833	131.9034	161.4154	204.2556	281.1174	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	8.4920	7.6702	8.4920	8.2180	8.4920	8.2180	8.4920	8.4920	8.2180	8.4920	8.2180	8.4920	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9541	-24.8708	-42.4882	-54.8798	-64.0812	-61.5030	-60.3713	-54.2093	-43.7560	-31.0030	-17.4758	-12.3621	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5447	-11.7075	-29.5072	-53.9842	-79.9096	-83.6490	-81.3696	-63.5332	-39.7064	-18.4938	-6.4743	-3.3869	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2427.8559	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2980.8759	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	24.2786	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4743.9371	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2427.8559	4.4400	107.7968	(340a)
Space heating total			107.7968	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2980.8759	4.4400	132.3509	(342a)
Water heating total			132.3509	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	16.4900	3.2957	(349)
Pump for solar water heating	80.0000	16.4900	13.1920	(349)
Energy for lighting	193.4401	16.4900	31.8983	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-481.9545	16.4900	-79.4743	
PV Unit electricity exported	-476.2665	5.5900	-26.6233	
Total			-106.0976	(352)
Total energy cost			274.4361	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.8395	(357)
SAP value	86.3911	
SAP rating (Section 12)	86	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1442.3285	0.1555	100.6989	(367)
Electrical energy for heat distribution (space & water)	24.2786	0.0000	8.1001	(372)
Overall CO2 factor for heat network			0.0414	(386)
Total CO2 associated with community systems			224.1020	(373)
Space and water heating			224.1020	(376)
Pumps, fans and electric keep-hot	99.9861	0.1387	13.8693	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-481.9545	0.1319	-63.5856	
PV Unit electricity exported	-476.2665	0.1213	-57.7895	
Total			-121.3751	(380)
Total CO2, kg/year			144.5156	(383)
CO2 emissions per m2			1.9900	(384)
EI value			98.3544	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330 (1b) - (3b)	
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		4.9323 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.3094	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day)	118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	

Distribution loss (46)m = 0.15 x (45)m

30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)

Water storage loss:

Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												698.3818	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												698.3818	
Solar input	-0.2882	-19.8943	-63.0504	-86.9122	-108.6771	-108.6071	-105.7317	-94.9883	-67.4759	-37.8323	-4.9243	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	258.3599	208.9842	180.2432	127.0942	98.8933	78.5413	78.9431	96.8840	126.3733	178.2168	224.7072	255.8155	(64)
									Total per year (kWh/year) = Sum(64)m =			1913.0561	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month													
	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)													
	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)
Total internal gains													
	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	4.8400	23.7835	0.7300	0.7000	0.7700	40.7638	(76)
South	1.2200	54.0600	0.7300	0.7000	0.7700	23.3555	(78)
West	1.2200	23.7835	0.7300	0.7000	0.7700	10.2752	(80)

Solar gains	74.3946	122.6177	186.2329	260.3509	298.7480	324.9059	304.7294	272.3724	223.2097	149.5564	89.9365	62.5313	(83)
Total gains	653.1431	699.1110	745.7259	788.2321	795.4433	793.4618	756.7535	727.5235	694.6153	649.7066	624.6991	627.3756	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9562	0.9397	0.8988	0.8223	0.6940	0.4982	0.3595	0.3917	0.6209	0.8322	0.9313	0.9622	(86)
MIT	19.8706	20.0296	20.3276	20.6254	20.8555	20.9717	20.9942	20.9917	20.9283	20.6665	20.2144	19.8112	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9480	0.9287	0.8802	0.7906	0.6428	0.4277	0.2791	0.3090	0.5517	0.7952	0.9167	0.9550	(89)
MIT 2	18.8166	19.0140	19.3796	19.7314	19.9837	20.0914	20.1068	20.1055	20.0572	19.7868	19.2473	18.7425	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.2032	19.3865	19.7274	20.0593	20.3035	20.4143	20.4323	20.4306	20.3767	20.1095	19.6021	19.1345	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2032	19.3865	19.7274	20.0593	20.3035	20.4143	20.4323	20.4306	20.3767	20.1095	19.6021	19.1345	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9378	0.9180	0.8711	0.7887	0.6545	0.4524	0.3085	0.3392	0.5733	0.7952	0.9069	0.9452	(94)
Useful gains	612.5215	641.7586	649.6041	621.6800	520.6318	358.9308	233.4577	246.7594	398.2371	516.6780	566.5337	592.9734	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	1028.7961	999.4399	896.6423	757.9945	570.8920	367.3458	234.7616	248.7300	421.0609	634.7163	852.5898	1031.0004	(97)
Space heating kWh													
	309.7084	240.3618	183.7964	98.1464	37.3936	0.0000	0.0000	0.0000	0.0000	87.8205	205.9604	325.8921	(98a)
Space heating requirement - total per year (kWh/year)												1489.0795	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	309.7084	240.3618	183.7964	98.1464	37.3936	0.0000	0.0000	0.0000	0.0000	87.8205	205.9604	325.8921	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1489.0795	
Space heating per m2											(98c) / (4) =	20.4882	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement													
	309.7084	240.3618	183.7964	98.1464	37.3936	0.0000	0.0000	0.0000	0.0000	87.8205	205.9604	325.8921	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	464.5625	360.5427	275.6946	147.2196	56.0904	0.0000	0.0000	0.0000	0.0000	131.7308	308.9405	488.8381	
Space heating requirement													
	464.5625	360.5427	275.6946	147.2196	56.0904	0.0000	0.0000	0.0000	0.0000	131.7308	308.9405	488.8381	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement													
	258.3599	208.9842	180.2432	127.0942	98.8933	78.5413	78.9431	96.8840	126.3733	178.2168	224.7072	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.5399	313.4764	270.3648	190.6413	148.3399	117.8120	118.4147	145.3260	189.5599	267.3252	337.0608	383.7233	
Water heating fuel													
	387.5399	313.4764	270.3648	190.6413	148.3399	117.8120	118.4147	145.3260	189.5599	267.3252	337.0608	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	8.4920	7.6702	8.4920	8.2180	8.4920	8.2180	8.4920	8.4920	8.2180	8.4920	8.2180	8.4920	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.8663	-26.6927	-44.7143	-57.6640	-65.4319	-65.1316	-63.3225	-57.8097	-47.4406	-34.4735	-20.5043	-14.8840	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.1321	-13.2725	-32.5307	-59.9091	-83.8086	-95.9871	-91.1676	-73.4319	-46.9082	-22.5228	-8.5261	-4.6148	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2233.6193	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2869.5841	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	22.3362	(313)
Space cooling fuel	0.0000	(321)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4341.8827	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2233.6193	6.5500	146.3021	(340a)
Space heating total			146.3021	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2869.5841	6.5500	187.9578	(342a)
Water heating total			187.9578	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	28.4300	5.6821	(349)
Pump for solar water heating	80.0000	28.4300	22.7440	(349)
Energy for lighting	193.4401	28.4300	54.9950	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-515.9355	28.4300	-146.6805	
PV Unit electricity exported	-538.8116	5.8100	-31.3050	
Total			-177.9854	(352)
Total energy cost			343.6955	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1360.8542	0.1559	92.8784	(367)
Electrical energy for heat distribution (space & water)	22.3362	0.0000	7.6631	(372)
Overall CO2 factor for heat network			0.0415	(386)
Total CO2 associated with community systems			212.0128	(373)
Space and water heating			212.0128	(376)
Pumps, fans and electric keep-hot	99.9861	0.1387	13.8693	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-515.9355	0.1322	-68.2250	
PV Unit electricity exported	-538.8116	0.1214	-65.4032	
Total			-133.6282	(380)
Total CO2, kg/year			120.1733	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1360.8542	1.5773	939.4838	(467)
Electrical energy for heat distribution (space & water)	22.3362	0.0000	79.3891	(472)
Overall CO2 factor for heat network			0.4304	(486)
Total CO2 associated with community systems			2196.4304	(473)
Space and water heating			2196.4304	(476)
Pumps, fans and electric keep-hot	99.9861	1.5128	151.2590	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-515.9355	1.4886	-768.0122	
PV Unit electricity exported	-538.8116	0.4453	-239.9213	
Total			-1007.9335	(480)
Total Primary energy kWh/year			1636.4609	(483)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.47	**TER**	11.88
Environmental	98 A	**% DER < TER**			79.21
CO_2 Emissions (t/year)	0.15	**DFEE**	33.53	**TFEE**	35.95
Compliance Check	See BREL	**% DFEE < TFEE**			6.72
% DPER < TPER	50.45	**DPER**	30.87	**TPER**	62.29

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005 (35)

Thermal bridges (User defined value 0.030 * total exposed area) 4.9323 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =		2611.4378	(64)
12Total per year (kWh/year)												2611	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)
Total internal gains	529.9009	542.3600	519.8296	502.5508	478.2395	462.4112	445.5913	446.6965	459.7372	474.1489	501.8869	519.6574	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.8400	10.6334	0.7300	0.7000	0.7700	18.2252	(74)
East	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(76)
South	1.2200	46.7521	0.7300	0.7000	0.7700	20.1983	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	46.9086	84.5076	128.6568	182.5560	226.5466	234.8677	222.2743	187.7660	146.9680	96.8350	57.0050	39.6244	(83)
Total gains	576.8095	626.8677	648.4864	685.1068	704.7861	697.2789	667.8656	634.4625	606.7052	570.9839	558.8918	559.2818	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9723	0.9592	0.9378	0.8816	0.7743	0.6042	0.4534	0.4946	0.7071	0.8905	0.9549	0.9755	(86)
MIT	19.6901	19.8661	20.1206	20.4714	20.7671	20.9371	20.9848	20.9781	20.8785	20.5230	20.0520	19.6426	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9668	0.9513	0.9253	0.8573	0.7294	0.5334	0.3662	0.4055	0.6409	0.8632	0.9448	0.9706	(89)
MIT 2	18.5909	18.8119	19.1298	19.5567	19.8951	20.0648	20.1019	20.0980	20.0148	19.6257	19.0485	18.5312	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.9941	19.1986	19.4932	19.8922	20.2150	20.3847	20.4257	20.4209	20.3316	19.9548	19.4166	18.9389	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9941	19.1986	19.4932	19.8922	20.2150	20.3847	20.4257	20.4209	20.3316	19.9548	19.4166	18.9389	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9582	0.9414	0.9150	0.8507	0.7351	0.5561	0.3978	0.4374	0.6585	0.8578	0.9351	0.9624	(94)
Useful gains	552.6746	590.1141	593.3891	582.8108	518.1057	387.7618	265.6675	277.5298	399.4968	489.7981	522.6313	538.2549	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1035.2000	1007.3369	915.3704	774.4014	599.8787	407.5356	269.5223	283.2700	439.0179	659.0484	867.7069	1038.3541	(97)
Space heating kWh													
	358.9989	280.3738	239.5541	137.9452	60.8391	0.0000	0.0000	0.0000	0.0000	125.9222	248.4544	372.0738	(98a)
Space heating requirement - total per year (kWh/year)												1824.1614	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	358.9989	280.3738	239.5541	137.9452	60.8391	0.0000	0.0000	0.0000	0.0000	125.9222	248.4544	372.0738	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1824.1614	
Space heating per m2											(98c) / (4) =	25.0985	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	358.9989	280.3738	239.5541	137.9452	60.8391	0.0000	0.0000	0.0000	0.0000	125.9222	248.4544	372.0738	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	538.4983	420.5606	359.3311	206.9178	91.2586	0.0000	0.0000	0.0000	0.0000	188.8833	372.6816	558.1107	
Space heating requirement													
	538.4983	420.5606	359.3311	206.9178	91.2586	0.0000	0.0000	0.0000	0.0000	188.8833	372.6816	558.1107	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	
Water heating fuel													
	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9032	-24.7478	-42.1903	-54.3464	-63.2831	-60.6270	-59.4769	-53.4801	-43.2885	-30.7805	-17.3978	-12.3224	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5955	-11.8305	-29.8051	-54.5176	-80.7077	-84.5250	-82.2640	-64.2624	-40.1739	-18.7163	-6.5523	-3.4266	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												2736.2421	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3917.1568	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												27.3624	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.9861	(330a)
Total electricity for the above, kWh/year												19.9861	(331)
Electricity for lighting (calculated in Appendix L)												193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5908.6041	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1774.2397	0.1552	113.2301	(367)
Electrical energy for heat distribution (space & water)	27.3624	0.0000	9.7640	(372)
Overall CO2 factor for heat network			0.0406	(386)
Total CO2 associated with community systems			270.1371	(373)
Space and water heating			270.1371	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	0.1320	-62.9388	
PV Unit electricity exported	-481.3770	0.1213	-58.4056	
Total			-121.3444	(380)
Total CO2, kg/year			179.4844	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.4700	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1774.2397	1.5745	1148.8726	(467)
Electrical energy for heat distribution (space & water)	27.3624	0.0000	102.6573	(472)
Overall CO2 factor for heat network			0.4269	(486)
Total CO2 associated with community systems			2840.1844	(473)
Space and water heating			2840.1844	(476)
Pumps, fans and electric keep-hot	19.9861	1.5128	30.2350	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	1.4877	-709.3875	
PV Unit electricity exported	-481.3770	0.4451	-214.2796	
Total			-923.6671	(480)
Total Primary energy kWh/year			2243.4573	(483)
Dwelling Primary energy Rate (DPER)			30.8700	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b) x	2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c) x	2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4185	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3243	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4135	0.4054	0.3973	0.3568	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3649	0.3811	(22b)
Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			7.2800	1.1450	8.3359			(27)
Heatloss floor			36.3400	0.1300	4.7242			(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.1800	14.8338			(29a)
500mm mineral wool	36.3400		36.3400	0.1100	3.9974			(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.9313			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	3.6500	0.0500	0.1825
E3 Sill	2.7400	0.0500	0.1370
E4 Jamb	14.8400	0.0500	0.7420
E5 Ground floor (normal)	18.7200	0.1600	2.9952
E6 Intermediate floor within a dwelling	18.7200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.7200	0.0600	1.1232
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	5.5000	0.0800	0.4400
P2 Party wall - Intermediate floor within a dwelling	5.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	5.5000	0.1200	0.6600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8399 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.7712 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.4047	34.2096	34.0184	33.1202	32.9522	32.1700	32.1700	32.0251	32.4713	32.9522	33.2921	33.6475	(38)
Heat transfer coeff	76.1759	75.9808	75.7896	74.8914	74.7234	73.9411	73.9411	73.7963	74.2424	74.7234	75.0633	75.4187	(39)
Average = Sum(39)m / 12 =												74.8906	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0481	1.0454	1.0428	1.0304	1.0281	1.0174	1.0174	1.0154	1.0215	1.0281	1.0328	1.0377	(40)
HLP (average)												1.0304	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	249.9662	221.0368	234.6117	205.6045	198.8885	178.7466	175.9929	183.1904	185.4473	207.3672	221.2297	247.1336	(62)
WWHRS	-28.7738	-25.4478	-26.6475	-22.0651	-20.5639	-17.5967	-16.4941	-17.5398	-18.2062	-21.4631	-24.3151	-28.2410	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
										Total per year (kWh/year) = Sum(64)m =		2241.8614	(64)
12Total per year (kWh/year)												2242	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	104.8969	93.1698	99.7915	89.4439	87.9135	80.5137	80.3008	82.6939	82.7417	90.7327	94.6393	103.9551	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	140.9904	138.6456	134.1284	124.2277	118.1634	111.8245	107.9311	111.1477	114.9190	121.9526	131.4435	139.7245	(72)
Total internal gains	523.5655	536.0247	513.4942	496.2155	471.9041	453.0758	436.2560	437.3612	450.4018	467.8135	495.5515	513.3220	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.8400	10.6334	0.6300	0.7000	0.7700	15.7286	(74)
East	1.2200	19.6403	0.6300	0.7000	0.7700	7.3228	(76)
South	1.2200	46.7521	0.6300	0.7000	0.7700	17.4314	(78)

Solar gains	40.4828	72.9313	111.0326	157.5483	195.5128	202.6940	191.8258	162.0446	126.8354	83.5699	49.1961	34.1964	(83)
Total gains	564.0483	608.9559	624.5268	653.7638	667.4169	655.7698	628.0817	599.4058	577.2372	551.3835	544.7476	547.5184	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3060	43.4172	43.5268	44.0488	44.1478	44.6149	44.6149	44.7025	44.4338	44.1478	43.9479	43.7408	
alpha	3.8871	3.8945	3.9018	3.9366	3.9432	3.9743	3.9743	3.9802	3.9623	3.9432	3.9299	3.9161	
util living area	0.9760	0.9657	0.9492	0.9038	0.8135	0.6532	0.4990	0.5392	0.7482	0.9081	0.9613	0.9784	(86)
MIT	19.4958	19.6750	19.9436	20.3397	20.6815	20.9057	20.9749	20.9658	20.8314	20.4208	19.9124	19.4715	(87)
Th 2	20.0434	20.0457	20.0478	20.0581	20.0600	20.0689	20.0689	20.0706	20.0655	20.0600	20.0561	20.0521	(88)
util rest of house	0.9711	0.9587	0.9383	0.8821	0.7705	0.5786	0.4014	0.4412	0.6818	0.8832	0.9522	0.9740	(89)
MIT 2	18.3008	18.5281	18.8673	19.3622	19.7630	20.0016	20.0571	20.0533	19.9326	19.4688	18.8374	18.2759	(90)
Living area fraction									fLA = Living area / (4) =			0.3668	(91)
MIT	18.7391	18.9488	19.2621	19.7208	20.1000	20.3333	20.3938	20.3880	20.2623	19.8180	19.2317	18.7145	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7391	18.9488	19.2621	19.7208	20.1000	20.3333	20.3938	20.3880	20.2623	19.8180	19.2317	18.7145	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9622	0.9484	0.9272	0.8730	0.7725	0.6009	0.4364	0.4758	0.6970	0.8756	0.9421	0.9657	(94)
Useful gains	542.7407	577.5484	579.0491	570.7606	515.5853	394.0431	274.0943	285.2063	402.3131	482.8141	513.1849	528.7424	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1099.9123	1067.4395	967.2311	810.3832	627.6735	423.9241	280.5165	294.2985	457.5027	688.8007	910.6476	1094.6638	(97)
Space heating kWh	414.5357	329.2068	288.8074	172.5283	83.3936	0.0000	0.0000	0.0000	0.0000	153.2540	286.1731	421.0456	(98a)
Space heating requirement - total per year (kWh/year)												2148.9444	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	414.5357	329.2068	288.8074	172.5283	83.3936	0.0000	0.0000	0.0000	0.0000	153.2540	286.1731	421.0456	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2148.9444	
Space heating per m2											(98c) / (4) =	29.5672	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 92.3000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	414.5357	329.2068	288.8074	172.5283	83.3936	0.0000	0.0000	0.0000	0.0000	153.2540	286.1731	421.0456	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	449.1177	356.6704	312.9007	186.9212	90.3506	0.0000	0.0000	0.0000	0.0000	166.0390	310.0467	456.1707	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4470	85.2180	84.7964	83.9213	82.4631	79.8000	79.8000	79.8000	79.8000	83.6300	84.8971	85.5016	(217)
Fuel for water heating, kWh/month	258.8650	229.5161	245.2512	218.7043	216.2477	201.9422	199.8732	207.5821	209.5753	222.2935	231.9450	256.0101	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.6146	19.7468	17.7798	13.0262	10.0618	8.2206	9.1787	11.9309	15.4970	20.3329	22.9660	25.2988	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-34.1427	-48.1921	-69.3402	-78.0353	-84.2042	-78.6248	-77.6860	-73.3488	-65.6465	-55.1924	-37.5712	-29.5143	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.0663	-40.1520	-79.8860	-120.0915	-158.8866	-159.6687	-157.7568	-133.4905	-97.7594	-57.4135	-25.4553	-15.0706	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2328.2172	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2697.8058	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	198.6542	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1796.1956	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3514.4816	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2328.2172	0.2100	488.9256	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2697.8058	0.2100	566.5392	(264)
Space and water heating			1055.4648	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	198.6542	0.1443	28.6719	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	0.1346	-98.4313	
PV Unit electricity exported	-1064.6971	0.1259	-134.0169	
Total			-232.4482	(269)
Total CO2, kg/year			863.6178	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.8800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2328.2172	1.1300	2630.8854	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2697.8058	1.1300	3048.5206	(278)
Space and water heating			5679.4060	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	198.6542	1.5338	304.7025	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	1.4973	-1095.2830	
PV Unit electricity exported	-1064.6971	0.4620	-491.9332	
Total			-1587.2162	(283)
Total Primary energy kWh/year			4526.9930	(286)
Target Primary Energy Rate (TPER)			62.2900	(287)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.47	**TER**	11.88
Environmental	98 A	**% DER < TER**			79.21
CO_2 Emissions (t/year)	0.15	**DFEE**	33.53	**TFEE**	35.95
Compliance Check	See BREL	**% DFEE < TFEE**			6.72
% DPER < TPER	50.45	**DPER**	30.87	**TPER**	62.29

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3185	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2468	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3147	0.3085	0.3024	0.2715	0.2653	0.2345	0.2345	0.2283	0.2468	0.2653	0.2777	0.2900	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5495	0.5476	0.5457	0.5369	0.5352	0.5275	0.5275	0.5261	0.5305	0.5352	0.5386	0.5421	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005	(35)
Thermal bridges (User defined value 0.030 * total exposed area)		4.9323	(36)
Point Thermal bridges	(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.2906	32.1776	32.0668	31.5466	31.4493	30.9963	30.9963	30.9124	31.1708	31.4493	31.6462	31.8520	(38)
Heat transfer coeff	73.3597	73.2467	73.1359	72.6157	72.5184	72.0654	72.0654	71.9815	72.2399	72.5184	72.7153	72.9211	(39)
Average = Sum(39)m / 12 =												72.6153	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0094	1.0078	1.0063	0.9991	0.9978	0.9915	0.9915	0.9904	0.9939	0.9978	1.0005	1.0033	(40)
HLP (average)												0.9991	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												60.0096	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.4702	63.6744	61.7137	59.2732	57.0961	54.8336	54.3634	56.3200	58.3269	60.6504	63.1125	65.3783	(44)
Energy conte	103.6888	90.6715	94.8517	81.1421	76.8624	67.4243	65.7478	69.7360	71.9229	82.3020	89.9153	102.3666	(45)
Energy content (annual)										Total = Sum(45)m =		996.6312	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(64)
									Total per year (kWh/year) = Sum(64)m =			847.1365	(64)
12Total per year (kWh/year)												847	(64)
Electric shower(s)	50.4049	44.9112	49.0413	46.7995	47.6777	45.4799	46.9959	47.6777	46.7995	49.0413	48.1191	50.4049	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							573.3528	(64a)
Heat gains from water heating, kWh/month	34.6351	30.4955	32.4163	28.9426	28.2527	25.6976	25.7204	26.7383	26.9835	29.7495	31.1368	34.3541	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	46.5525	45.3802	43.5703	40.1980	37.9740	35.6912	34.5704	35.9386	37.4771	39.9859	43.2455	46.1749	(72)
Total internal gains	426.1276	439.7593	419.9362	409.1858	388.7147	376.9424	362.8952	362.1520	372.9599	382.8469	404.3535	416.7724	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.8400	10.6334	0.7300	0.7000	0.7700	18.2252	(74)
East	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(76)
South	1.2200	46.7521	0.7300	0.7000	0.7700	20.1983	(78)

Solar gains	46.9086	84.5076	128.6568	182.5560	226.5466	234.8677	222.2743	187.7660	146.9680	96.8350	57.0050	39.6244	(83)
Total gains	473.0363	524.2669	548.5930	591.7418	615.2614	611.8101	585.1695	549.9180	519.9279	479.6818	461.3585	456.3968	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	44.9685	45.0379	45.1061	45.4292	45.4902	45.7762	45.7762	45.8295	45.6656	45.4902	45.3670	45.2389	
alpha	3.9979	4.0025	4.0071	4.0286	4.0327	4.0517	4.0517	4.0553	4.0444	4.0327	4.0245	4.0159	
util living area	0.9862	0.9780	0.9643	0.9230	0.8363	0.6762	0.5202	0.5689	0.7845	0.9346	0.9764	0.9880	(86)

MIT	19.4029	19.5961	19.8801	20.2982	20.6624	20.8994	20.9731	20.9614	20.8085	20.3541	19.8177	19.3676	(87)
Th 2	20.0755	20.0768	20.0781	20.0841	20.0852	20.0904	20.0904	20.0914	20.0884	20.0852	20.0829	20.0806	(88)
util rest of house													
	0.9833	0.9733	0.9562	0.9048	0.7966	0.6028	0.4217	0.4698	0.7221	0.9155	0.9705	0.9855	(89)
MIT 2	18.6183	18.8102	19.0910	19.4999	19.8360	20.0335	20.0803	20.0757	19.9676	19.5600	19.0356	18.5870	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.9061	19.0984	19.3805	19.7927	20.1391	20.3512	20.4078	20.4006	20.2761	19.8513	19.3225	18.8733	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9061	19.0984	19.3805	19.7927	20.1391	20.3512	20.4078	20.4006	20.2761	19.8513	19.3225	18.8733	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9784	0.9670	0.9487	0.8981	0.7992	0.6250	0.4571	0.5048	0.7362	0.9096	0.9643	0.9810	(94)
Useful gains	462.8114	506.9436	520.4651	531.4226	491.6916	382.3801	267.4841	277.6248	382.7720	436.3300	444.8939	447.7295	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1071.4960	1039.9888	942.0262	790.9849	611.9930	414.4594	274.4118	287.9702	446.1582	670.8866	888.7620	1069.9969	(97)
Space heating kWh													
	452.8613	358.2064	313.6415	186.8849	89.5042	0.0000	0.0000	0.0000	0.0000	174.5101	319.5850	462.9669	(98a)
Space heating requirement - total per year (kWh/year)												2358.1604	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	452.8613	358.2064	313.6415	186.8849	89.5042	0.0000	0.0000	0.0000	0.0000	174.5101	319.5850	462.9669	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2358.1604	
Space heating per m2											(98c) / (4) =	32.4458	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	677.4144	533.2836	547.0591	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7905	0.8628	0.8321	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	535.5272	460.0961	455.2198	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	658.5228	630.1179	591.3585	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	88.5569	126.4962	101.2872	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	22.1392	31.6241	25.3218	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												79.0851	(107)
Energy for space heating												32.4458	(99)
Energy for space cooling												1.0881	(108)
Total												33.5339	(109)
Fabric Energy Efficiency (DFEE)												33.5	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b) x	2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c) x	2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4185	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3243	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4135	0.4054	0.3973	0.3568	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3649	0.3811	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			7.2800	1.1450	8.3359			(27)
Heatloss floor			36.3400	0.1300	4.7242			(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.1800	14.8338			(29a)
500mm mineral wool	36.3400		36.3400	0.1100	3.9974			(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.9313			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	3.6500	0.0500	0.1825
E3 Sill	2.7400	0.0500	0.1370
E4 Jamb	14.8400	0.0500	0.7420
E5 Ground floor (normal)	18.7200	0.1600	2.9952
E6 Intermediate floor within a dwelling	18.7200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.7200	0.0600	1.1232
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	5.5000	0.0800	0.4400
P2 Party wall - Intermediate floor within a dwelling	5.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	5.5000	0.1200	0.6600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8399 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.7712 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.4047	34.2096	34.0184	33.1202	32.9522	32.1700	32.1700	32.0251	32.4713	32.9522	33.2921	33.6475	(38)
Heat transfer coeff	76.1759	75.9808	75.7896	74.8914	74.7234	73.9411	73.9411	73.7963	74.2424	74.7234	75.0633	75.4187	(39)
Average = Sum(39)m / 12 =												74.8906	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0481	1.0454	1.0428	1.0304	1.0281	1.0174	1.0174	1.0154	1.0215	1.0281	1.0328	1.0377	(40)
HLP (average)												1.0304	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 60.0096 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.4702	63.6744	61.7137	59.2732	57.0961	54.8336	54.3634	56.3200	58.3269	60.6504	63.1125	65.3783	(44)
Energy conte	103.6888	90.6715	94.8517	81.1421	76.8624	67.4243	65.7478	69.7360	71.9229	82.3020	89.9153	102.3666	(45)
Energy content (annual)										Total = Sum(45)m =		996.6312	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(64)
								Total per year (kWh/year) = Sum(64)m =			847.1365	(64)
12Total per year (kWh/year)											847	(64)	

Electric shower(s)

50.4049	44.9112	49.0413	46.7995	47.6777	45.4799	46.9959	47.6777	46.7995	49.0413	48.1191	50.4049	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				573.3528	(64a)

Heat gains from water heating, kWh/month

34.6351	30.4955	32.4163	28.9426	28.2527	25.6976	25.7204	26.7383	26.9835	29.7495	31.1368	34.3541	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)													
	46.5525	45.3802	43.5703	40.1980	37.9740	35.6912	34.5704	35.9386	37.4771	39.9859	43.2455	46.1749	(72)
Total internal gains													
	426.1276	439.7593	419.9362	409.1858	388.7147	376.9424	362.8952	362.1520	372.9599	382.8469	404.3535	416.7724	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.8400	10.6334	0.6300	0.7000	0.7700	15.7286	(74)
East	1.2200	19.6403	0.6300	0.7000	0.7700	7.3228	(76)
South	1.2200	46.7521	0.6300	0.7000	0.7700	17.4314	(78)

Solar gains	40.4828	72.9313	111.0326	157.5483	195.5128	202.6940	191.8258	162.0446	126.8354	83.5699	49.1961	34.1964	(83)
Total gains	466.6104	512.6906	530.9687	566.7341	584.2276	579.6364	554.7210	524.1966	499.7953	466.4168	453.5496	450.9688	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3060	43.4172	43.5268	44.0488	44.1478	44.6149	44.6149	44.7025	44.4338	44.1478	43.9479	43.7408	
alpha	3.8871	3.8945	3.9018	3.9366	3.9432	3.9743	3.9743	3.9802	3.9623	3.9432	3.9299	3.9161	
util living area													
	0.9871	0.9801	0.9689	0.9345	0.8604	0.7111	0.5552	0.6018	0.8082	0.9419	0.9782	0.9887	(86)
MIT	19.3084	19.4965	19.7800	20.2115	20.5972	20.8717	20.9635	20.9496	20.7726	20.2923	19.7450	19.2837	(87)
Th 2	20.0434	20.0457	20.0478	20.0581	20.0600	20.0689	20.0689	20.0706	20.0655	20.0600	20.0561	20.0521	(88)
util rest of house													
	0.9843	0.9757	0.9616	0.9182	0.8235	0.6371	0.4505	0.4980	0.7476	0.9243	0.9727	0.9862	(89)
MIT 2	18.5010	18.6888	18.9704	19.3979	19.7591	19.9952	20.0551	20.0499	19.9201	19.4822	18.9442	18.4829	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.7972	18.9851	19.2674	19.6963	20.0666	20.3167	20.3883	20.3799	20.2328	19.7793	19.2379	18.7766	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7972	18.9851	19.2674	19.6963	20.0666	20.3167	20.3883	20.3799	20.2328	19.7793	19.2379	18.7766	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9794	0.9695	0.9542	0.9107	0.8238	0.6582	0.4878	0.5343	0.7597	0.9179	0.9665	0.9818	(94)
Useful gains	457.0020	497.0611	506.6422	516.1346	481.2786	381.5035	270.6201	280.0677	379.6797	428.1040	438.3746	442.7494	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1104.3330	1070.1934	967.6345	808.5530	625.1788	422.6999	280.1126	293.7036	455.3167	685.9101	911.1148	1099.3519	(97)
Space heating kWh													
	481.6142	385.1449	342.9783	210.5412	107.0617	0.0000	0.0000	0.0000	0.0000	191.8078	340.3730	488.5123	(98a)
Space heating requirement - total per year (kWh/year)												2548.0334	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	481.6142	385.1449	342.9783	210.5412	107.0617	0.0000	0.0000	0.0000	0.0000	191.8078	340.3730	488.5123	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2548.0334	
Space heating per m2											(98c) / (4) =	35.0582	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	695.0467	547.1644	560.8517	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7516	0.8307	0.7995	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	522.3988	454.5284	448.4114	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	620.9173	594.5287	561.2946	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	70.9333	104.1602	83.9851	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	17.7333	26.0400	20.9963	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												64.7696	(107)
Energy for space heating												35.0582	(99)
Energy for space cooling												0.8912	(108)
Total												35.9494	(109)
Fabric Energy Efficiency (TFEE)												35.9	(109)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.47	**TER**	11.88
Environmental	98 A	**% DER < TER**			79.21
CO_2 Emissions (t/year)	0.15	**DFEE**	33.53	**TFEE**	35.95
Compliance Check	See BREL	**% DFEE < TFEE**			6.72
% DPER < TPER	50.45	**DPER**	30.87	**TPER**	62.29

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005 (35)

Thermal bridges (User defined value 0.030 * total exposed area) 4.9323 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =		2611.4378	(64)
12Total per year (kWh/year)												2611	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)
Total internal gains	529.9009	542.3600	519.8296	502.5508	478.2395	462.4112	445.5913	446.6965	459.7372	474.1489	501.8869	519.6574	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.8400	10.6334	0.7300	0.7000	0.7700	18.2252	(74)
East	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(76)
South	1.2200	46.7521	0.7300	0.7000	0.7700	20.1983	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	46.9086	84.5076	128.6568	182.5560	226.5466	234.8677	222.2743	187.7660	146.9680	96.8350	57.0050	39.6244	(83)
Total gains	576.8095	626.8677	648.4864	685.1068	704.7861	697.2789	667.8656	634.4625	606.7052	570.9839	558.8918	559.2818	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9723	0.9592	0.9378	0.8816	0.7743	0.6042	0.4534	0.4946	0.7071	0.8905	0.9549	0.9755	(86)
MIT	19.6901	19.8661	20.1206	20.4714	20.7671	20.9371	20.9848	20.9781	20.8785	20.5230	20.0520	19.6426	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9668	0.9513	0.9253	0.8573	0.7294	0.5334	0.3662	0.4055	0.6409	0.8632	0.9448	0.9706	(89)
MIT 2	18.5909	18.8119	19.1298	19.5567	19.8951	20.0648	20.1019	20.0980	20.0148	19.6257	19.0485	18.5312	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.9941	19.1986	19.4932	19.8922	20.2150	20.3847	20.4257	20.4209	20.3316	19.9548	19.4166	18.9389	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9941	19.1986	19.4932	19.8922	20.2150	20.3847	20.4257	20.4209	20.3316	19.9548	19.4166	18.9389	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9582	0.9414	0.9150	0.8507	0.7351	0.5561	0.3978	0.4374	0.6585	0.8578	0.9351	0.9624	(94)
Useful gains	552.6746	590.1141	593.3891	582.8108	518.1057	387.7618	265.6675	277.5298	399.4968	489.7981	522.6313	538.2549	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1035.2000	1007.3369	915.3704	774.4014	599.8787	407.5356	269.5223	283.2700	439.0179	659.0484	867.7069	1038.3541	(97)
Space heating kWh													
	358.9989	280.3738	239.5541	137.9452	60.8391	0.0000	0.0000	0.0000	0.0000	125.9222	248.4544	372.0738	(98a)
Space heating requirement - total per year (kWh/year)												1824.1614	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	358.9989	280.3738	239.5541	137.9452	60.8391	0.0000	0.0000	0.0000	0.0000	125.9222	248.4544	372.0738	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1824.1614	
Space heating per m2											(98c) / (4) =	25.0985	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	358.9989	280.3738	239.5541	137.9452	60.8391	0.0000	0.0000	0.0000	0.0000	125.9222	248.4544	372.0738	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	538.4983	420.5606	359.3311	206.9178	91.2586	0.0000	0.0000	0.0000	0.0000	188.8833	372.6816	558.1107	
Space heating requirement													
	538.4983	420.5606	359.3311	206.9178	91.2586	0.0000	0.0000	0.0000	0.0000	188.8833	372.6816	558.1107	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	
Water heating fuel													
	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9032	-24.7478	-42.1903	-54.3464	-63.2831	-60.6270	-59.4769	-53.4801	-43.2885	-30.7805	-17.3978	-12.3224	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5955	-11.8305	-29.8051	-54.5176	-80.7077	-84.5250	-82.2640	-64.2624	-40.1739	-18.7163	-6.5523	-3.4266	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												2736.2421	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3917.1568	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												27.3624	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.9861	(330a)
Total electricity for the above, kWh/year												19.9861	(331)
Electricity for lighting (calculated in Appendix L)												193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5908.6041	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1774.2397	0.1552	113.2301	(367)
Electrical energy for heat distribution (space & water)	27.3624	0.0000	9.7640	(372)
Overall CO2 factor for heat network			0.0406	(386)
Total CO2 associated with community systems			270.1371	(373)
Space and water heating			270.1371	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	0.1320	-62.9388	
PV Unit electricity exported	-481.3770	0.1213	-58.4056	
Total			-121.3444	(380)
Total CO2, kg/year			179.4844	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.4700	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1774.2397	1.5745	1148.8726	(467)
Electrical energy for heat distribution (space & water)	27.3624	0.0000	102.6573	(472)
Overall CO2 factor for heat network			0.4269	(486)
Total CO2 associated with community systems			2840.1844	(473)
Space and water heating			2840.1844	(476)
Pumps, fans and electric keep-hot	19.9861	1.5128	30.2350	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	1.4877	-709.3875	
PV Unit electricity exported	-481.3770	0.4451	-214.2796	
Total			-923.6671	(480)
Total Primary energy kWh/year			2243.4573	(483)
Dwelling Primary energy Rate (DPER)			30.8700	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b) x	2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c) x	2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4185	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3243	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4135	0.4054	0.3973	0.3568	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3649	0.3811	(22b)
Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			7.2800	1.1450	8.3359			(27)
Heatloss floor			36.3400	0.1300	4.7242			(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.1800	14.8338			(29a)
500mm mineral wool	36.3400		36.3400	0.1100	3.9974			(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.9313			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	3.6500	0.0500	0.1825
E3 Sill	2.7400	0.0500	0.1370
E4 Jamb	14.8400	0.0500	0.7420
E5 Ground floor (normal)	18.7200	0.1600	2.9952
E6 Intermediate floor within a dwelling	18.7200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.7200	0.0600	1.1232
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	5.5000	0.0800	0.4400
P2 Party wall - Intermediate floor within a dwelling	5.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	5.5000	0.1200	0.6600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8399 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.7712 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.4047	34.2096	34.0184	33.1202	32.9522	32.1700	32.1700	32.0251	32.4713	32.9522	33.2921	33.6475	(38)
Heat transfer coeff	76.1759	75.9808	75.7896	74.8914	74.7234	73.9411	73.9411	73.7963	74.2424	74.7234	75.0633	75.4187	(39)
Average = Sum(39)m / 12 =												74.8906	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0481	1.0454	1.0428	1.0304	1.0281	1.0174	1.0174	1.0154	1.0215	1.0281	1.0328	1.0377	(40)
HLP (average)												1.0304	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	249.9662	221.0368	234.6117	205.6045	198.8885	178.7466	175.9929	183.1904	185.4473	207.3672	221.2297	247.1336	(62)
WWHRS	-28.7738	-25.4478	-26.6475	-22.0651	-20.5639	-17.5967	-16.4941	-17.5398	-18.2062	-21.4631	-24.3151	-28.2410	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
										Total per year (kWh/year) = Sum(64)m =		2241.8614	(64)
12Total per year (kWh/year)												2242	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	104.8969	93.1698	99.7915	89.4439	87.9135	80.5137	80.3008	82.6939	82.7417	90.7327	94.6393	103.9551	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	140.9904	138.6456	134.1284	124.2277	118.1634	111.8245	107.9311	111.1477	114.9190	121.9526	131.4435	139.7245	(72)
Total internal gains	523.5655	536.0247	513.4942	496.2155	471.9041	453.0758	436.2560	437.3612	450.4018	467.8135	495.5515	513.3220	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.8400	10.6334	0.6300	0.7000	0.7700	15.7286	(74)
East	1.2200	19.6403	0.6300	0.7000	0.7700	7.3228	(76)
South	1.2200	46.7521	0.6300	0.7000	0.7700	17.4314	(78)

Solar gains	40.4828	72.9313	111.0326	157.5483	195.5128	202.6940	191.8258	162.0446	126.8354	83.5699	49.1961	34.1964	(83)
Total gains	564.0483	608.9559	624.5268	653.7638	667.4169	655.7698	628.0817	599.4058	577.2372	551.3835	544.7476	547.5184	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3060	43.4172	43.5268	44.0488	44.1478	44.6149	44.6149	44.7025	44.4338	44.1478	43.9479	43.7408	
alpha	3.8871	3.8945	3.9018	3.9366	3.9432	3.9743	3.9743	3.9802	3.9623	3.9432	3.9299	3.9161	
util living area	0.9760	0.9657	0.9492	0.9038	0.8135	0.6532	0.4990	0.5392	0.7482	0.9081	0.9613	0.9784	(86)
MIT	19.4958	19.6750	19.9436	20.3397	20.6815	20.9057	20.9749	20.9658	20.8314	20.4208	19.9124	19.4715	(87)
Th 2	20.0434	20.0457	20.0478	20.0581	20.0600	20.0689	20.0689	20.0706	20.0655	20.0600	20.0561	20.0521	(88)
util rest of house	0.9711	0.9587	0.9383	0.8821	0.7705	0.5786	0.4014	0.4412	0.6818	0.8832	0.9522	0.9740	(89)
MIT 2	18.3008	18.5281	18.8673	19.3622	19.7630	20.0016	20.0571	20.0533	19.9326	19.4688	18.8374	18.2759	(90)
Living area fraction									fLA = Living area / (4) =			0.3668	(91)
MIT	18.7391	18.9488	19.2621	19.7208	20.1000	20.3333	20.3938	20.3880	20.2623	19.8180	19.2317	18.7145	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7391	18.9488	19.2621	19.7208	20.1000	20.3333	20.3938	20.3880	20.2623	19.8180	19.2317	18.7145	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9622	0.9484	0.9272	0.8730	0.7725	0.6009	0.4364	0.4758	0.6970	0.8756	0.9421	0.9657	(94)
Useful gains	542.7407	577.5484	579.0491	570.7606	515.5853	394.0431	274.0943	285.2063	402.3131	482.8141	513.1849	528.7424	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1099.9123	1067.4395	967.2311	810.3832	627.6735	423.9241	280.5165	294.2985	457.5027	688.8007	910.6476	1094.6638	(97)
Space heating kWh	414.5357	329.2068	288.8074	172.5283	83.3936	0.0000	0.0000	0.0000	0.0000	153.2540	286.1731	421.0456	(98a)
Space heating requirement - total per year (kWh/year)												2148.9444	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	414.5357	329.2068	288.8074	172.5283	83.3936	0.0000	0.0000	0.0000	0.0000	153.2540	286.1731	421.0456	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2148.9444	
Space heating per m2											(98c) / (4) =	29.5672	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 92.3000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	414.5357	329.2068	288.8074	172.5283	83.3936	0.0000	0.0000	0.0000	0.0000	153.2540	286.1731	421.0456	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	449.1177	356.6704	312.9007	186.9212	90.3506	0.0000	0.0000	0.0000	0.0000	166.0390	310.0467	456.1707	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4470	85.2180	84.7964	83.9213	82.4631	79.8000	79.8000	79.8000	79.8000	83.6300	84.8971	85.5016	(217)
Fuel for water heating, kWh/month	258.8650	229.5161	245.2512	218.7043	216.2477	201.9422	199.8732	207.5821	209.5753	222.2935	231.9450	256.0101	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.6146	19.7468	17.7798	13.0262	10.0618	8.2206	9.1787	11.9309	15.4970	20.3329	22.9660	25.2988	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-34.1427	-48.1921	-69.3402	-78.0353	-84.2042	-78.6248	-77.6860	-73.3488	-65.6465	-55.1924	-37.5712	-29.5143	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.0663	-40.1520	-79.8860	-120.0915	-158.8866	-159.6687	-157.7568	-133.4905	-97.7594	-57.4135	-25.4553	-15.0706	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2328.2172	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2697.8058	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	198.6542	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1796.1956	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3514.4816	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2328.2172	0.2100	488.9256	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2697.8058	0.2100	566.5392	(264)
Space and water heating			1055.4648	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	198.6542	0.1443	28.6719	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	0.1346	-98.4313	
PV Unit electricity exported	-1064.6971	0.1259	-134.0169	
Total			-232.4482	(269)
Total CO2, kg/year			863.6178	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.8800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2328.2172	1.1300	2630.8854	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2697.8058	1.1300	3048.5206	(278)
Space and water heating			5679.4060	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	198.6542	1.5338	304.7025	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	1.4973	-1095.2830	
PV Unit electricity exported	-1064.6971	0.4620	-491.9332	
Total			-1587.2162	(283)
Total Primary energy kWh/year			4526.9930	(286)
Target Primary Energy Rate (TPER)			62.2900	(287)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.47	**TER**	11.88
Environmental	98 A	**% DER < TER**			79.21
CO_2 Emissions (t/year)	0.15	**DFEE**	33.53	**TFEE**	35.95
Compliance Check	See BREL	**% DFEE < TFEE**			6.72
% DPER < TPER	50.45	**DPER**	30.87	**TPER**	62.29

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005 (35)

Thermal bridges (User defined value 0.030 * total exposed area)												4.9323	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	41.0691	(37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3094	(42)
Hot water usage for mixer showers													
	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths													
	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses													
	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)											Total = Sum(45)m =	1960.5981	
Distribution loss (46)m = 0.15 x (45)m													
	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =		2611.4378	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)													
	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)
Total internal gains													
	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.8400	10.6334	0.7300	0.7000	0.7700	18.2252	(74)
East	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(76)
South	1.2200	46.7521	0.7300	0.7000	0.7700	20.1983	(78)

Solar gains	46.9086	84.5076	128.6568	182.5560	226.5466	234.8677	222.2743	187.7660	146.9680	96.8350	57.0050	39.6244	(83)
Total gains	625.6572	661.0009	688.1497	710.4372	723.2420	703.4236	674.2984	642.9171	618.3735	596.9852	591.7676	604.4687	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area	0.9639	0.9519	0.9262	0.8704	0.7631	0.6000	0.4494	0.4888	0.6981	0.8775	0.9463	0.9683	(86)
MIT	19.7800	19.9255	20.1827	20.5021	20.7803	20.9386	20.9852	20.9791	20.8842	20.5557	20.1080	19.7272	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house	0.9571	0.9429	0.9119	0.8448	0.7174	0.5294	0.3629	0.4005	0.6317	0.8482	0.9347	0.9622	(89)
MIT 2	18.7032	18.8853	19.2048	19.5917	19.9082	20.0660	20.1021	20.0985	20.0197	19.6624	19.1169	18.6371	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.0982	19.2669	19.5635	19.9256	20.2281	20.3861	20.4261	20.4215	20.3368	19.9901	19.4805	19.0370	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0982	19.2669	19.5635	19.9256	20.2281	20.3861	20.4261	20.4215	20.3368	19.9901	19.4805	19.0370	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9474	0.9325	0.9017	0.8389	0.7239	0.5521	0.3942	0.4321	0.6497	0.8437	0.9247	0.9530	(94)
Useful gains	592.7535	616.3600	620.5112	595.9901	523.5835	388.3639	265.8164	277.8247	401.7468	503.6898	547.1964	576.0810	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1042.5303	1012.1449	920.3229	776.7547	600.8023	407.6302	269.5455	283.3159	439.3836	661.5309	872.2035	1045.2647	(97)
Space heating kWh	334.6339	265.9675	223.0599	130.1505	57.4507	0.0000	0.0000	0.0000	0.0000	117.4338	234.0051	349.0726	(98a)
Space heating requirement - total per year (kWh/year)												1711.7741	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	334.6339	265.9675	223.0599	130.1505	57.4507	0.0000	0.0000	0.0000	0.0000	117.4338	234.0051	349.0726	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1711.7741	
Space heating per m2										(98c) / (4) =		23.5522	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	334.6339	265.9675	223.0599	130.1505	57.4507	0.0000	0.0000	0.0000	0.0000	117.4338	234.0051	349.0726	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	501.9509	398.9512	334.5899	195.2258	86.1761	0.0000	0.0000	0.0000	0.0000	176.1507	351.0076	523.6089	
Space heating requirement													
	501.9509	398.9512	334.5899	195.2258	86.1761	0.0000	0.0000	0.0000	0.0000	176.1507	351.0076	523.6089	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	
Water heating fuel													
	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9032	-24.7478	-42.1903	-54.3464	-63.2831	-60.6270	-59.4769	-53.4801	-43.2885	-30.7805	-17.3978	-12.3224	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5955	-11.8305	-29.8051	-54.5176	-80.7077	-84.5250	-82.2640	-64.2624	-40.1739	-18.7163	-6.5523	-3.4266	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2567.6612	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3917.1568	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	25.6766	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
Total electricity for the above, kWh/year	19.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5740.0233	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2567.6612	4.4400	114.0042	(340a)
Space heating total			114.0042	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3917.1568	4.4400	173.9218	(342a)
Water heating total			173.9218	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	16.4900	3.2957	(349)
Energy for lighting	193.4401	16.4900	31.8983	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	16.4900	-78.6316	
PV Unit electricity exported	-481.3770	5.5900	-26.9090	
Total			-105.5405	(352)
Total energy cost			309.5794	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.9470	(357)
SAP value	84.6484	
SAP rating (Section 12)	85	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1729.2848	0.1552	106.2512	(367)
Electrical energy for heat distribution (space & water)	25.6766	0.0000	9.5023	(372)
Overall CO2 factor for heat network			0.0405	(386)
Total CO2 associated with community systems			262.8964	(373)
Space and water heating			262.8964	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	0.1320	-62.9388	
PV Unit electricity exported	-481.3770	0.1213	-58.4056	
Total			-121.3444	(380)
Total CO2, kg/year			172.2437	(383)
CO2 emissions per m2			2.3700	(384)
EI value			98.0387	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b)	x 2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c)	x 2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11875.9502 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

Thermal bridges (User defined value 0.030 * total exposed area) 4.9323 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)

Average = Sum(39)m / 12 = 70.4500

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 118.0387 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =		2611.4378	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
303.6858 306.8371 298.8959 281.9900 260.6494 240.5922 227.1928 224.0415 231.9827 248.8885 270.2292 290.2863 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 (71)
Water heating gains (Table 5)
150.3258 147.9809 143.4637 133.5631 127.4987 121.1599 117.2665 120.4831 124.2544 131.2879 140.7789 149.0599 (72)
Total internal gains
578.7486 576.4933 559.4929 527.8812 496.6954 468.5559 452.0241 455.1511 471.4055 500.1502 534.7626 564.8443 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.8400	12.7500	0.7300	0.7000	0.7700	21.8529	(74)
East	1.2200	23.7835	0.7300	0.7000	0.7700	10.2752	(76)
South	1.2200	54.0600	0.7300	0.7000	0.7700	23.3555	(78)

Solar gains 55.4836 89.2500 134.9422 195.1502 234.1094 260.5436 241.8893 207.8888 163.2641 108.2035 66.4993 47.0895 (83)
Total gains 634.2322 665.7433 694.4351 723.0315 730.8048 729.0995 693.9134 663.0399 634.6696 608.3537 601.2619 611.9338 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area	0.9601	0.9479	0.9165	0.8536	0.7336	0.5366	0.3907	0.4275	0.6644	0.8555	0.9386	0.9651	(86)
MIT	19.8374	19.9745	20.2556	20.5594	20.8216	20.9630	20.9922	20.9885	20.9079	20.6235	20.1772	19.7833	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house	0.9525	0.9381	0.9002	0.8250	0.6836	0.4626	0.3039	0.3383	0.5945	0.8214	0.9252	0.9583	(89)
MIT 2	18.7753	18.9465	19.2944	19.6586	19.9516	20.0855	20.1059	20.1041	20.0411	19.7405	19.2025	18.7079	(90)
Living area fraction									fLA = Living area / (4) =			0.3668	(91)
MIT	19.1649	19.3236	19.6470	19.9890	20.2707	20.4074	20.4310	20.4286	20.3590	20.0644	19.5601	19.1024	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1649	19.3236	19.6470	19.9890	20.2707	20.4074	20.4310	20.4286	20.3590	20.0644	19.5601	19.1024	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9425	0.9276	0.8905	0.8208	0.6932	0.4880	0.3356	0.3708	0.6151	0.8195	0.9153	0.9488	(94)
Useful gains	597.7884	617.5446	618.3702	593.4369	506.5873	355.7850	232.8835	245.8438	390.3988	498.5485	550.3290	580.6047	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	1026.0973	995.0069	890.9815	753.0429	568.5837	366.8598	234.6708	248.5864	419.8138	631.5406	849.6306	1028.7360	(97)
Space heating kWh	318.6618	253.6547	202.8228	114.9163	46.1253	0.0000	0.0000	0.0000	0.0000	98.9461	215.4972	333.4097	(98a)
Space heating requirement - total per year (kWh/year)												1584.0339	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	318.6618	253.6547	202.8228	114.9163	46.1253	0.0000	0.0000	0.0000	0.0000	98.9461	215.4972	333.4097	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1584.0339	
Space heating per m2										(98c) / (4) =		21.7946	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement
318.6618 253.6547 202.8228 114.9163 46.1253 0.0000 0.0000 0.0000 0.0000 98.9461 215.4972 333.4097 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50
307a 477.9927 380.4820 304.2342 172.3744 69.1880 0.0000 0.0000 0.0000 0.0000 148.4192 323.2457 500.1145
Space heating requirement
477.9927 380.4820 304.2342 172.3744 69.1880 0.0000 0.0000 0.0000 0.0000 148.4192 323.2457 500.1145 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)

Water heating
Annual water heating requirement
258.6481 228.8785 243.2936 214.0064 207.5704 187.1484 184.6748 191.8723 193.8492 216.0491 229.6316 255.8155 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50
310a 387.9721 343.3178 364.9404 321.0096 311.3556 280.7226 277.0123 287.8084 290.7737 324.0737 344.4473 383.7233
Water heating fuel
387.9721 343.3178 364.9404 321.0096 311.3556 280.7226 277.0123 287.8084 290.7737 324.0737 344.4473 383.7233 (310)
Cooling System Energy Efficiency Ratio 0.0000 (314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (315)
Pumps and Fa 1.6975 1.5332 1.6975 1.6427 1.6975 1.6427 1.6975 1.6975 1.6427 1.6975 1.6427 1.6975 (331)
Lighting 23.9686 19.2285 17.3131 12.6843 9.7977 8.0048 8.9378 11.6177 15.0903 19.7993 22.3632 24.6347 (332)
Electricity generated by PVs (Appendix M) (negative quantity)
(333a)m -17.7988 -26.5546 -44.3894 -57.0811 -64.6020 -64.1536 -62.3425 -56.9881 -46.9012 -34.2077 -20.4034 -14.8306 (333a)

Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.1997	-13.4106	-32.8557	-60.4920	-84.6385	-96.9652	-92.1477	-74.2535	-47.4476	-22.7886	-8.6270	-4.6681	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2376.0508	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3917.1568	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	23.7605	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
Total electricity for the above, kWh/year	19.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5451.8868	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2376.0508	6.5500	155.6313	(340a)
Space heating total			155.6313	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3917.1568	6.5500	256.5738	(342a)
Water heating total			256.5738	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	28.4300	5.6821	(349)
Energy for lighting	193.4401	28.4300	54.9950	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.2528	28.4300	-145.0649	
PV Unit electricity exported	-544.4942	5.8100	-31.6351	
Total			-176.7000	(352)
Total energy cost			400.1822	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1678.1887	0.1556	98.5690	(367)
Electrical energy for heat distribution (space & water)	23.7605	0.0000	9.2142	(372)
Overall CO2 factor for heat network			0.0405	(386)
Total CO2 associated with community systems			254.9262	(373)
Space and water heating			254.9262	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.2528	0.1323	-67.5052	
PV Unit electricity exported	-544.4942	0.1214	-66.0897	
Total			-133.5948	(380)
Total CO2, kg/year			152.0230	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1678.1887	1.5759	998.5413	(467)
Electrical energy for heat distribution (space & water)	23.7605	0.0000	97.0198	(472)
Overall CO2 factor for heat network			0.4265	(486)
Total CO2 associated with community systems			2684.2156	(473)
Space and water heating			2684.2156	(476)
Pumps, fans and electric keep-hot	19.9861	1.5128	30.2350	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.2528	1.4888	-759.6722	
PV Unit electricity exported	-544.4942	0.4453	-242.4386	
Total			-1002.1108	(480)
Total Primary energy kWh/year			2009.0448	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - North

Current energy efficiency rating: B 85
Current environmental impact rating: A 98

N Solar water heating — Recommended
U Solar photovoltaic panels — Already installed
V2 Wind turbine — Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.4	-£ 47	-26 kg (17.1%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£47	0.36 kg/m²	B 86	A 98
Total Savings	£47	0.36 kg/m²		

Potential energy efficiency rating: B 86
Potential environmental impact rating: A 98

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£61	£83	-£23
Community scheme	£516	£448	£69
Space heating	£265	£288	-£23
Water heating	£257	£188	£69
Lighting	£55	£55	£0
Generated (PV)	-£177	-£178	£1
Total cost of fuels	£400	£353	£47
Total cost of uses	£400	£353	£47
Delivered energy	75 kWh/m²	62 kWh/m²	13 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	2 kg/m²	2 kg/m²	0 kg/m²
Primary energy	28 kWh/m²	23 kWh/m²	4 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330 (1b) - (3b)	
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

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2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		4.9323 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3094	(42)
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												624.1873	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												624.1873	
Solar input	-0.0000	-16.2194	-58.0608	-80.0094	-105.2873	-97.2929	-96.7392	-84.2620	-57.6788	-28.6375	-0.0000	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.6481	212.6591	185.2328	133.9970	102.2831	89.8555	87.9356	107.6103	136.1704	187.4116	229.6316	255.8155	(64)
									Total per year (kWh/year) = Sum(64)m =			1987.2506	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757 (71)
Water heating gains (Table 5)												
	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599 (72)
Total internal gains												
	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.8400	10.6334	0.7300	0.7000	0.7700	18.2252	(74)
East	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(76)
South	1.2200	46.7521	0.7300	0.7000	0.7700	20.1983	(78)

Solar gains	46.9086	84.5076	128.6568	182.5560	226.5466	234.8677	222.2743	187.7660	146.9680	96.8350	57.0050	39.6244	(83)
Total gains	625.6572	661.0009	688.1497	710.4372	723.2420	703.4236	674.2984	642.9171	618.3735	596.9852	591.7676	604.4687	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9639	0.9519	0.9262	0.8704	0.7631	0.6000	0.4494	0.4888	0.6981	0.8775	0.9463	0.9683	(86)
MIT	19.7800	19.9255	20.1827	20.5021	20.7803	20.9386	20.9852	20.9791	20.8842	20.5557	20.1080	19.7272	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9571	0.9429	0.9119	0.8448	0.7174	0.5294	0.3629	0.4005	0.6317	0.8482	0.9347	0.9622	(89)
MIT 2	18.7032	18.8853	19.2048	19.5917	19.9082	20.0660	20.1021	20.0985	20.0197	19.6624	19.1169	18.6371	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.0982	19.2669	19.5635	19.9256	20.2281	20.3861	20.4261	20.4215	20.3368	19.9901	19.4805	19.0370	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0982	19.2669	19.5635	19.9256	20.2281	20.3861	20.4261	20.4215	20.3368	19.9901	19.4805	19.0370	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9474	0.9325	0.9017	0.8389	0.7239	0.5521	0.3942	0.4321	0.6497	0.8437	0.9247	0.9530	(94)
Useful gains	592.7535	616.3600	620.5112	595.9901	523.5835	388.3639	265.8164	277.8247	401.7468	503.6898	547.1964	576.0810	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1042.5303	1012.1449	920.3229	776.7547	600.8023	407.6302	269.5455	283.3159	439.3836	661.5309	872.2035	1045.2647	(97)
Space heating kWh													
	334.6339	265.9675	223.0599	130.1505	57.4507	0.0000	0.0000	0.0000	0.0000	117.4338	234.0051	349.0726	(98a)
Space heating requirement - total per year (kWh/year)												1711.7741	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	334.6339	265.9675	223.0599	130.1505	57.4507	0.0000	0.0000	0.0000	0.0000	117.4338	234.0051	349.0726	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1711.7741	
Space heating per m2											(98c) / (4) =	23.5522	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	334.6339	265.9675	223.0599	130.1505	57.4507	0.0000	0.0000	0.0000	0.0000	117.4338	234.0051	349.0726	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	501.9509	398.9512	334.5899	195.2258	86.1761	0.0000	0.0000	0.0000	0.0000	176.1507	351.0076	523.6089	
Space heating requirement													
	501.9509	398.9512	334.5899	195.2258	86.1761	0.0000	0.0000	0.0000	0.0000	176.1507	351.0076	523.6089	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	212.6591	185.2328	133.9970	102.2831	89.8555	87.9356	107.6103	136.1704	187.4116	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	318.9886	277.8492	200.9955	153.4247	134.7833	131.9034	161.4154	204.2556	281.1174	344.4473	383.7233	
Water heating fuel													
	387.9721	318.9886	277.8492	200.9955	153.4247	134.7833	131.9034	161.4154	204.2556	281.1174	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	8.4920	7.6702	8.4920	8.2180	8.4920	8.2180	8.4920	8.4920	8.2180	8.4920	8.2180	8.4920	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9541	-24.8708	-42.4882	-54.8798	-64.0812	-61.5030	-60.3713	-54.2093	-43.7560	-31.0030	-17.4758	-12.3621	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5447	-11.7075	-29.5072	-53.9842	-79.9096	-83.6490	-81.3696	-63.5332	-39.7064	-18.4938	-6.4743	-3.3869	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2567.6612	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2980.8759	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	25.6766	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4883.7424	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2567.6612	4.4400	114.0042	(340a)
Space heating total			114.0042	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2980.8759	4.4400	132.3509	(342a)
Water heating total			132.3509	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	16.4900	3.2957	(349)
Pump for solar water heating	80.0000	16.4900	13.1920	(349)
Energy for lighting	193.4401	16.4900	31.8983	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-481.9545	16.4900	-79.4743	
PV Unit electricity exported	-476.2665	5.5900	-26.6233	
Total			-106.0976	(352)
Total energy cost			280.6435	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.8585	(357)
SAP value	86.0833	
SAP rating (Section 12)	86	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1479.6099	0.1552	106.2512	(367)
Electrical energy for heat distribution (space & water)	25.6766	0.0000	8.3083	(372)
Overall CO2 factor for heat network			0.0414	(386)
Total CO2 associated with community systems			229.8625	(373)
Space and water heating			229.8625	(376)
Pumps, fans and electric keep-hot	99.9861	0.1387	13.8693	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-481.9545	0.1319	-63.5856	
PV Unit electricity exported	-476.2665	0.1213	-57.7895	
Total			-121.3751	(380)
Total CO2, kg/year			150.2761	(383)
CO2 emissions per m2			2.0700	(384)
EI value			98.2888	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330 (1b) - (3b)	
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		4.9323 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.3094	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day)	118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	

Distribution loss (46)m = 0.15 x (45)m

30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)

Water storage loss:

Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												698.3818	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												698.3818	
Solar input	-0.2882	-19.8943	-63.0504	-86.9122	-108.6771	-108.6071	-105.7317	-94.9883	-67.4759	-37.8323	-4.9243	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	258.3599	208.9842	180.2432	127.0942	98.8933	78.5413	78.9431	96.8840	126.3733	178.2168	224.7072	255.8155	(64)
									Total per year (kWh/year) = Sum(64)m =			1913.0561	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month													
	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)													
	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)
Total internal gains													
	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.8400	12.7500	0.7300	0.7000	0.7700	21.8529	(74)
East	1.2200	23.7835	0.7300	0.7000	0.7700	10.2752	(76)
South	1.2200	54.0600	0.7300	0.7000	0.7700	23.3555	(78)

Solar gains	55.4836	89.2500	134.9422	195.1502	234.1094	260.5436	241.8893	207.8888	163.2641	108.2035	66.4993	47.0895	(83)
Total gains	634.2322	665.7433	694.4351	723.0315	730.8048	729.0995	693.9134	663.0399	634.6696	608.3537	601.2619	611.9338	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9601	0.9479	0.9165	0.8536	0.7336	0.5366	0.3907	0.4275	0.6644	0.8555	0.9386	0.9651	(86)
MIT	19.8374	19.9745	20.2556	20.5594	20.8216	20.9630	20.9922	20.9885	20.9079	20.6235	20.1772	19.7833	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9525	0.9381	0.9002	0.8250	0.6836	0.4626	0.3039	0.3383	0.5945	0.8214	0.9252	0.9583	(89)
MIT 2	18.7753	18.9465	19.2944	19.6586	19.9516	20.0855	20.1059	20.1041	20.0411	19.7405	19.2025	18.7079	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.1649	19.3236	19.6470	19.9890	20.2707	20.4074	20.4310	20.4286	20.3590	20.0644	19.5601	19.1024	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1649	19.3236	19.6470	19.9890	20.2707	20.4074	20.4310	20.4286	20.3590	20.0644	19.5601	19.1024	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9425	0.9276	0.8905	0.8208	0.6932	0.4880	0.3356	0.3708	0.6151	0.8195	0.9153	0.9488	(94)
Useful gains	597.7884	617.5446	618.3702	593.4369	506.5873	355.7850	232.8835	245.8438	390.3988	498.5485	550.3290	580.6047	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	1026.0973	995.0069	890.9815	753.0429	568.5837	366.8598	234.6708	248.5864	419.8138	631.5406	849.6306	1028.7360	(97)
Space heating kWh													
	318.6618	253.6547	202.8228	114.9163	46.1253	0.0000	0.0000	0.0000	0.0000	98.9461	215.4972	333.4097	(98a)
Space heating requirement - total per year (kWh/year)												1584.0339	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	318.6618	253.6547	202.8228	114.9163	46.1253	0.0000	0.0000	0.0000	0.0000	98.9461	215.4972	333.4097	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1584.0339	
Space heating per m2											(98c) / (4) =	21.7946	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement													
	318.6618	253.6547	202.8228	114.9163	46.1253	0.0000	0.0000	0.0000	0.0000	98.9461	215.4972	333.4097	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	477.9927	380.4820	304.2342	172.3744	69.1880	0.0000	0.0000	0.0000	0.0000	148.4192	323.2457	500.1145	
Space heating requirement													
	477.9927	380.4820	304.2342	172.3744	69.1880	0.0000	0.0000	0.0000	0.0000	148.4192	323.2457	500.1145	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement													
	258.3599	208.9842	180.2432	127.0942	98.8933	78.5413	78.9431	96.8840	126.3733	178.2168	224.7072	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.5399	313.4764	270.3648	190.6413	148.3399	117.8120	118.4147	145.3260	189.5599	267.3252	337.0608	383.7233	
Water heating fuel													
	387.5399	313.4764	270.3648	190.6413	148.3399	117.8120	118.4147	145.3260	189.5599	267.3252	337.0608	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	8.4920	7.6702	8.4920	8.2180	8.4920	8.2180	8.4920	8.4920	8.2180	8.4920	8.2180	8.4920	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.8663	-26.6927	-44.7143	-57.6640	-65.4319	-65.1316	-63.3225	-57.8097	-47.4406	-34.4735	-20.5043	-14.8840	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.1321	-13.2725	-32.5307	-59.9091	-83.8086	-95.9871	-91.1676	-73.4319	-46.9082	-22.5228	-8.5261	-4.6148	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2376.0508	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2869.5841	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	23.7605	(313)
Space cooling fuel	0.0000	(321)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4484.3142	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2376.0508	6.5500	155.6313	(340a)
Space heating total			155.6313	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2869.5841	6.5500	187.9578	(342a)
Water heating total			187.9578	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	28.4300	5.6821	(349)
Pump for solar water heating	80.0000	28.4300	22.7440	(349)
Energy for lighting	193.4401	28.4300	54.9950	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-515.9355	28.4300	-146.6805	
PV Unit electricity exported	-538.8116	5.8100	-31.3050	
Total			-177.9854	(352)
Total energy cost			353.0248	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1398.8360	0.1556	98.5690	(367)
Electrical energy for heat distribution (space & water)	23.7605	0.0000	7.8765	(372)
Overall CO2 factor for heat network			0.0415	(386)
Total CO2 associated with community systems			217.9168	(373)
Space and water heating			217.9168	(376)
Pumps, fans and electric keep-hot	99.9861	0.1387	13.8693	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-515.9355	0.1322	-68.2250	
PV Unit electricity exported	-538.8116	0.1214	-65.4032	
Total			-133.6282	(380)
Total CO2, kg/year			126.0773	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1398.8360	1.5759	998.5413	(467)
Electrical energy for heat distribution (space & water)	23.7605	0.0000	81.6037	(472)
Overall CO2 factor for heat network			0.4304	(486)
Total CO2 associated with community systems			2257.7026	(473)
Space and water heating			2257.7026	(476)
Pumps, fans and electric keep-hot	99.9861	1.5128	151.2590	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-515.9355	1.4886	-768.0122	
PV Unit electricity exported	-538.8116	0.4453	-239.9213	
Total			-1007.9335	(480)
Total Primary energy kWh/year			1697.7331	(483)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.44	**TER**	11.78
Environmental	98 A	**% DER < TER**			79.29
CO_2 Emissions (t/year)	0.15	**DFEE**	33.13	**TFEE**	35.56
Compliance Check	See BREL	**% DFEE < TFEE**			6.83
% DPER < TPER	50.51	**DPER**	30.56	**TPER**	61.75

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				3	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =	11875.9502			(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							163.4005	(35)

Thermal bridges (User defined value 0.030 * total exposed area)												4.9323	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	41.0691	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3094	(42)
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)											Total = Sum(45)m =	1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
											Total per year (kWh/year) = Sum(64)m =	2611.4378	(64)
12Total per year (kWh/year)												2611	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)
Total internal gains	529.9009	542.3600	519.8296	502.5508	478.2395	462.4112	445.5913	446.6965	459.7372	474.1489	501.8869	519.6574	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	4.8400	11.2829	0.7300	0.7000	0.7700	19.3385	(75)
Southeast	1.2200	36.7938	0.7300	0.7000	0.7700	15.8960	(77)
Southwest	1.2200	36.7938	0.7300	0.7000	0.7700	15.8960	(79)

Solar gains	51.1305	93.5177	145.0168	208.2811	259.3954	269.0015	254.5679	214.6790	166.6485	107.9573	62.4124	43.0002	(83)
Total gains	581.0314	635.8777	664.8464	710.8320	737.6348	731.4126	700.1592	661.3755	626.3857	582.1062	564.2992	562.6575	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9716	0.9573	0.9331	0.8703	0.7544	0.5813	0.4340	0.4764	0.6920	0.8850	0.9535	0.9750	(86)
MIT	19.6980	19.8820	20.1466	20.5025	20.7899	20.9453	20.9870	20.9809	20.8880	20.5372	20.0614	19.6490	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9661	0.9492	0.9199	0.8446	0.7082	0.5116	0.3499	0.3898	0.6255	0.8568	0.9432	0.9700	(89)
MIT 2	18.6008	18.8315	19.1613	19.5922	19.9178	20.0710	20.1030	20.0995	20.0229	19.6417	19.0600	18.5392	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.0033	19.2169	19.5227	19.9261	20.2377	20.3917	20.4273	20.4228	20.3402	19.9702	19.4273	18.9463	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0033	19.2169	19.5227	19.9261	20.2377	20.3917	20.4273	20.4228	20.3402	19.9702	19.4273	18.9463	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9573	0.9391	0.9096	0.8387	0.7153	0.5344	0.3804	0.4210	0.6437	0.8518	0.9334	0.9617	(94)
Useful gains	556.2073	597.1346	604.7581	596.1900	527.6335	390.8896	266.3587	278.4170	403.2232	495.8465	526.7437	541.1302	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1035.8454	1008.6229	917.4479	776.7903	601.4819	408.0260	269.6298	283.4079	439.6229	660.1311	868.4598	1038.8788	(97)
Space heating kWh	356.8508	276.5201	232.6412	130.0322	54.9433	0.0000	0.0000	0.0000	0.0000	122.2277	246.0355	370.3249	(98a)
Space heating requirement - total per year (kWh/year)												1789.5757	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	356.8508	276.5201	232.6412	130.0322	54.9433	0.0000	0.0000	0.0000	0.0000	122.2277	246.0355	370.3249	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1789.5757	
Space heating per m2											(98c) / (4) =	24.6227	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	356.8508	276.5201	232.6412	130.0322	54.9433	0.0000	0.0000	0.0000	0.0000	122.2277	246.0355	370.3249	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	535.2761	414.7802	348.9618	195.0483	82.4149	0.0000	0.0000	0.0000	0.0000	183.3415	369.0533	555.4874	
Space heating requirement													
	535.2761	414.7802	348.9618	195.0483	82.4149	0.0000	0.0000	0.0000	0.0000	183.3415	369.0533	555.4874	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	
Water heating fuel													
	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9032	-24.7478	-42.1903	-54.3464	-63.2831	-60.6270	-59.4769	-53.4801	-43.2885	-30.7805	-17.3978	-12.3224	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5955	-11.8305	-29.8051	-54.5176	-80.7077	-84.5250	-82.2640	-64.2624	-40.1739	-18.7163	-6.5523	-3.4266	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												2684.3636	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3917.1568	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												26.8436	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.9861	(330a)
Total electricity for the above, kWh/year												19.9861	(331)
Electricity for lighting (calculated in Appendix L)												193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5856.7257	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1760.4054	0.1553	111.1954	(367)
Electrical energy for heat distribution (space & water)	26.8436	0.0000	9.6877	(372)
Overall CO2 factor for heat network			0.0406	(386)
Total CO2 associated with community systems			268.0260	(373)
Space and water heating			268.0260	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	0.1320	-62.9388	
PV Unit electricity exported	-481.3770	0.1213	-58.4056	
Total			-121.3444	(380)
Total CO2, kg/year			177.3733	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.4400	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1760.4054	1.5751	1127.5031	(467)
Electrical energy for heat distribution (space & water)	26.8436	0.0000	101.8559	(472)
Overall CO2 factor for heat network			0.4269	(486)
Total CO2 associated with community systems			2818.0136	(473)
Space and water heating			2818.0136	(476)
Pumps, fans and electric keep-hot	19.9861	1.5128	30.2350	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	1.4877	-709.3875	
PV Unit electricity exported	-481.3770	0.4451	-214.2796	
Total			-923.6671	(480)
Total Primary energy kWh/year			2221.2865	(483)
Dwelling Primary energy Rate (DPER)			30.5600	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b) x	2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c) x	2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4185	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3243	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4135	0.4054	0.3973	0.3568	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3649	0.3811	(22b)
Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			7.2800	1.1450	8.3359			(27)
Heatloss floor			36.3400	0.1300	4.7242			(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.1800	14.8338			(29a)
500mm mineral wool	36.3400		36.3400	0.1100	3.9974			(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.9313			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	3.6500	0.0500	0.1825
E3 Sill	2.7400	0.0500	0.1370
E4 Jamb	14.8400	0.0500	0.7420
E5 Ground floor (normal)	18.7200	0.1600	2.9952
E6 Intermediate floor within a dwelling	18.7200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.7200	0.0600	1.1232
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	5.5000	0.0800	0.4400
P2 Party wall - Intermediate floor within a dwelling	5.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	5.5000	0.1200	0.6600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8399 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.7712 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.4047	34.2096	34.0184	33.1202	32.9522	32.1700	32.1700	32.0251	32.4713	32.9522	33.2921	33.6475	(38)
Heat transfer coeff	76.1759	75.9808	75.7896	74.8914	74.7234	73.9411	73.9411	73.7963	74.2424	74.7234	75.0633	75.4187	(39)
Average = Sum(39)m / 12 =												74.8906	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0481	1.0454	1.0428	1.0304	1.0281	1.0174	1.0174	1.0154	1.0215	1.0281	1.0328	1.0377	(40)
HLP (average)												1.0304	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	249.9662	221.0368	234.6117	205.6045	198.8885	178.7466	175.9929	183.1904	185.4473	207.3672	221.2297	247.1336	(62)
WWHRS	-28.7738	-25.4478	-26.6475	-22.0651	-20.5639	-17.5967	-16.4941	-17.5398	-18.2062	-21.4631	-24.3151	-28.2410	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
										Total per year (kWh/year) = Sum(64)m =		2241.8614	(64)
12Total per year (kWh/year)												2242	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	104.8969	93.1698	99.7915	89.4439	87.9135	80.5137	80.3008	82.6939	82.7417	90.7327	94.6393	103.9551	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	140.9904	138.6456	134.1284	124.2277	118.1634	111.8245	107.9311	111.1477	114.9190	121.9526	131.4435	139.7245	(72)
Total internal gains	523.5655	536.0247	513.4942	496.2155	471.9041	453.0758	436.2560	437.3612	450.4018	467.8135	495.5515	513.3220	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	4.8400	11.2829	0.6300	0.7000	0.7700	16.6894	(75)
Southeast	1.2200	36.7938	0.6300	0.7000	0.7700	13.7185	(77)
Southwest	1.2200	36.7938	0.6300	0.7000	0.7700	13.7185	(79)

Solar gains	44.1264	80.7070	125.1515	179.7495	223.8618	232.1520	219.6956	185.2709	143.8199	93.1686	53.8627	37.1097	(83)
Total gains	567.6919	616.7317	638.6457	675.9649	695.7658	685.2277	655.9515	622.6321	594.2218	560.9821	549.4142	550.4317	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3060	43.4172	43.5268	44.0488	44.1478	44.6149	44.6149	44.7025	44.4338	44.1478	43.9479	43.7408	
alpha	3.8871	3.8945	3.9018	3.9366	3.9432	3.9743	3.9743	3.9802	3.9623	3.9432	3.9299	3.9161	
util living area	0.9755	0.9643	0.9458	0.8952	0.7972	0.6323	0.4801	0.5219	0.7354	0.9039	0.9602	0.9780	(86)
MIT	19.5026	19.6889	19.9670	20.3696	20.7062	20.9160	20.9781	20.9695	20.8420	20.4342	19.9206	19.4770	(87)
Th 2	20.0434	20.0457	20.0478	20.0581	20.0600	20.0689	20.0689	20.0706	20.0655	20.0600	20.0561	20.0521	(88)
util rest of house	0.9705	0.9571	0.9343	0.8722	0.7526	0.5581	0.3853	0.4260	0.6681	0.8782	0.9509	0.9735	(89)
MIT 2	18.3093	18.5454	18.8959	19.3969	19.7883	20.0097	20.0587	20.0553	19.9419	19.4840	18.8475	18.2829	(90)
Living area fraction									fLA = Living area / (4) =			0.3668	(91)
MIT	18.7470	18.9649	19.2888	19.7537	20.1250	20.3421	20.3960	20.3906	20.2721	19.8325	19.2412	18.7209	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7470	18.9649	19.2888	19.7537	20.1250	20.3421	20.3960	20.3906	20.2721	19.8325	19.2412	18.7209	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9615	0.9467	0.9231	0.8636	0.7560	0.5809	0.4194	0.4600	0.6842	0.8709	0.9408	0.9652	(94)
Useful gains	545.8611	583.8425	589.5106	583.7960	525.9956	398.0250	275.0941	286.4155	406.5487	488.5628	516.8673	531.2708	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1100.5164	1068.6603	969.2581	812.8511	629.5450	424.5803	280.6776	294.4932	458.2309	689.8872	911.3554	1095.1490	(97)
Space heating kWh	412.6636	325.7975	282.5322	164.9196	77.0408	0.0000	0.0000	0.0000	0.0000	149.7853	284.0315	419.5254	(98a)
Space heating requirement - total per year (kWh/year)												2116.2959	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	412.6636	325.7975	282.5322	164.9196	77.0408	0.0000	0.0000	0.0000	0.0000	149.7853	284.0315	419.5254	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2116.2959	
Space heating per m2											(98c) / (4) =	29.1180	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 92.3000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	412.6636	325.7975	282.5322	164.9196	77.0408	0.0000	0.0000	0.0000	0.0000	149.7853	284.0315	419.5254	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	447.0894	352.9768	306.1020	178.6778	83.4678	0.0000	0.0000	0.0000	0.0000	162.2810	307.7264	454.5237	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4375	85.1955	84.7475	83.8207	82.3170	79.8000	79.8000	79.8000	79.8000	83.5797	84.8805	85.4940	(217)
Fuel for water heating, kWh/month	258.8939	229.5766	245.3927	218.9667	216.6316	201.9422	199.8732	207.5821	209.5753	222.4272	231.9903	256.0328	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.6146	19.7468	17.7798	13.0262	10.0618	8.2206	9.1787	11.9309	15.4970	20.3329	22.9660	25.2988	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-34.1427	-48.1921	-69.3402	-78.0353	-84.2042	-78.6248	-77.6860	-73.3488	-65.6465	-55.1924	-37.5712	-29.5143	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.0663	-40.1520	-79.8860	-120.0915	-158.8866	-159.6687	-157.7568	-133.4905	-97.7594	-57.4135	-25.4553	-15.0706	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2292.8449	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2698.8847	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	198.6542	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1796.1956	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3480.1883	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2292.8449	0.2100	481.4974	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2698.8847	0.2100	566.7658	(264)
Space and water heating			1048.2632	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	198.6542	0.1443	28.6719	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	0.1346	-98.4313	
PV Unit electricity exported	-1064.6971	0.1259	-134.0169	
Total			-232.4482	(269)
Total CO2, kg/year			856.4162	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.7800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2292.8449	1.1300	2590.9148	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2698.8847	1.1300	3049.7397	(278)
Space and water heating			5640.6545	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	198.6542	1.5338	304.7025	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	1.4973	-1095.2830	
PV Unit electricity exported	-1064.6971	0.4620	-491.9332	
Total			-1587.2162	(283)
Total Primary energy kWh/year			4488.2416	(286)
Target Primary Energy Rate (TPER)			61.7500	(287)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.44	**TER**	11.78
Environmental	98 A	**% DER < TER**			79.29
CO_2 Emissions (t/year)	0.15	**DFEE**	33.13	**TFEE**	35.56
Compliance Check	See BREL	**% DFEE < TFEE**			6.83
% DPER < TPER	50.51	**DPER**	30.56	**TPER**	61.75

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3185	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2468	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3147	0.3085	0.3024	0.2715	0.2653	0.2345	0.2345	0.2283	0.2468	0.2653	0.2777	0.2900	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5495	0.5476	0.5457	0.5369	0.5352	0.5275	0.5275	0.5261	0.5305	0.5352	0.5386	0.5421	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		11875.9502	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							163.4005	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							4.9323	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.2906	32.1776	32.0668	31.5466	31.4493	30.9963	30.9963	30.9124	31.1708	31.4493	31.6462	31.8520	(38)
Heat transfer coeff	73.3597	73.2467	73.1359	72.6157	72.5184	72.0654	72.0654	71.9815	72.2399	72.5184	72.7153	72.9211	(39)
Average = Sum(39)m / 12 =												72.6153	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0094	1.0078	1.0063	0.9991	0.9978	0.9915	0.9915	0.9904	0.9939	0.9978	1.0005	1.0033	(40)
HLP (average)												0.9991	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 60.0096 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.4702	63.6744	61.7137	59.2732	57.0961	54.8336	54.3634	56.3200	58.3269	60.6504	63.1125	65.3783	(44)
Energy conte	103.6888	90.6715	94.8517	81.1421	76.8624	67.4243	65.7478	69.7360	71.9229	82.3020	89.9153	102.3666	(45)
Energy content (annual)										Total = Sum(45)m =		996.6312	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(64)
										Total per year (kWh/year) = Sum(64)m =		847.1365	(64)
12Total per year (kWh/year)												847	(64)
Electric shower(s)													
	50.4049	44.9112	49.0413	46.7995	47.6777	45.4799	46.9959	47.6777	46.7995	49.0413	48.1191	50.4049	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =					573.3528	(64a)
Heat gains from water heating, kWh/month													
	34.6351	30.4955	32.4163	28.9426	28.2527	25.6976	25.7204	26.7383	26.9835	29.7495	31.1368	34.3541	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)													
	46.5525	45.3802	43.5703	40.1980	37.9740	35.6912	34.5704	35.9386	37.4771	39.9859	43.2455	46.1749	(72)
Total internal gains													
	426.1276	439.7593	419.9362	409.1858	388.7147	376.9424	362.8952	362.1520	372.9599	382.8469	404.3535	416.7724	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	4.8400	11.2829	0.7300	0.7000	0.7700	19.3385	(75)
Southeast	1.2200	36.7938	0.7300	0.7000	0.7700	15.8960	(77)
Southwest	1.2200	36.7938	0.7300	0.7000	0.7700	15.8960	(79)

Solar gains	51.1305	93.5177	145.0168	208.2811	259.3954	269.0015	254.5679	214.6790	166.6485	107.9573	62.4124	43.0002	(83)
Total gains	477.2582	533.2770	564.9530	617.4669	648.1101	645.9439	617.4631	576.8310	539.6084	490.8041	466.7659	459.7725	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	44.9685	45.0379	45.1061	45.4292	45.4902	45.7762	45.7762	45.8295	45.6656	45.4902	45.3670	45.2389	
alpha	3.9979	4.0025	4.0071	4.0286	4.0327	4.0517	4.0517	4.0553	4.0444	4.0327	4.0245	4.0159	
util living area													
	0.9858	0.9767	0.9609	0.9136	0.8169	0.6502	0.4961	0.5466	0.7687	0.9302	0.9755	0.9877	(86)

MIT	19.4112	19.6132	19.9093	20.3360	20.6939	20.9128	20.9773	20.9666	20.8232	20.3715	19.8279	19.3743	(87)
Th 2	20.0755	20.0768	20.0781	20.0841	20.0852	20.0904	20.0904	20.0914	20.0884	20.0852	20.0829	20.0806	(88)
util rest of house													
	0.9828	0.9718	0.9522	0.8937	0.7750	0.5770	0.4010	0.4497	0.7049	0.9101	0.9694	0.9851	(89)
MIT 2	18.6265	18.8269	19.1192	19.5346	19.8617	20.0418	20.0820	20.0780	19.9780	19.5759	19.0456	18.5937	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.9143	19.1154	19.4090	19.8286	20.1670	20.3613	20.4104	20.4039	20.2880	19.8677	19.3326	18.8800	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9143	19.1154	19.4090	19.8286	20.1670	20.3613	20.4104	20.4039	20.2880	19.8677	19.3326	18.8800	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9778	0.9653	0.9444	0.8874	0.7791	0.5999	0.4353	0.4842	0.7201	0.9044	0.9631	0.9806	(94)
Useful gains	466.6559	514.7554	533.5676	547.9094	504.9265	387.4738	268.7822	279.2932	388.5902	443.8945	449.5336	450.8372	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1072.1028	1041.2274	944.1113	793.5858	614.0110	415.1905	274.5986	288.2093	447.0234	672.0809	889.4941	1070.4843	(97)
Space heating kWh													
	450.4524	353.7892	305.4445	176.8870	81.1589	0.0000	0.0000	0.0000	0.0000	169.7707	316.7715	461.0175	(98a)
Space heating requirement - total per year (kWh/year)												2315.2917	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	450.4524	353.7892	305.4445	176.8870	81.1589	0.0000	0.0000	0.0000	0.0000	169.7707	316.7715	461.0175	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2315.2917	
Space heating per m2											(98c) / (4) =	31.8560	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	677.4144	533.2836	547.0591	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8141	0.8808	0.8505	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	551.4834	469.7056	465.2817	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	698.4194	667.8636	622.8153	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	105.7939	147.4296	117.2050	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	26.4485	36.8574	29.3012	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												92.6071	(107)
Energy for space heating												31.8560	(99)
Energy for space cooling												1.2742	(108)
Total												33.1301	(109)
Fabric Energy Efficiency (DFEE)												33.1	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		36.3400	(1b) x	2.4500	(2b) =	89.0330	(1b) - (3b)
First floor		36.3400	(1c) x	2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		3 * 10 =	30.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1685 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.4185 (18)
Number of sides sheltered			3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3243 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4135	0.4054	0.3973	0.3568	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3649	0.3811	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			7.2800	1.1450	8.3359			(27)
Heatloss floor			36.3400	0.1300	4.7242			(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.1800	14.8338			(29a)
500mm mineral wool	36.3400		36.3400	0.1100	3.9974			(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.9313			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	3.6500	0.0500	0.1825
E3 Sill	2.7400	0.0500	0.1370
E4 Jamb	14.8400	0.0500	0.7420
E5 Ground floor (normal)	18.7200	0.1600	2.9952
E6 Intermediate floor within a dwelling	18.7200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.7200	0.0600	1.1232
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	5.5000	0.0800	0.4400
P2 Party wall - Intermediate floor within a dwelling	5.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	5.5000	0.1200	0.6600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8399 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.7712 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.4047	34.2096	34.0184	33.1202	32.9522	32.1700	32.1700	32.0251	32.4713	32.9522	33.2921	33.6475	(38)
Heat transfer coeff	76.1759	75.9808	75.7896	74.8914	74.7234	73.9411	73.9411	73.7963	74.2424	74.7234	75.0633	75.4187	(39)
Average = Sum(39)m / 12 =												74.8906	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0481	1.0454	1.0428	1.0304	1.0281	1.0174	1.0174	1.0154	1.0215	1.0281	1.0328	1.0377	(40)
HLP (average)												1.0304	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 60.0096 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.4702	63.6744	61.7137	59.2732	57.0961	54.8336	54.3634	56.3200	58.3269	60.6504	63.1125	65.3783	(44)
Energy conte	103.6888	90.6715	94.8517	81.1421	76.8624	67.4243	65.7478	69.7360	71.9229	82.3020	89.9153	102.3666	(45)
Energy content (annual)										Total = Sum(45)m =		996.6312	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(64)
								Total per year (kWh/year) = Sum(64)m =			847.1365	(64)
12Total per year (kWh/year)											847	(64)	

Electric shower(s)

50.4049	44.9112	49.0413	46.7995	47.6777	45.4799	46.9959	47.6777	46.7995	49.0413	48.1191	50.4049	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				573.3528	(64a)

Heat gains from water heating, kWh/month

34.6351	30.4955	32.4163	28.9426	28.2527	25.6976	25.7204	26.7383	26.9835	29.7495	31.1368	34.3541	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)													
	46.5525	45.3802	43.5703	40.1980	37.9740	35.6912	34.5704	35.9386	37.4771	39.9859	43.2455	46.1749	(72)
Total internal gains													
	426.1276	439.7593	419.9362	409.1858	388.7147	376.9424	362.8952	362.1520	372.9599	382.8469	404.3535	416.7724	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	4.8400	11.2829	0.6300	0.7000	0.7700	16.6894	(75)
Southeast	1.2200	36.7938	0.6300	0.7000	0.7700	13.7185	(77)
Southwest	1.2200	36.7938	0.6300	0.7000	0.7700	13.7185	(79)

Solar gains	44.1264	80.7070	125.1515	179.7495	223.8618	232.1520	219.6956	185.2709	143.8199	93.1686	53.8627	37.1097	(83)
Total gains	470.2540	520.4663	545.0877	588.9352	612.5765	609.0944	582.5908	547.4229	516.7799	476.0155	458.2163	453.8821	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3060	43.4172	43.5268	44.0488	44.1478	44.6149	44.6149	44.7025	44.4338	44.1478	43.9479	43.7408	
alpha	3.8871	3.8945	3.9018	3.9366	3.9432	3.9743	3.9743	3.9802	3.9623	3.9432	3.9299	3.9161	
util living area													
	0.9867	0.9791	0.9662	0.9271	0.8447	0.6880	0.5327	0.5814	0.7950	0.9385	0.9775	0.9884	(86)
MIT	19.3155	19.5113	19.8055	20.2458	20.6281	20.8863	20.9685	20.9554	20.7871	20.3077	19.7539	19.2895	(87)
Th 2	20.0434	20.0457	20.0478	20.0581	20.0600	20.0689	20.0689	20.0706	20.0655	20.0600	20.0561	20.0521	(88)
util rest of house													
	0.9839	0.9746	0.9585	0.9094	0.8054	0.6135	0.4306	0.4791	0.7327	0.9200	0.9718	0.9859	(89)
MIT 2	18.5081	18.7033	18.9952	19.4298	19.7849	20.0044	20.0571	20.0525	19.9307	19.4965	18.9528	18.4886	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.8043	18.9997	19.2924	19.7291	20.0942	20.3279	20.3914	20.3837	20.2448	19.7941	19.2467	18.7824	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8043	18.9997	19.2924	19.7291	20.0942	20.3279	20.3914	20.3837	20.2448	19.7941	19.2467	18.7824	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9789	0.9682	0.9508	0.9021	0.8070	0.6355	0.4672	0.5151	0.7459	0.9136	0.9655	0.9814	(94)
Useful gains	460.3402	503.8943	518.2640	531.2932	494.3654	387.1050	272.1813	281.9792	385.4775	434.9083	442.4264	445.4440	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1104.8744	1071.3056	969.5324	811.0081	627.2418	423.5274	280.3417	293.9832	456.2051	687.0107	911.7690	1099.7850	(97)
Space heating kWh													
	479.5334	381.3004	335.7437	201.3947	98.8601	0.0000	0.0000	0.0000	0.0000	187.5642	337.9267	486.8297	(98a)
Space heating requirement - total per year (kWh/year)												2509.1529	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	479.5334	381.3004	335.7437	201.3947	98.8601	0.0000	0.0000	0.0000	0.0000	187.5642	337.9267	486.8297	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2509.1529	
Space heating per m2										(98c) / (4) =		34.5233	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	695.0467	547.1644	560.8517	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7748	0.8495	0.8179	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	538.5338	464.7993	458.7326	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	655.3486	627.1038	588.4422	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	84.1067	120.7545	96.5039	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	21.0267	30.1886	24.1260	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												75.3413	(107)
Energy for space heating												34.5233	(99)
Energy for space cooling												1.0366	(108)
Total												35.5599	(109)
Fabric Energy Efficiency (TFEE)												35.6	(109)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.44	**TER**	11.78
Environmental	98 A	**% DER < TER**			79.29
CO_2 Emissions (t/year)	0.15	**DFEE**	33.13	**TFEE**	35.56
Compliance Check	See BREL	**% DFEE < TFEE**			6.83
% DPER < TPER	50.51	**DPER**	30.56	**TPER**	61.75

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				3	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =	11875.9502			(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							163.4005	(35)

Thermal bridges (User defined value 0.030 * total exposed area)												4.9323	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	41.0691	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3094	(42)
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)											Total = Sum(45)m =	1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
											Total per year (kWh/year) = Sum(64)m =	2611.4378	(64)
12Total per year (kWh/year)												2611	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)
Total internal gains	529.9009	542.3600	519.8296	502.5508	478.2395	462.4112	445.5913	446.6965	459.7372	474.1489	501.8869	519.6574	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	4.8400	11.2829	0.7300	0.7000	0.7700	19.3385	(75)
Southeast	1.2200	36.7938	0.7300	0.7000	0.7700	15.8960	(77)
Southwest	1.2200	36.7938	0.7300	0.7000	0.7700	15.8960	(79)

Solar gains	51.1305	93.5177	145.0168	208.2811	259.3954	269.0015	254.5679	214.6790	166.6485	107.9573	62.4124	43.0002	(83)
Total gains	581.0314	635.8777	664.8464	710.8320	737.6348	731.4126	700.1592	661.3755	626.3857	582.1062	564.2992	562.6575	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9716	0.9573	0.9331	0.8703	0.7544	0.5813	0.4340	0.4764	0.6920	0.8850	0.9535	0.9750	(86)
MIT	19.6980	19.8820	20.1466	20.5025	20.7899	20.9453	20.9870	20.9809	20.8880	20.5372	20.0614	19.6490	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9661	0.9492	0.9199	0.8446	0.7082	0.5116	0.3499	0.3898	0.6255	0.8568	0.9432	0.9700	(89)
MIT 2	18.6008	18.8315	19.1613	19.5922	19.9178	20.0710	20.1030	20.0995	20.0229	19.6417	19.0600	18.5392	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.0033	19.2169	19.5227	19.9261	20.2377	20.3917	20.4273	20.4228	20.3402	19.9702	19.4273	18.9463	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0033	19.2169	19.5227	19.9261	20.2377	20.3917	20.4273	20.4228	20.3402	19.9702	19.4273	18.9463	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9573	0.9391	0.9096	0.8387	0.7153	0.5344	0.3804	0.4210	0.6437	0.8518	0.9334	0.9617	(94)
Useful gains	556.2073	597.1346	604.7581	596.1900	527.6335	390.8896	266.3587	278.4170	403.2232	495.8465	526.7437	541.1302	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1035.8454	1008.6229	917.4479	776.7903	601.4819	408.0260	269.6298	283.4079	439.6229	660.1311	868.4598	1038.8788	(97)
Space heating kWh	356.8508	276.5201	232.6412	130.0322	54.9433	0.0000	0.0000	0.0000	0.0000	122.2277	246.0355	370.3249	(98a)
Space heating requirement - total per year (kWh/year)												1789.5757	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	356.8508	276.5201	232.6412	130.0322	54.9433	0.0000	0.0000	0.0000	0.0000	122.2277	246.0355	370.3249	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1789.5757	
Space heating per m2											(98c) / (4) =	24.6227	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	356.8508	276.5201	232.6412	130.0322	54.9433	0.0000	0.0000	0.0000	0.0000	122.2277	246.0355	370.3249	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	535.2761	414.7802	348.9618	195.0483	82.4149	0.0000	0.0000	0.0000	0.0000	183.3415	369.0533	555.4874	
Space heating requirement													
	535.2761	414.7802	348.9618	195.0483	82.4149	0.0000	0.0000	0.0000	0.0000	183.3415	369.0533	555.4874	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	
Water heating fuel													
	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9032	-24.7478	-42.1903	-54.3464	-63.2831	-60.6270	-59.4769	-53.4801	-43.2885	-30.7805	-17.3978	-12.3224	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5955	-11.8305	-29.8051	-54.5176	-80.7077	-84.5250	-82.2640	-64.2624	-40.1739	-18.7163	-6.5523	-3.4266	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												2684.3636	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3917.1568	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												26.8436	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.9861	(330a)
Total electricity for the above, kWh/year												19.9861	(331)
Electricity for lighting (calculated in Appendix L)												193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5856.7257	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1760.4054	0.1553	111.1954	(367)
Electrical energy for heat distribution (space & water)	26.8436	0.0000	9.6877	(372)
Overall CO2 factor for heat network			0.0406	(386)
Total CO2 associated with community systems			268.0260	(373)
Space and water heating			268.0260	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	0.1320	-62.9388	
PV Unit electricity exported	-481.3770	0.1213	-58.4056	
Total			-121.3444	(380)
Total CO2, kg/year			177.3733	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.4400	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1760.4054	1.5751	1127.5031	(467)
Electrical energy for heat distribution (space & water)	26.8436	0.0000	101.8559	(472)
Overall CO2 factor for heat network			0.4269	(486)
Total CO2 associated with community systems			2818.0136	(473)
Space and water heating			2818.0136	(476)
Pumps, fans and electric keep-hot	19.9861	1.5128	30.2350	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	1.4877	-709.3875	
PV Unit electricity exported	-481.3770	0.4451	-214.2796	
Total			-923.6671	(480)
Total Primary energy kWh/year			2221.2865	(483)
Dwelling Primary energy Rate (DPER)			30.5600	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b) x	2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c) x	2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4185	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3243	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4135	0.4054	0.3973	0.3568	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3649	0.3811	(22b)
Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			7.2800	1.1450	8.3359			(27)
Heatloss floor			36.3400	0.1300	4.7242			(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.1800	14.8338			(29a)
500mm mineral wool	36.3400		36.3400	0.1100	3.9974			(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.9313			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	3.6500	0.0500	0.1825
E3 Sill	2.7400	0.0500	0.1370
E4 Jamb	14.8400	0.0500	0.7420
E5 Ground floor (normal)	18.7200	0.1600	2.9952
E6 Intermediate floor within a dwelling	18.7200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.7200	0.0600	1.1232
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	5.5000	0.0800	0.4400
P2 Party wall - Intermediate floor within a dwelling	5.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	5.5000	0.1200	0.6600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8399 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.7712 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.4047	34.2096	34.0184	33.1202	32.9522	32.1700	32.1700	32.0251	32.4713	32.9522	33.2921	33.6475	(38)
Heat transfer coeff	76.1759	75.9808	75.7896	74.8914	74.7234	73.9411	73.9411	73.7963	74.2424	74.7234	75.0633	75.4187	(39)
Average = Sum(39)m / 12 =												74.8906	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0481	1.0454	1.0428	1.0304	1.0281	1.0174	1.0174	1.0154	1.0215	1.0281	1.0328	1.0377	(40)
HLP (average)												1.0304	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	249.9662	221.0368	234.6117	205.6045	198.8885	178.7466	175.9929	183.1904	185.4473	207.3672	221.2297	247.1336	(62)
WWHRS	-28.7738	-25.4478	-26.6475	-22.0651	-20.5639	-17.5967	-16.4941	-17.5398	-18.2062	-21.4631	-24.3151	-28.2410	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
										Total per year (kWh/year) = Sum(64)m =		2241.8614	(64)
12Total per year (kWh/year)												2242	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	104.8969	93.1698	99.7915	89.4439	87.9135	80.5137	80.3008	82.6939	82.7417	90.7327	94.6393	103.9551	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	140.9904	138.6456	134.1284	124.2277	118.1634	111.8245	107.9311	111.1477	114.9190	121.9526	131.4435	139.7245	(72)
Total internal gains	523.5655	536.0247	513.4942	496.2155	471.9041	453.0758	436.2560	437.3612	450.4018	467.8135	495.5515	513.3220	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	4.8400	11.2829	0.6300	0.7000	0.7700	16.6894	(75)
Southeast	1.2200	36.7938	0.6300	0.7000	0.7700	13.7185	(77)
Southwest	1.2200	36.7938	0.6300	0.7000	0.7700	13.7185	(79)

Solar gains	44.1264	80.7070	125.1515	179.7495	223.8618	232.1520	219.6956	185.2709	143.8199	93.1686	53.8627	37.1097	(83)
Total gains	567.6919	616.7317	638.6457	675.9649	695.7658	685.2277	655.9515	622.6321	594.2218	560.9821	549.4142	550.4317	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3060	43.4172	43.5268	44.0488	44.1478	44.6149	44.6149	44.7025	44.4338	44.1478	43.9479	43.7408	
alpha	3.8871	3.8945	3.9018	3.9366	3.9432	3.9743	3.9743	3.9802	3.9623	3.9432	3.9299	3.9161	
util living area	0.9755	0.9643	0.9458	0.8952	0.7972	0.6323	0.4801	0.5219	0.7354	0.9039	0.9602	0.9780	(86)
MIT	19.5026	19.6889	19.9670	20.3696	20.7062	20.9160	20.9781	20.9695	20.8420	20.4342	19.9206	19.4770	(87)
Th 2	20.0434	20.0457	20.0478	20.0581	20.0600	20.0689	20.0689	20.0706	20.0655	20.0600	20.0561	20.0521	(88)
util rest of house	0.9705	0.9571	0.9343	0.8722	0.7526	0.5581	0.3853	0.4260	0.6681	0.8782	0.9509	0.9735	(89)
MIT 2	18.3093	18.5454	18.8959	19.3969	19.7883	20.0097	20.0587	20.0553	19.9419	19.4840	18.8475	18.2829	(90)
Living area fraction									fLA = Living area / (4) =			0.3668	(91)
MIT	18.7470	18.9649	19.2888	19.7537	20.1250	20.3421	20.3960	20.3906	20.2721	19.8325	19.2412	18.7209	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7470	18.9649	19.2888	19.7537	20.1250	20.3421	20.3960	20.3906	20.2721	19.8325	19.2412	18.7209	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9615	0.9467	0.9231	0.8636	0.7560	0.5809	0.4194	0.4600	0.6842	0.8709	0.9408	0.9652	(94)
Useful gains	545.8611	583.8425	589.5106	583.7960	525.9956	398.0250	275.0941	286.4155	406.5487	488.5628	516.8673	531.2708	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1100.5164	1068.6603	969.2581	812.8511	629.5450	424.5803	280.6776	294.4932	458.2309	689.8872	911.3554	1095.1490	(97)
Space heating kWh	412.6636	325.7975	282.5322	164.9196	77.0408	0.0000	0.0000	0.0000	0.0000	149.7853	284.0315	419.5254	(98a)
Space heating requirement - total per year (kWh/year)												2116.2959	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	412.6636	325.7975	282.5322	164.9196	77.0408	0.0000	0.0000	0.0000	0.0000	149.7853	284.0315	419.5254	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2116.2959	
Space heating per m2											(98c) / (4) =	29.1180	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 92.3000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	412.6636	325.7975	282.5322	164.9196	77.0408	0.0000	0.0000	0.0000	0.0000	149.7853	284.0315	419.5254	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	447.0894	352.9768	306.1020	178.6778	83.4678	0.0000	0.0000	0.0000	0.0000	162.2810	307.7264	454.5237	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4375	85.1955	84.7475	83.8207	82.3170	79.8000	79.8000	79.8000	79.8000	83.5797	84.8805	85.4940	(217)
Fuel for water heating, kWh/month	258.8939	229.5766	245.3927	218.9667	216.6316	201.9422	199.8732	207.5821	209.5753	222.4272	231.9903	256.0328	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.6146	19.7468	17.7798	13.0262	10.0618	8.2206	9.1787	11.9309	15.4970	20.3329	22.9660	25.2988	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-34.1427	-48.1921	-69.3402	-78.0353	-84.2042	-78.6248	-77.6860	-73.3488	-65.6465	-55.1924	-37.5712	-29.5143	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.0663	-40.1520	-79.8860	-120.0915	-158.8866	-159.6687	-157.7568	-133.4905	-97.7594	-57.4135	-25.4553	-15.0706	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2292.8449	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2698.8847	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	198.6542	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1796.1956	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3480.1883	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2292.8449	0.2100	481.4974	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2698.8847	0.2100	566.7658	(264)
Space and water heating			1048.2632	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	198.6542	0.1443	28.6719	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	0.1346	-98.4313	
PV Unit electricity exported	-1064.6971	0.1259	-134.0169	
Total			-232.4482	(269)
Total CO2, kg/year			856.4162	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.7800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2292.8449	1.1300	2590.9148	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2698.8847	1.1300	3049.7397	(278)
Space and water heating			5640.6545	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	198.6542	1.5338	304.7025	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	1.4973	-1095.2830	
PV Unit electricity exported	-1064.6971	0.4620	-491.9332	
Total			-1587.2162	(283)
Total Primary energy kWh/year			4488.2416	(286)
Target Primary Energy Rate (TPER)			61.7500	(287)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.44	**TER**	11.78
Environmental	98 A	**% DER < TER**			79.29
CO_2 Emissions (t/year)	0.15	**DFEE**	33.13	**TFEE**	35.56
Compliance Check	See BREL	**% DFEE < TFEE**			6.83
% DPER < TPER	50.51	**DPER**	30.56	**TPER**	61.75

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				3	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		11875.9502	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							163.4005	(35)

Thermal bridges (User defined value 0.030 * total exposed area)												4.9323	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	41.0691	(37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3094	(42)
Hot water usage for mixer showers													
	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths													
	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses													
	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)											Total = Sum(45)m =	1960.5981	
Distribution loss (46)m = 0.15 x (45)m													
	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =		2611.4378	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)													
	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)
Total internal gains													
	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	4.8400	11.2829	0.7300	0.7000	0.7700	19.3385	(75)
Southeast	1.2200	36.7938	0.7300	0.7000	0.7700	15.8960	(77)
Southwest	1.2200	36.7938	0.7300	0.7000	0.7700	15.8960	(79)

Solar gains	51.1305	93.5177	145.0168	208.2811	259.3954	269.0015	254.5679	214.6790	166.6485	107.9573	62.4124	43.0002	(83)
Total gains	629.8791	670.0110	704.5098	736.1623	756.0907	737.5573	706.5920	669.8301	638.0540	608.1075	597.1750	607.8445	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area	0.9631	0.9499	0.9211	0.8589	0.7433	0.5773	0.4303	0.4710	0.6832	0.8718	0.9448	0.9677	(86)
MIT	19.7876	19.9409	20.2073	20.5316	20.8017	20.9467	20.9874	20.9817	20.8932	20.5690	20.1170	19.7334	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house	0.9562	0.9405	0.9062	0.8319	0.6965	0.5078	0.3468	0.3851	0.6166	0.8416	0.9329	0.9616	(89)
MIT 2	18.7126	18.9042	19.2344	19.6251	19.9294	20.0720	20.1032	20.0999	20.0273	19.6773	19.1279	18.6449	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.1069	19.2845	19.5913	19.9576	20.2494	20.3928	20.4275	20.4234	20.3449	20.0044	19.4907	19.0442	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1069	19.2845	19.5913	19.9576	20.2494	20.3928	20.4275	20.4234	20.3449	20.0044	19.4907	19.0442	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9464	0.9300	0.8960	0.8268	0.7044	0.5307	0.3771	0.4160	0.6352	0.8376	0.9229	0.9523	(94)
Useful gains	596.1342	623.1279	631.2604	608.6754	532.5558	391.3997	266.4808	278.6666	405.2781	509.3698	551.1358	578.8482	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1043.1492	1013.3848	922.2817	779.0081	602.3043	408.1058	269.6488	283.4466	439.9550	662.5416	872.9243	1045.7708	(97)
Space heating kWh	332.5792	262.2526	216.5198	122.6396	51.8929	0.0000	0.0000	0.0000	0.0000	113.9598	231.6877	347.3905	(98a)
Space heating requirement - total per year (kWh/year)												1678.9221	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	332.5792	262.2526	216.5198	122.6396	51.8929	0.0000	0.0000	0.0000	0.0000	113.9598	231.6877	347.3905	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1678.9221	
Space heating per m2											(98c) / (4) =	23.1002	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	332.5792	262.2526	216.5198	122.6396	51.8929	0.0000	0.0000	0.0000	0.0000	113.9598	231.6877	347.3905	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	498.8688	393.3790	324.7797	183.9593	77.8394	0.0000	0.0000	0.0000	0.0000	170.9397	347.5315	521.0857	
Space heating requirement													
	498.8688	393.3790	324.7797	183.9593	77.8394	0.0000	0.0000	0.0000	0.0000	170.9397	347.5315	521.0857	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	
Water heating fuel													
	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9032	-24.7478	-42.1903	-54.3464	-63.2831	-60.6270	-59.4769	-53.4801	-43.2885	-30.7805	-17.3978	-12.3224	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5955	-11.8305	-29.8051	-54.5176	-80.7077	-84.5250	-82.2640	-64.2624	-40.1739	-18.7163	-6.5523	-3.4266	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												2518.3832	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3917.1568	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												25.1838	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.9861	(330a)
Total electricity for the above, kWh/year												19.9861	(331)
Electricity for lighting (calculated in Appendix L)												193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5690.7453	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2518.3832	4.4400	111.8162	(340a)
Space heating total			111.8162	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3917.1568	4.4400	173.9218	(342a)
Water heating total			173.9218	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	16.4900	3.2957	(349)
Energy for lighting	193.4401	16.4900	31.8983	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	16.4900	-78.6316	
PV Unit electricity exported	-481.3770	5.5900	-26.9090	
Total			-105.5405	(352)
Total energy cost			307.3914	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.9404	(357)
SAP value	84.7569	
SAP rating (Section 12)	85	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1716.1440	0.1553	104.3175	(367)
Electrical energy for heat distribution (space & water)	25.1838	0.0000	9.4298	(372)
Overall CO2 factor for heat network			0.0405	(386)
Total CO2 associated with community systems			260.8902	(373)
Space and water heating			260.8902	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	0.1320	-62.9388	
PV Unit electricity exported	-481.3770	0.1213	-58.4056	
Total			-121.3444	(380)
Total CO2, kg/year			170.2375	(383)
CO2 emissions per m2			2.3400	(384)
EI value			98.0615	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b) x	2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c) x	2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 72.6800						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	0 * 10 = 0.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	3	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11875.9502 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

Thermal bridges (User defined value 0.030 * total exposed area) 4.9323 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)

Average = Sum(39)m / 12 = 70.4500

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 118.0387 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =		2611.4378	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
303.6858 306.8371 298.8959 281.9900 260.6494 240.5922 227.1928 224.0415 231.9827 248.8885 270.2292 290.2863 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 (71)
Water heating gains (Table 5)
150.3258 147.9809 143.4637 133.5631 127.4987 121.1599 117.2665 120.4831 124.2544 131.2879 140.7789 149.0599 (72)
Total internal gains
578.7486 576.4933 559.4929 527.8812 496.6954 468.5559 452.0241 455.1511 471.4055 500.1502 534.7626 564.8443 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	4.8400	13.7758	0.7300	0.7000	0.7700	23.6110	(75)
Southeast	1.2200	42.9509	0.7300	0.7000	0.7700	18.5561	(77)
Southwest	1.2200	42.9509	0.7300	0.7000	0.7700	18.5561	(79)

Solar gains 60.7232 99.1478 152.5336 222.9299 268.1175 298.3804 277.0426 237.8680 185.5364 121.0636 73.1026 51.3078 (83)
Total gains 639.4718 675.6411 712.0265 750.8111 764.8129 766.9363 729.0668 693.0191 656.9419 621.2138 607.8652 616.1522 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area	0.9590	0.9456	0.9105	0.8404	0.7125	0.5134	0.3726	0.4101	0.6478	0.8483	0.9366	0.9643	(86)
MIT	19.8466	19.9910	20.2810	20.5888	20.8404	20.9684	20.9934	20.9902	20.9162	20.6373	20.1878	19.7910	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house	0.9513	0.9354	0.8935	0.8104	0.6617	0.4415	0.2895	0.3240	0.5780	0.8133	0.9228	0.9574	(89)
MIT 2	18.7868	18.9668	19.3245	19.6912	19.9695	20.0892	20.1065	20.1049	20.0477	19.7556	19.2153	18.7174	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.1756	19.3425	19.6754	20.0204	20.2890	20.4117	20.4318	20.4296	20.3662	20.0790	19.5720	19.1112	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1756	19.3425	19.6754	20.0204	20.2890	20.4117	20.4318	20.4296	20.3662	20.0790	19.5720	19.1112	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9412	0.9248	0.8839	0.8071	0.6725	0.4665	0.3199	0.3554	0.5991	0.8120	0.9130	0.9478	(94)
Useful gains	601.8989	624.8271	629.3737	605.9943	514.3745	357.7571	233.2317	246.3154	393.5778	504.4091	554.9516	584.0017	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	1026.8502	996.3406	892.9797	755.2537	569.8683	367.1648	234.7258	248.6604	420.3216	632.5711	850.4752	1029.3578	(97)
Space heating kWh	316.1638	249.6570	196.1229	107.4667	41.2874	0.0000	0.0000	0.0000	0.0000	95.3525	212.7770	331.3449	(98a)
Space heating requirement - total per year (kWh/year)												1550.1722	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	316.1638	249.6570	196.1229	107.4667	41.2874	0.0000	0.0000	0.0000	0.0000	95.3525	212.7770	331.3449	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1550.1722	
Space heating per m2											(98c) / (4) =	21.3287	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement
316.1638 249.6570 196.1229 107.4667 41.2874 0.0000 0.0000 0.0000 0.0000 95.3525 212.7770 331.3449 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50
307a 474.2456 374.4855 294.1843 161.2001 61.9310 0.0000 0.0000 0.0000 0.0000 143.0288 319.1654 497.0174
Space heating requirement
474.2456 374.4855 294.1843 161.2001 61.9310 0.0000 0.0000 0.0000 0.0000 143.0288 319.1654 497.0174 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)

Water heating
Annual water heating requirement
258.6481 228.8785 243.2936 214.0064 207.5704 187.1484 184.6748 191.8723 193.8492 216.0491 229.6316 255.8155 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50
310a 387.9721 343.3178 364.9404 321.0096 311.3556 280.7226 277.0123 287.8084 290.7737 324.0737 344.4473 383.7233
Water heating fuel
387.9721 343.3178 364.9404 321.0096 311.3556 280.7226 277.0123 287.8084 290.7737 324.0737 344.4473 383.7233 (310)
Cooling System Energy Efficiency Ratio 0.0000 (314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (315)
Pumps and Fa 1.6975 1.5332 1.6975 1.6427 1.6975 1.6427 1.6975 1.6975 1.6427 1.6975 1.6427 1.6975 (331)
Lighting 23.9686 19.2285 17.3131 12.6843 9.7977 8.0048 8.9378 11.6177 15.0903 19.7993 22.3632 24.6347 (332)
Electricity generated by PVs (Appendix M) (negative quantity)
(333a)m -17.7988 -26.5546 -44.3894 -57.0811 -64.6020 -64.1536 -62.3425 -56.9881 -46.9012 -34.2077 -20.4034 -14.8306 (333a)

Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.1997	-13.4106	-32.8557	-60.4920	-84.6385	-96.9652	-92.1477	-74.2535	-47.4476	-22.7886	-8.6270	-4.6681	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2325.2582	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3917.1568	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	23.2526	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
Total electricity for the above, kWh/year	19.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5401.0942	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2325.2582	6.5500	152.3044	(340a)
Space heating total			152.3044	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3917.1568	6.5500	256.5738	(342a)
Water heating total			256.5738	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	28.4300	5.6821	(349)
Energy for lighting	193.4401	28.4300	54.9950	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.2528	28.4300	-145.0649	
PV Unit electricity exported	-544.4942	5.8100	-31.6351	
Total			-176.7000	(352)
Total energy cost			396.8553	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1664.6440	0.1557	96.5643	(367)
Electrical energy for heat distribution (space & water)	23.2526	0.0000	9.1390	(372)
Overall CO2 factor for heat network			0.0405	(386)
Total CO2 associated with community systems			252.8463	(373)
Space and water heating			252.8463	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.2528	0.1323	-67.5052	
PV Unit electricity exported	-544.4942	0.1214	-66.0897	
Total			-133.5948	(380)
Total CO2, kg/year			149.9431	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1664.6440	1.5766	977.5724	(467)
Electrical energy for heat distribution (space & water)	23.2526	0.0000	96.2335	(472)
Overall CO2 factor for heat network			0.4265	(486)
Total CO2 associated with community systems			2662.4604	(473)
Space and water heating			2662.4604	(476)
Pumps, fans and electric keep-hot	19.9861	1.5128	30.2350	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.2528	1.4888	-759.6722	
PV Unit electricity exported	-544.4942	0.4453	-242.4386	
Total			-1002.1108	(480)
Total Primary energy kWh/year			1987.2896	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Northeast

Current energy efficiency rating: B 85
Current environmental impact rating: A 98

N Solar water heating — Recommended
U Solar photovoltaic panels — Already installed
V2 Wind turbine — Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.4	-£ 47	-26 kg (17.3%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£47	0.36 kg/m²	B 86	A 98
Total Savings	£47	0.36 kg/m²		

Potential energy efficiency rating: B 86
Potential environmental impact rating: A 98

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£61	£83	-£23
Community scheme	£513	£444	£69
Space heating	£262	£285	-£23
Water heating	£257	£188	£69
Lighting	£55	£55	£0
Generated (PV)	-£177	-£178	£1
Total cost of fuels	£397	£349	£47
Total cost of uses	£397	£350	£47
Delivered energy	74 kWh/m²	61 kWh/m²	13 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	2 kg/m²	2 kg/m²	0 kg/m²
Primary energy	27 kWh/m²	23 kWh/m²	4 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330 (1b) - (3b)	
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		4.9323 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3094	(42)
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												624.1873	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												624.1873	
Solar input	-0.0000	-16.2194	-58.0608	-80.0094	-105.2873	-97.2929	-96.7392	-84.2620	-57.6788	-28.6375	-0.0000	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.6481	212.6591	185.2328	133.9970	102.2831	89.8555	87.9356	107.6103	136.1704	187.4116	229.6316	255.8155	(64)
									Total per year (kWh/year) = Sum(64)m =			1987.2506	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757 (71)
Water heating gains (Table 5)												
	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599 (72)
Total internal gains												
	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	4.8400	11.2829	0.7300	0.7000	0.7700	19.3385	(75)
Southeast	1.2200	36.7938	0.7300	0.7000	0.7700	15.8960	(77)
Southwest	1.2200	36.7938	0.7300	0.7000	0.7700	15.8960	(79)

Solar gains	51.1305	93.5177	145.0168	208.2811	259.3954	269.0015	254.5679	214.6790	166.6485	107.9573	62.4124	43.0002	(83)
Total gains	629.8791	670.0110	704.5098	736.1623	756.0907	737.5573	706.5920	669.8301	638.0540	608.1075	597.1750	607.8445	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9631	0.9499	0.9211	0.8589	0.7433	0.5773	0.4303	0.4710	0.6832	0.8718	0.9448	0.9677	(86)
MIT	19.7876	19.9409	20.2073	20.5316	20.8017	20.9467	20.9874	20.9817	20.8932	20.5690	20.1170	19.7334	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9562	0.9405	0.9062	0.8319	0.6965	0.5078	0.3468	0.3851	0.6166	0.8416	0.9329	0.9616	(89)
MIT 2	18.7126	18.9042	19.2344	19.6251	19.9294	20.0720	20.1032	20.0999	20.0273	19.6773	19.1279	18.6449	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.1069	19.2845	19.5913	19.9576	20.2494	20.3928	20.4275	20.4234	20.3449	20.0044	19.4907	19.0442	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1069	19.2845	19.5913	19.9576	20.2494	20.3928	20.4275	20.4234	20.3449	20.0044	19.4907	19.0442	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9464	0.9300	0.8960	0.8268	0.7044	0.5307	0.3771	0.4160	0.6352	0.8376	0.9229	0.9523	(94)
Useful gains	596.1342	623.1279	631.2604	608.6754	532.5558	391.3997	266.4808	278.6666	405.2781	509.3698	551.1358	578.8482	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1043.1492	1013.3848	922.2817	779.0081	602.3043	408.1058	269.6488	283.4466	439.9550	662.5416	872.9243	1045.7708	(97)
Space heating kWh													
	332.5792	262.2526	216.5198	122.6396	51.8929	0.0000	0.0000	0.0000	0.0000	113.9598	231.6877	347.3905	(98a)
Space heating requirement - total per year (kWh/year)												1678.9221	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	332.5792	262.2526	216.5198	122.6396	51.8929	0.0000	0.0000	0.0000	0.0000	113.9598	231.6877	347.3905	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1678.9221	
Space heating per m2											(98c) / (4) =	23.1002	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	332.5792	262.2526	216.5198	122.6396	51.8929	0.0000	0.0000	0.0000	0.0000	113.9598	231.6877	347.3905	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	498.8688	393.3790	324.7797	183.9593	77.8394	0.0000	0.0000	0.0000	0.0000	170.9397	347.5315	521.0857	
Space heating requirement													
	498.8688	393.3790	324.7797	183.9593	77.8394	0.0000	0.0000	0.0000	0.0000	170.9397	347.5315	521.0857	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	212.6591	185.2328	133.9970	102.2831	89.8555	87.9356	107.6103	136.1704	187.4116	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	318.9886	277.8492	200.9955	153.4247	134.7833	131.9034	161.4154	204.2556	281.1174	344.4473	383.7233	
Water heating fuel													
	387.9721	318.9886	277.8492	200.9955	153.4247	134.7833	131.9034	161.4154	204.2556	281.1174	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	8.4920	7.6702	8.4920	8.2180	8.4920	8.2180	8.4920	8.4920	8.2180	8.4920	8.2180	8.4920	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9541	-24.8708	-42.4882	-54.8798	-64.0812	-61.5030	-60.3713	-54.2093	-43.7560	-31.0030	-17.4758	-12.3621	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5447	-11.7075	-29.5072	-53.9842	-79.9096	-83.6490	-81.3696	-63.5332	-39.7064	-18.4938	-6.4743	-3.3869	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2518.3832	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2980.8759	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	25.1838	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4834.4644	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2518.3832	4.4400	111.8162	(340a)
Space heating total			111.8162	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2980.8759	4.4400	132.3509	(342a)
Water heating total			132.3509	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	16.4900	3.2957	(349)
Pump for solar water heating	80.0000	16.4900	13.1920	(349)
Energy for lighting	193.4401	16.4900	31.8983	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-481.9545	16.4900	-79.4743	
PV Unit electricity exported	-476.2665	5.5900	-26.6233	
Total			-106.0976	(352)
Total energy cost			278.4555	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.8518	(357)
SAP value	86.1917	
SAP rating (Section 12)	86	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1466.4691	0.1553	104.3175	(367)
Electrical energy for heat distribution (space & water)	25.1838	0.0000	8.2358	(372)
Overall CO2 factor for heat network			0.0414	(386)
Total CO2 associated with community systems			227.8563	(373)
Space and water heating			227.8563	(376)
Pumps, fans and electric keep-hot	99.9861	0.1387	13.8693	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-481.9545	0.1319	-63.5856	
PV Unit electricity exported	-476.2665	0.1213	-57.7895	
Total			-121.3751	(380)
Total CO2, kg/year			148.2699	(383)
CO2 emissions per m2			2.0400	(384)
EI value			98.3117	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330 (1b) - (3b)	
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		4.9323 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.3094	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day)	118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	

Distribution loss (46)m = 0.15 x (45)m

30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)

Water storage loss:

Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												698.3818	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												698.3818	
Solar input	-0.2882	-19.8943	-63.0504	-86.9122	-108.6771	-108.6071	-105.7317	-94.9883	-67.4759	-37.8323	-4.9243	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	258.3599	208.9842	180.2432	127.0942	98.8933	78.5413	78.9431	96.8840	126.3733	178.2168	224.7072	255.8155	(64)
									Total per year (kWh/year) = Sum(64)m =			1913.0561	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month													
	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)													
	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)
Total internal gains													
	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	4.8400	13.7758	0.7300	0.7000	0.7700	23.6110	(75)
Southeast	1.2200	42.9509	0.7300	0.7000	0.7700	18.5561	(77)
Southwest	1.2200	42.9509	0.7300	0.7000	0.7700	18.5561	(79)

Solar gains	60.7232	99.1478	152.5336	222.9299	268.1175	298.3804	277.0426	237.8680	185.5364	121.0636	73.1026	51.3078	(83)
Total gains	639.4718	675.6411	712.0265	750.8111	764.8129	766.9363	729.0668	693.0191	656.9419	621.2138	607.8652	616.1522	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9590	0.9456	0.9105	0.8404	0.7125	0.5134	0.3726	0.4101	0.6478	0.8483	0.9366	0.9643	(86)
MIT	19.8466	19.9910	20.2810	20.5888	20.8404	20.9684	20.9934	20.9902	20.9162	20.6373	20.1878	19.7910	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9513	0.9354	0.8935	0.8104	0.6617	0.4415	0.2895	0.3240	0.5780	0.8133	0.9228	0.9574	(89)
MIT 2	18.7868	18.9668	19.3245	19.6912	19.9695	20.0892	20.1065	20.1049	20.0477	19.7556	19.2153	18.7174	(90)
Living area fraction									fLA = Living area / (4) =			0.3668	(91)
MIT	19.1756	19.3425	19.6754	20.0204	20.2890	20.4117	20.4318	20.4296	20.3662	20.0790	19.5720	19.1112	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1756	19.3425	19.6754	20.0204	20.2890	20.4117	20.4318	20.4296	20.3662	20.0790	19.5720	19.1112	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9412	0.9248	0.8839	0.8071	0.6725	0.4665	0.3199	0.3554	0.5991	0.8120	0.9130	0.9478	(94)
Useful gains	601.8989	624.8271	629.3737	605.9943	514.3745	357.7571	233.2317	246.3154	393.5778	504.4091	554.9516	584.0017	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	1026.8502	996.3406	892.9797	755.2537	569.8683	367.1648	234.7258	248.6604	420.3216	632.5711	850.4752	1029.3578	(97)
Space heating kWh													
	316.1638	249.6570	196.1229	107.4667	41.2874	0.0000	0.0000	0.0000	0.0000	95.3525	212.7770	331.3449	(98a)
Space heating requirement - total per year (kWh/year)												1550.1722	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	316.1638	249.6570	196.1229	107.4667	41.2874	0.0000	0.0000	0.0000	0.0000	95.3525	212.7770	331.3449	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1550.1722	
Space heating per m2											(98c) / (4) =	21.3287	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement

	316.1638	249.6570	196.1229	107.4667	41.2874	0.0000	0.0000	0.0000	0.0000	95.3525	212.7770	331.3449	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	474.2456	374.4855	294.1843	161.2001	61.9310	0.0000	0.0000	0.0000	0.0000	143.0288	319.1654	497.0174	
Space heating requirement													
	474.2456	374.4855	294.1843	161.2001	61.9310	0.0000	0.0000	0.0000	0.0000	143.0288	319.1654	497.0174	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement

	258.3599	208.9842	180.2432	127.0942	98.8933	78.5413	78.9431	96.8840	126.3733	178.2168	224.7072	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.5399	313.4764	270.3648	190.6413	148.3399	117.8120	118.4147	145.3260	189.5599	267.3252	337.0608	383.7233	
Water heating fuel													
	387.5399	313.4764	270.3648	190.6413	148.3399	117.8120	118.4147	145.3260	189.5599	267.3252	337.0608	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	8.4920	7.6702	8.4920	8.2180	8.4920	8.2180	8.4920	8.4920	8.2180	8.4920	8.2180	8.4920	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.8663	-26.6927	-44.7143	-57.6640	-65.4319	-65.1316	-63.3225	-57.8097	-47.4406	-34.4735	-20.5043	-14.8840	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.1321	-13.2725	-32.5307	-59.9091	-83.8086	-95.9871	-91.1676	-73.4319	-46.9082	-22.5228	-8.5261	-4.6148	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2325.2582	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2869.5841	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	23.2526	(313)
Space cooling fuel	0.0000	(321)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)

mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4433.5216	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2325.2582	6.5500	152.3044	(340a)
Space heating total			152.3044	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2869.5841	6.5500	187.9578	(342a)
Water heating total			187.9578	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	28.4300	5.6821	(349)
Pump for solar water heating	80.0000	28.4300	22.7440	(349)
Energy for lighting	193.4401	28.4300	54.9950	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-515.9355	28.4300	-146.6805	
PV Unit electricity exported	-538.8116	5.8100	-31.3050	
Total			-177.9854	(352)
Total energy cost			349.6979	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1385.2913	0.1557	96.5643	(367)
Electrical energy for heat distribution (space & water)	23.2526	0.0000	7.8013	(372)
Overall CO2 factor for heat network			0.0415	(386)
Total CO2 associated with community systems			215.8369	(373)
Space and water heating			215.8369	(376)
Pumps, fans and electric keep-hot	99.9861	0.1387	13.8693	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-515.9355	0.1322	-68.2250	
PV Unit electricity exported	-538.8116	0.1214	-65.4032	
Total			-133.6282	(380)
Total CO2, kg/year			123.9974	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1385.2913	1.5766	977.5724	(467)
Electrical energy for heat distribution (space & water)	23.2526	0.0000	80.8174	(472)
Overall CO2 factor for heat network			0.4304	(486)
Total CO2 associated with community systems			2235.9474	(473)
Space and water heating			2235.9474	(476)
Pumps, fans and electric keep-hot	99.9861	1.5128	151.2590	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-515.9355	1.4886	-768.0122	
PV Unit electricity exported	-538.8116	0.4453	-239.9213	
Total			-1007.9335	(480)
Total Primary energy kWh/year			1675.9778	(483)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.48	**TER**	11.91
Environmental	98 A	**% DER < TER**			79.18
CO_2 Emissions (t/year)	0.15	**DFEE**	33.80	**TFEE**	36.16
Compliance Check	See BREL	**% DFEE < TFEE**			6.53
% DPER < TPER	50.40	**DPER**	30.96	**TPER**	62.43

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				3	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =	11875.9502			(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							163.4005	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 4.9323 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 118.0387 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)											Total = Sum(45)m =	1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)

WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)

Total per year (kWh/year) = Sum(64)m = 2611.4378 (64)
12Total per year (kWh/year) 2611 (64)
Electric shower(s) 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)

Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)

Water heating gains (Table 5)

150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)

Total internal gains

529.9009	542.3600	519.8296	502.5508	478.2395	462.4112	445.5913	446.6965	459.7372	474.1489	501.8869	519.6574	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.2200	11.2829	0.7300	0.7000	0.7700	4.8746	(75)
Southeast	1.2200	36.7938	0.7300	0.7000	0.7700	15.8960	(77)
Northwest	4.8400	11.2829	0.7300	0.7000	0.7700	19.3385	(81)

Solar gains	40.1091	76.3632	125.8460	191.7362	247.4434	260.0301	244.7141	200.9562	148.3169	90.1575	49.5060	33.3773	(83)
Total gains	570.0100	618.7232	645.6756	694.2870	725.6828	722.4413	690.3054	647.6527	608.0541	564.3064	551.3929	553.0347	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9733	0.9609	0.9386	0.8776	0.7616	0.5872	0.4398	0.4855	0.7060	0.8938	0.9568	0.9764	(86)
MIT	19.6773	19.8517	20.1160	20.4827	20.7819	20.9433	20.9864	20.9796	20.8792	20.5142	20.0390	19.6307	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9681	0.9532	0.9262	0.8528	0.7158	0.5172	0.3548	0.3977	0.6398	0.8670	0.9470	0.9717	(89)
MIT 2	18.5749	18.7940	19.1243	19.5696	19.9098	20.0695	20.1027	20.0988	20.0154	19.6159	19.0325	18.5162	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.9793	19.1820	19.4881	19.9045	20.2297	20.3900	20.4268	20.4219	20.3322	19.9454	19.4017	18.9251	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9793	19.1820	19.4881	19.9045	20.2297	20.3900	20.4268	20.4219	20.3322	19.9454	19.4017	18.9251	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9596	0.9434	0.9160	0.8464	0.7225	0.5400	0.3856	0.4292	0.6574	0.8614	0.9374	0.9636	(94)
Useful gains	546.9585	583.7116	591.4102	587.6673	524.2838	390.1171	266.1621	277.9832	399.7631	486.0898	516.8818	532.9135	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1034.1559	1006.1643	915.0086	775.2699	600.9200	407.9052	269.5993	283.3405	439.0612	658.3833	866.6543	1037.3798	(97)
Space heating kWh													
	362.4749	283.8882	240.7572	135.0739	57.0173	0.0000	0.0000	0.0000	0.0000	128.1864	251.8362	375.3229	(98a)
Space heating requirement - total per year (kWh/year)												1834.5570	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	362.4749	283.8882	240.7572	135.0739	57.0173	0.0000	0.0000	0.0000	0.0000	128.1864	251.8362	375.3229	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1834.5570	
Space heating per m2											(98c) / (4) =	25.2416	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	362.4749	283.8882	240.7572	135.0739	57.0173	0.0000	0.0000	0.0000	0.0000	128.1864	251.8362	375.3229	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	543.7123	425.8324	361.1358	202.6108	85.5260	0.0000	0.0000	0.0000	0.0000	192.2796	377.7542	562.9844	
Space heating requirement													
	543.7123	425.8324	361.1358	202.6108	85.5260	0.0000	0.0000	0.0000	0.0000	192.2796	377.7542	562.9844	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	
Water heating fuel													
	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9032	-24.7478	-42.1903	-54.3464	-63.2831	-60.6270	-59.4769	-53.4801	-43.2885	-30.7805	-17.3978	-12.3224	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5955	-11.8305	-29.8051	-54.5176	-80.7077	-84.5250	-82.2640	-64.2624	-40.1739	-18.7163	-6.5523	-3.4266	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												2751.8355	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3917.1568	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												27.5184	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.9861	(330a)
Total electricity for the above, kWh/year												19.9861	(331)
Electricity for lighting (calculated in Appendix L)												193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5924.1976	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1778.3979	0.1553	113.9286	(367)
Electrical energy for heat distribution (space & water)	27.5184	0.0000	9.7902	(372)
Overall CO2 factor for heat network			0.0406	(386)
Total CO2 associated with community systems			270.8617	(373)
Space and water heating			270.8617	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	0.1320	-62.9388	
PV Unit electricity exported	-481.3770	0.1213	-58.4056	
Total			-121.3444	(380)
Total CO2, kg/year			180.2090	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.4800	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1778.3979	1.5748	1155.6180	(467)
Electrical energy for heat distribution (space & water)	27.5184	0.0000	102.9102	(472)
Overall CO2 factor for heat network			0.4269	(486)
Total CO2 associated with community systems			2847.1827	(473)
Space and water heating			2847.1827	(476)
Pumps, fans and electric keep-hot	19.9861	1.5128	30.2350	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	1.4877	-709.3875	
PV Unit electricity exported	-481.3770	0.4451	-214.2796	
Total			-923.6671	(480)
Total Primary energy kWh/year			2250.4556	(483)
Dwelling Primary energy Rate (DPER)			30.9600	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b) x	2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c) x	2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4185	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3243	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4135	0.4054	0.3973	0.3568	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3649	0.3811	(22b)
Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			7.2800	1.1450	8.3359			(27)
Heatloss floor			36.3400	0.1300	4.7242			(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.1800	14.8338			(29a)
500mm mineral wool	36.3400		36.3400	0.1100	3.9974			(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.9313			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	3.6500	0.0500	0.1825
E3 Sill	2.7400	0.0500	0.1370
E4 Jamb	14.8400	0.0500	0.7420
E5 Ground floor (normal)	18.7200	0.1600	2.9952
E6 Intermediate floor within a dwelling	18.7200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.7200	0.0600	1.1232
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	5.5000	0.0800	0.4400
P2 Party wall - Intermediate floor within a dwelling	5.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	5.5000	0.1200	0.6600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8399 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.7712 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.4047	34.2096	34.0184	33.1202	32.9522	32.1700	32.1700	32.0251	32.4713	32.9522	33.2921	33.6475	(38)
Heat transfer coeff	76.1759	75.9808	75.7896	74.8914	74.7234	73.9411	73.9411	73.7963	74.2424	74.7234	75.0633	75.4187	(39)
Average = Sum(39)m / 12 =												74.8906	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0481	1.0454	1.0428	1.0304	1.0281	1.0174	1.0174	1.0154	1.0215	1.0281	1.0328	1.0377	(40)
HLP (average)												1.0304	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	249.9662	221.0368	234.6117	205.6045	198.8885	178.7466	175.9929	183.1904	185.4473	207.3672	221.2297	247.1336	(62)
WWHRS	-28.7738	-25.4478	-26.6475	-22.0651	-20.5639	-17.5967	-16.4941	-17.5398	-18.2062	-21.4631	-24.3151	-28.2410	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
										Total per year (kWh/year) = Sum(64)m =		2241.8614	(64)
12Total per year (kWh/year)												2242	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	104.8969	93.1698	99.7915	89.4439	87.9135	80.5137	80.3008	82.6939	82.7417	90.7327	94.6393	103.9551	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	140.9904	138.6456	134.1284	124.2277	118.1634	111.8245	107.9311	111.1477	114.9190	121.9526	131.4435	139.7245	(72)
Total internal gains	523.5655	536.0247	513.4942	496.2155	471.9041	453.0758	436.2560	437.3612	450.4018	467.8135	495.5515	513.3220	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.2200	11.2829	0.6300	0.7000	0.7700	4.2068	(75)
Southeast	1.2200	36.7938	0.6300	0.7000	0.7700	13.7185	(77)
Northwest	4.8400	11.2829	0.6300	0.7000	0.7700	16.6894	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	34.6147	65.9025	108.6068	165.4709	213.5470	224.4095	211.1916	173.4279	127.9995	77.8071	42.7244	28.8050	(83)
Total gains	558.1802	601.9271	622.1010	661.6864	685.4511	677.4853	647.4476	610.7891	578.4014	545.6207	538.2759	542.1271	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3060	43.4172	43.5268	44.0488	44.1478	44.6149	44.6149	44.7025	44.4338	44.1478	43.9479	43.7408	
alpha	3.8871	3.8945	3.9018	3.9366	3.9432	3.9743	3.9743	3.9802	3.9623	3.9432	3.9299	3.9161	
util living area	0.9768	0.9669	0.9498	0.9007	0.8031	0.6377	0.4857	0.5306	0.7474	0.9106	0.9626	0.9791	(86)
MIT	19.4848	19.6624	19.9395	20.3505	20.6974	20.9135	20.9772	20.9677	20.8321	20.4127	19.9009	19.4612	(87)
Th 2	20.0434	20.0457	20.0478	20.0581	20.0600	20.0689	20.0689	20.0706	20.0655	20.0600	20.0561	20.0521	(88)
util rest of house	0.9720	0.9601	0.9390	0.8786	0.7591	0.5634	0.3901	0.4336	0.6809	0.8862	0.9538	0.9748	(89)
MIT 2	18.2869	18.5124	18.8623	19.3748	19.7794	20.0077	20.0583	20.0543	19.9333	19.4595	18.8233	18.2630	(90)
Living area fraction									fLA = Living area / (4) =			0.3668	(91)
MIT	18.7263	18.9342	19.2574	19.7327	20.1161	20.3399	20.3953	20.3893	20.2630	19.8091	19.2186	18.7025	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7263	18.9342	19.2574	19.7327	20.1161	20.3399	20.3953	20.3893	20.2630	19.8091	19.2186	18.7025	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9633	0.9500	0.9279	0.8697	0.7620	0.5860	0.4244	0.4680	0.6961	0.8785	0.9438	0.9667	(94)
Useful gains	537.6978	571.8220	577.2346	575.4712	522.3043	397.0299	274.8067	285.8203	402.6131	479.3082	508.0472	524.0498	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1098.9364	1066.3291	966.8795	811.2760	628.8831	424.4167	280.6313	294.3974	457.5544	688.1373	909.6602	1093.7637	(97)
Space heating kWh	417.5615	332.3088	289.8958	169.7794	79.2947	0.0000	0.0000	0.0000	0.0000	155.3688	289.1614	423.8672	(98a)
Space heating requirement - total per year (kWh/year)												2157.2376	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	417.5615	332.3088	289.8958	169.7794	79.2947	0.0000	0.0000	0.0000	0.0000	155.3688	289.1614	423.8672	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2157.2376	
Space heating per m2											(98c) / (4) =	29.6813	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 92.3000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	417.5615	332.3088	289.8958	169.7794	79.2947	0.0000	0.0000	0.0000	0.0000	155.3688	289.1614	423.8672	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	452.3960	360.0312	314.0799	183.9430	85.9097	0.0000	0.0000	0.0000	0.0000	168.3303	313.2842	459.2277	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4623	85.2382	84.8048	83.8854	82.3696	79.8000	79.8000	79.8000	79.8000	83.6602	84.9201	85.5155	(217)
Fuel for water heating, kWh/month	258.8187	229.4617	245.2271	218.7978	216.4932	201.9422	199.8732	207.5821	209.5753	222.2133	231.8823	255.9684	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.6146	19.7468	17.7798	13.0262	10.0618	8.2206	9.1787	11.9309	15.4970	20.3329	22.9660	25.2988	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-34.1427	-48.1921	-69.3402	-78.0353	-84.2042	-78.6248	-77.6860	-73.3488	-65.6465	-55.1924	-37.5712	-29.5143	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.0663	-40.1520	-79.8860	-120.0915	-158.8866	-159.6687	-157.7568	-133.4905	-97.7594	-57.4135	-25.4553	-15.0706	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2337.2022	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2697.8353	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	198.6542	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1796.1956	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3523.4962	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2337.2022	0.2100	490.8125	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2697.8353	0.2100	566.5454	(264)
Space and water heating			1057.3579	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	198.6542	0.1443	28.6719	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	0.1346	-98.4313	
PV Unit electricity exported	-1064.6971	0.1259	-134.0169	
Total			-232.4482	(269)
Total CO2, kg/year			865.5109	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.9100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2337.2022	1.1300	2641.0384	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2697.8353	1.1300	3048.5539	(278)
Space and water heating			5689.5924	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	198.6542	1.5338	304.7025	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	1.4973	-1095.2830	
PV Unit electricity exported	-1064.6971	0.4620	-491.9332	
Total			-1587.2162	(283)
Total Primary energy kWh/year			4537.1794	(286)
Target Primary Energy Rate (TPER)			62.4300	(287)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.48	**TER**	11.91
Environmental	98 A	**% DER < TER**			79.18
CO_2 Emissions (t/year)	0.15	**DFEE**	33.80	**TFEE**	36.16
Compliance Check	See BREL	**% DFEE < TFEE**			6.53
% DPER < TPER	50.40	**DPER**	30.96	**TPER**	62.43

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		3 * 10 =	30.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1685	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.3185	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2468	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3147	0.3085	0.3024	0.2715	0.2653	0.2345	0.2345	0.2283	0.2468	0.2653	0.2777	0.2900	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5495	0.5476	0.5457	0.5369	0.5352	0.5275	0.5275	0.5261	0.5305	0.5352	0.5386	0.5421	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		11875.9502	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							163.4005	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							4.9323	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.2906	32.1776	32.0668	31.5466	31.4493	30.9963	30.9963	30.9124	31.1708	31.4493	31.6462	31.8520	(38)
Heat transfer coeff	73.3597	73.2467	73.1359	72.6157	72.5184	72.0654	72.0654	71.9815	72.2399	72.5184	72.7153	72.9211	(39)
Average = Sum(39)m / 12 =												72.6153	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0094	1.0078	1.0063	0.9991	0.9978	0.9915	0.9915	0.9904	0.9939	0.9978	1.0005	1.0033	(40)
HLP (average)												0.9991	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												60.0096	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.4702	63.6744	61.7137	59.2732	57.0961	54.8336	54.3634	56.3200	58.3269	60.6504	63.1125	65.3783	(44)
Energy conte	103.6888	90.6715	94.8517	81.1421	76.8624	67.4243	65.7478	69.7360	71.9229	82.3020	89.9153	102.3666	(45)
Energy content (annual)										Total = Sum(45)m =		996.6312	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(64)
									Total per year (kWh/year) = Sum(64)m =			847.1365	(64)
12Total per year (kWh/year)												847	(64)
Electric shower(s)	50.4049	44.9112	49.0413	46.7995	47.6777	45.4799	46.9959	47.6777	46.7995	49.0413	48.1191	50.4049	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							573.3528	(64a)
Heat gains from water heating, kWh/month	34.6351	30.4955	32.4163	28.9426	28.2527	25.6976	25.7204	26.7383	26.9835	29.7495	31.1368	34.3541	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	46.5525	45.3802	43.5703	40.1980	37.9740	35.6912	34.5704	35.9386	37.4771	39.9859	43.2455	46.1749	(72)
Total internal gains	426.1276	439.7593	419.9362	409.1858	388.7147	376.9424	362.8952	362.1520	372.9599	382.8469	404.3535	416.7724	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.2200	11.2829	0.7300	0.7000	0.7700	4.8746	(75)
Southeast	1.2200	36.7938	0.7300	0.7000	0.7700	15.8960	(77)
Northwest	4.8400	11.2829	0.7300	0.7000	0.7700	19.3385	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	40.1091	76.3632	125.8460	191.7362	247.4434	260.0301	244.7141	200.9562	148.3169	90.1575	49.5060	33.3773	(83)
Total gains	466.2367	516.1225	545.7822	600.9220	636.1581	636.9725	607.6093	563.1082	521.2768	473.0043	453.8596	450.1497	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	44.9685	45.0379	45.1061	45.4292	45.4902	45.7762	45.7762	45.8295	45.6656	45.4902	45.3670	45.2389	
alpha	3.9979	4.0025	4.0071	4.0286	4.0327	4.0517	4.0517	4.0553	4.0444	4.0327	4.0245	4.0159	
util living area	0.9869	0.9791	0.9648	0.9197	0.8240	0.6569	0.5033	0.5578	0.7834	0.9372	0.9776	0.9886	(86)

MIT	19.3894	19.5805	19.8751	20.3119	20.6827	20.9095	20.9761	20.9640	20.8096	20.3435	19.8034	19.3551	(87)
Th 2	20.0755	20.0768	20.0781	20.0841	20.0852	20.0904	20.0904	20.0914	20.0884	20.0852	20.0829	20.0806	(88)
util rest of house													
	0.9841	0.9746	0.9569	0.9009	0.7828	0.5836	0.4071	0.4597	0.7209	0.9187	0.9721	0.9861	(89)
MIT 2	18.6050	18.7949	19.0861	19.5125	19.8527	20.0398	20.0815	20.0769	19.9683	19.5502	19.0217	18.5747	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.8927	19.0831	19.3755	19.8057	20.1572	20.3588	20.4097	20.4023	20.2769	19.8412	19.3084	18.8609	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8927	19.0831	19.3755	19.8057	20.1572	20.3588	20.4097	20.4023	20.2769	19.8412	19.3084	18.8609	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9793	0.9684	0.9494	0.8943	0.7864	0.6063	0.4418	0.4945	0.7351	0.9127	0.9660	0.9818	(94)
Useful gains	456.5999	499.8364	518.1912	537.3913	500.2582	386.2153	268.4145	278.4791	383.1868	431.7100	438.4212	441.9635	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1070.5162	1038.8627	941.6645	791.9271	613.3009	415.0103	274.5457	288.0927	446.2200	670.1569	887.7412	1069.0928	(97)
Space heating kWh													
	456.7537	362.2256	315.0641	183.2658	84.1038	0.0000	0.0000	0.0000	0.0000	177.4045	323.5104	466.5842	(98a)
Space heating requirement - total per year (kWh/year)												2368.9122	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	456.7537	362.2256	315.0641	183.2658	84.1038	0.0000	0.0000	0.0000	0.0000	177.4045	323.5104	466.5842	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2368.9122	
Space heating per m2											(98c) / (4) =	32.5937	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	677.4144	533.2836	547.0591	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8082	0.8756	0.8414	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	547.4721	466.9270	460.3036	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	687.9334	656.3462	606.7756	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	101.1322	140.9279	108.9752	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	25.2830	35.2320	27.2438	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												87.7588	(107)
Energy for space heating												32.5937	(99)
Energy for space cooling												1.2075	(108)
Total												33.8012	(109)
Fabric Energy Efficiency (DFEE)												33.8	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor		36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		=	178.0660	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4185	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3243	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4135	0.4054	0.3973	0.3568	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3649	0.3811	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			7.2800	1.1450	8.3359			(27)
Heatloss floor			36.3400	0.1300	4.7242			(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.1800	14.8338			(29a)
500mm mineral wool	36.3400		36.3400	0.1100	3.9974			(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.9313			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	3.6500	0.0500	0.1825
E3 Sill	2.7400	0.0500	0.1370
E4 Jamb	14.8400	0.0500	0.7420
E5 Ground floor (normal)	18.7200	0.1600	2.9952
E6 Intermediate floor within a dwelling	18.7200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.7200	0.0600	1.1232
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	5.5000	0.0800	0.4400
P2 Party wall - Intermediate floor within a dwelling	5.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	5.5000	0.1200	0.6600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8399 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.7712 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.4047	34.2096	34.0184	33.1202	32.9522	32.1700	32.1700	32.0251	32.4713	32.9522	33.2921	33.6475	(38)
Heat transfer coeff	76.1759	75.9808	75.7896	74.8914	74.7234	73.9411	73.9411	73.7963	74.2424	74.7234	75.0633	75.4187	(39)
Average = Sum(39)m / 12 =												74.8906	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0481	1.0454	1.0428	1.0304	1.0281	1.0174	1.0174	1.0154	1.0215	1.0281	1.0328	1.0377	(40)
HLP (average)												1.0304	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 60.0096 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.4702	63.6744	61.7137	59.2732	57.0961	54.8336	54.3634	56.3200	58.3269	60.6504	63.1125	65.3783	(44)
Energy conte	103.6888	90.6715	94.8517	81.1421	76.8624	67.4243	65.7478	69.7360	71.9229	82.3020	89.9153	102.3666	(45)
Energy content (annual)										Total = Sum(45)m =		996.6312	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(64)
								Total per year (kWh/year) = Sum(64)m =			847.1365	(64)
12Total per year (kWh/year)											847	(64)	

Electric shower(s)

50.4049	44.9112	49.0413	46.7995	47.6777	45.4799	46.9959	47.6777	46.7995	49.0413	48.1191	50.4049	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				573.3528	(64a)

Heat gains from water heating, kWh/month

34.6351	30.4955	32.4163	28.9426	28.2527	25.6976	25.7204	26.7383	26.9835	29.7495	31.1368	34.3541	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)													
	46.5525	45.3802	43.5703	40.1980	37.9740	35.6912	34.5704	35.9386	37.4771	39.9859	43.2455	46.1749	(72)
Total internal gains													
	426.1276	439.7593	419.9362	409.1858	388.7147	376.9424	362.8952	362.1520	372.9599	382.8469	404.3535	416.7724	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.2200	11.2829	0.6300	0.7000	0.7700	4.2068	(75)
Southeast	1.2200	36.7938	0.6300	0.7000	0.7700	13.7185	(77)
Northwest	4.8400	11.2829	0.6300	0.7000	0.7700	16.6894	(81)

Solar gains	34.6147	65.9025	108.6068	165.4709	213.5470	224.4095	211.1916	173.4279	127.9995	77.8071	42.7244	28.8050	(83)
Total gains	460.7423	505.6618	528.5430	574.6567	602.2618	601.3519	574.0868	535.5800	500.9595	460.6540	447.0779	445.5774	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3060	43.4172	43.5268	44.0488	44.1478	44.6149	44.6149	44.7025	44.4338	44.1478	43.9479	43.7408	
alpha	3.8871	3.8945	3.9018	3.9366	3.9432	3.9743	3.9743	3.9802	3.9623	3.9432	3.9299	3.9161	
util living area													
	0.9876	0.9809	0.9693	0.9319	0.8504	0.6940	0.5394	0.5917	0.8073	0.9440	0.9792	0.9891	(86)
MIT	19.2968	19.4830	19.7756	20.2239	20.6171	20.8826	20.9670	20.9525	20.7736	20.2829	19.7327	19.2730	(87)
Th 2	20.0434	20.0457	20.0478	20.0581	20.0600	20.0689	20.0689	20.0706	20.0655	20.0600	20.0561	20.0521	(88)
util rest of house													
	0.9849	0.9768	0.9622	0.9151	0.8120	0.6196	0.4365	0.4886	0.7466	0.9268	0.9740	0.9867	(89)
MIT 2	18.4896	18.6756	18.9661	19.4094	19.7758	20.0021	20.0565	20.0512	19.9209	19.4735	18.9321	18.4723	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.7857	18.9718	19.2631	19.7082	20.0844	20.3251	20.3905	20.3819	20.2337	19.7704	19.2258	18.7660	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7857	18.9718	19.2631	19.7082	20.0844	20.3251	20.3905	20.3819	20.2337	19.7704	19.2258	18.7660	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9802	0.9707	0.9548	0.9077	0.8131	0.6414	0.4733	0.5247	0.7587	0.9204	0.9679	0.9824	(94)
Useful gains	451.6119	490.8526	504.6297	521.6052	489.7189	385.7062	271.7343	281.0402	380.0899	423.9630	432.7286	437.7524	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1103.4592	1069.1835	967.3060	809.4393	626.5107	423.3212	280.2761	293.8459	455.3797	685.2402	910.2037	1098.5490	(97)
Space heating kWh													
	484.9744	388.6383	344.2312	207.2405	101.7731	0.0000	0.0000	0.0000	0.0000	194.3903	343.7820	491.6327	(98a)
Space heating requirement - total per year (kWh/year)												2556.6626	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	484.9744	388.6383	344.2312	207.2405	101.7731	0.0000	0.0000	0.0000	0.0000	194.3903	343.7820	491.6327	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2556.6626	
Space heating per m2											(98c) / (4) =	35.1770	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	695.0467	547.1644	560.8517	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7689	0.8440	0.8088	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	534.4391	461.7991	453.5958	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	646.2990	617.1641	574.5998	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	80.5391	115.5916	90.0270	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	20.1348	28.8979	22.5067	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												71.5394	(107)
Energy for space heating												35.1770	(99)
Energy for space cooling												0.9843	(108)
Total												36.1613	(109)
Fabric Energy Efficiency (TFEE)												36.2	(109)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.48	**TER**	11.91
Environmental	98 A	**% DER < TER**			79.18
CO_2 Emissions (t/year)	0.15	**DFEE**	33.80	**TFEE**	36.16
Compliance Check	See BREL	**% DFEE < TFEE**			6.53
% DPER < TPER	50.40	**DPER**	30.96	**TPER**	62.43

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				3	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =	11875.9502			(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							163.4005	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 4.9323 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 118.0387 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)											Total = Sum(45)m =	1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)

WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)

Total per year (kWh/year) = Sum(64)m = 2611.4378 (64)
12Total per year (kWh/year) 2611 (64)
Electric shower(s) 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)

Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)

Water heating gains (Table 5)

150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)

Total internal gains

529.9009	542.3600	519.8296	502.5508	478.2395	462.4112	445.5913	446.6965	459.7372	474.1489	501.8869	519.6574	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.2200	11.2829	0.7300	0.7000	0.7700	4.8746	(75)
Southeast	1.2200	36.7938	0.7300	0.7000	0.7700	15.8960	(77)
Northwest	4.8400	11.2829	0.7300	0.7000	0.7700	19.3385	(81)

Solar gains	40.1091	76.3632	125.8460	191.7362	247.4434	260.0301	244.7141	200.9562	148.3169	90.1575	49.5060	33.3773	(83)
Total gains	570.0100	618.7232	645.6756	694.2870	725.6828	722.4413	690.3054	647.6527	608.0541	564.3064	551.3929	553.0347	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9733	0.9609	0.9386	0.8776	0.7616	0.5872	0.4398	0.4855	0.7060	0.8938	0.9568	0.9764	(86)
MIT	19.6773	19.8517	20.1160	20.4827	20.7819	20.9433	20.9864	20.9796	20.8792	20.5142	20.0390	19.6307	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9681	0.9532	0.9262	0.8528	0.7158	0.5172	0.3548	0.3977	0.6398	0.8670	0.9470	0.9717	(89)
MIT 2	18.5749	18.7940	19.1243	19.5696	19.9098	20.0695	20.1027	20.0988	20.0154	19.6159	19.0325	18.5162	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.9793	19.1820	19.4881	19.9045	20.2297	20.3900	20.4268	20.4219	20.3322	19.9454	19.4017	18.9251	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9793	19.1820	19.4881	19.9045	20.2297	20.3900	20.4268	20.4219	20.3322	19.9454	19.4017	18.9251	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9596	0.9434	0.9160	0.8464	0.7225	0.5400	0.3856	0.4292	0.6574	0.8614	0.9374	0.9636	(94)
Useful gains	546.9585	583.7116	591.4102	587.6673	524.2838	390.1171	266.1621	277.9832	399.7631	486.0898	516.8818	532.9135	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1034.1559	1006.1643	915.0086	775.2699	600.9200	407.9052	269.5993	283.3405	439.0612	658.3833	866.6543	1037.3798	(97)
Space heating kWh													
	362.4749	283.8882	240.7572	135.0739	57.0173	0.0000	0.0000	0.0000	0.0000	128.1864	251.8362	375.3229	(98a)
Space heating requirement - total per year (kWh/year)												1834.5570	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	362.4749	283.8882	240.7572	135.0739	57.0173	0.0000	0.0000	0.0000	0.0000	128.1864	251.8362	375.3229	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1834.5570	
Space heating per m2											(98c) / (4) =	25.2416	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	362.4749	283.8882	240.7572	135.0739	57.0173	0.0000	0.0000	0.0000	0.0000	128.1864	251.8362	375.3229	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	543.7123	425.8324	361.1358	202.6108	85.5260	0.0000	0.0000	0.0000	0.0000	192.2796	377.7542	562.9844	
Space heating requirement													
	543.7123	425.8324	361.1358	202.6108	85.5260	0.0000	0.0000	0.0000	0.0000	192.2796	377.7542	562.9844	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	
Water heating fuel													
	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9032	-24.7478	-42.1903	-54.3464	-63.2831	-60.6270	-59.4769	-53.4801	-43.2885	-30.7805	-17.3978	-12.3224	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5955	-11.8305	-29.8051	-54.5176	-80.7077	-84.5250	-82.2640	-64.2624	-40.1739	-18.7163	-6.5523	-3.4266	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												2751.8355	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3917.1568	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												27.5184	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.9861	(330a)
Total electricity for the above, kWh/year												19.9861	(331)
Electricity for lighting (calculated in Appendix L)												193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5924.1976	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1778.3979	0.1553	113.9286	(367)
Electrical energy for heat distribution (space & water)	27.5184	0.0000	9.7902	(372)
Overall CO2 factor for heat network			0.0406	(386)
Total CO2 associated with community systems			270.8617	(373)
Space and water heating			270.8617	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	0.1320	-62.9388	
PV Unit electricity exported	-481.3770	0.1213	-58.4056	
Total			-121.3444	(380)
Total CO2, kg/year			180.2090	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.4800	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1778.3979	1.5748	1155.6180	(467)
Electrical energy for heat distribution (space & water)	27.5184	0.0000	102.9102	(472)
Overall CO2 factor for heat network			0.4269	(486)
Total CO2 associated with community systems			2847.1827	(473)
Space and water heating			2847.1827	(476)
Pumps, fans and electric keep-hot	19.9861	1.5128	30.2350	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	1.4877	-709.3875	
PV Unit electricity exported	-481.3770	0.4451	-214.2796	
Total			-923.6671	(480)
Total Primary energy kWh/year			2250.4556	(483)
Dwelling Primary energy Rate (DPER)			30.9600	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b) x	2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c) x	2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4185	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3243	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4135	0.4054	0.3973	0.3568	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3649	0.3811	(22b)
Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			7.2800	1.1450	8.3359			(27)
Heatloss floor			36.3400	0.1300	4.7242			(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.1800	14.8338			(29a)
500mm mineral wool	36.3400		36.3400	0.1100	3.9974			(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.9313			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	3.6500	0.0500	0.1825
E3 Sill	2.7400	0.0500	0.1370
E4 Jamb	14.8400	0.0500	0.7420
E5 Ground floor (normal)	18.7200	0.1600	2.9952
E6 Intermediate floor within a dwelling	18.7200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.7200	0.0600	1.1232
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	5.5000	0.0800	0.4400
P2 Party wall - Intermediate floor within a dwelling	5.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	5.5000	0.1200	0.6600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8399 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.7712 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.4047	34.2096	34.0184	33.1202	32.9522	32.1700	32.1700	32.0251	32.4713	32.9522	33.2921	33.6475	(38)
Heat transfer coeff	76.1759	75.9808	75.7896	74.8914	74.7234	73.9411	73.9411	73.7963	74.2424	74.7234	75.0633	75.4187	(39)
Average = Sum(39)m / 12 =												74.8906	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0481	1.0454	1.0428	1.0304	1.0281	1.0174	1.0174	1.0154	1.0215	1.0281	1.0328	1.0377	(40)
HLP (average)												1.0304	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	249.9662	221.0368	234.6117	205.6045	198.8885	178.7466	175.9929	183.1904	185.4473	207.3672	221.2297	247.1336	(62)
WWHRS	-28.7738	-25.4478	-26.6475	-22.0651	-20.5639	-17.5967	-16.4941	-17.5398	-18.2062	-21.4631	-24.3151	-28.2410	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
										Total per year (kWh/year) = Sum(64)m =		2241.8614	(64)
12Total per year (kWh/year)												2242	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	104.8969	93.1698	99.7915	89.4439	87.9135	80.5137	80.3008	82.6939	82.7417	90.7327	94.6393	103.9551	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	140.9904	138.6456	134.1284	124.2277	118.1634	111.8245	107.9311	111.1477	114.9190	121.9526	131.4435	139.7245	(72)
Total internal gains	523.5655	536.0247	513.4942	496.2155	471.9041	453.0758	436.2560	437.3612	450.4018	467.8135	495.5515	513.3220	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.2200	11.2829	0.6300	0.7000	0.7700	4.2068	(75)
Southeast	1.2200	36.7938	0.6300	0.7000	0.7700	13.7185	(77)
Northwest	4.8400	11.2829	0.6300	0.7000	0.7700	16.6894	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	34.6147	65.9025	108.6068	165.4709	213.5470	224.4095	211.1916	173.4279	127.9995	77.8071	42.7244	28.8050	(83)
Total gains	558.1802	601.9271	622.1010	661.6864	685.4511	677.4853	647.4476	610.7891	578.4014	545.6207	538.2759	542.1271	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3060	43.4172	43.5268	44.0488	44.1478	44.6149	44.6149	44.7025	44.4338	44.1478	43.9479	43.7408	
alpha	3.8871	3.8945	3.9018	3.9366	3.9432	3.9743	3.9743	3.9802	3.9623	3.9432	3.9299	3.9161	
util living area	0.9768	0.9669	0.9498	0.9007	0.8031	0.6377	0.4857	0.5306	0.7474	0.9106	0.9626	0.9791	(86)
MIT	19.4848	19.6624	19.9395	20.3505	20.6974	20.9135	20.9772	20.9677	20.8321	20.4127	19.9009	19.4612	(87)
Th 2	20.0434	20.0457	20.0478	20.0581	20.0600	20.0689	20.0689	20.0706	20.0655	20.0600	20.0561	20.0521	(88)
util rest of house	0.9720	0.9601	0.9390	0.8786	0.7591	0.5634	0.3901	0.4336	0.6809	0.8862	0.9538	0.9748	(89)
MIT 2	18.2869	18.5124	18.8623	19.3748	19.7794	20.0077	20.0583	20.0543	19.9333	19.4595	18.8233	18.2630	(90)
Living area fraction									fLA = Living area / (4) =			0.3668	(91)
MIT	18.7263	18.9342	19.2574	19.7327	20.1161	20.3399	20.3953	20.3893	20.2630	19.8091	19.2186	18.7025	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7263	18.9342	19.2574	19.7327	20.1161	20.3399	20.3953	20.3893	20.2630	19.8091	19.2186	18.7025	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9633	0.9500	0.9279	0.8697	0.7620	0.5860	0.4244	0.4680	0.6961	0.8785	0.9438	0.9667	(94)
Useful gains	537.6978	571.8220	577.2346	575.4712	522.3043	397.0299	274.8067	285.8203	402.6131	479.3082	508.0472	524.0498	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1098.9364	1066.3291	966.8795	811.2760	628.8831	424.4167	280.6313	294.3974	457.5544	688.1373	909.6602	1093.7637	(97)
Space heating kWh	417.5615	332.3088	289.8958	169.7794	79.2947	0.0000	0.0000	0.0000	0.0000	155.3688	289.1614	423.8672	(98a)
Space heating requirement - total per year (kWh/year)												2157.2376	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	417.5615	332.3088	289.8958	169.7794	79.2947	0.0000	0.0000	0.0000	0.0000	155.3688	289.1614	423.8672	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2157.2376	
Space heating per m2											(98c) / (4) =	29.6813	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 92.3000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	417.5615	332.3088	289.8958	169.7794	79.2947	0.0000	0.0000	0.0000	0.0000	155.3688	289.1614	423.8672	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	452.3960	360.0312	314.0799	183.9430	85.9097	0.0000	0.0000	0.0000	0.0000	168.3303	313.2842	459.2277	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4623	85.2382	84.8048	83.8854	82.3696	79.8000	79.8000	79.8000	79.8000	83.6602	84.9201	85.5155	(217)
Fuel for water heating, kWh/month	258.8187	229.4617	245.2271	218.7978	216.4932	201.9422	199.8732	207.5821	209.5753	222.2133	231.8823	255.9684	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.6146	19.7468	17.7798	13.0262	10.0618	8.2206	9.1787	11.9309	15.4970	20.3329	22.9660	25.2988	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-34.1427	-48.1921	-69.3402	-78.0353	-84.2042	-78.6248	-77.6860	-73.3488	-65.6465	-55.1924	-37.5712	-29.5143	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.0663	-40.1520	-79.8860	-120.0915	-158.8866	-159.6687	-157.7568	-133.4905	-97.7594	-57.4135	-25.4553	-15.0706	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2337.2022	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2697.8353	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	198.6542	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1796.1956	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3523.4962	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2337.2022	0.2100	490.8125	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2697.8353	0.2100	566.5454	(264)
Space and water heating			1057.3579	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	198.6542	0.1443	28.6719	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	0.1346	-98.4313	
PV Unit electricity exported	-1064.6971	0.1259	-134.0169	
Total			-232.4482	(269)
Total CO2, kg/year			865.5109	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.9100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2337.2022	1.1300	2641.0384	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2697.8353	1.1300	3048.5539	(278)
Space and water heating			5689.5924	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	198.6542	1.5338	304.7025	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	1.4973	-1095.2830	
PV Unit electricity exported	-1064.6971	0.4620	-491.9332	
Total			-1587.2162	(283)
Total Primary energy kWh/year			4537.1794	(286)
Target Primary Energy Rate (TPER)			62.4300	(287)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.48	**TER**	11.91
Environmental	98 A	**% DER < TER**			79.18
CO_2 Emissions (t/year)	0.15	**DFEE**	33.80	**TFEE**	36.16
Compliance Check	See BREL	**% DFEE < TFEE**			6.53
% DPER < TPER	50.40	**DPER**	30.96	**TPER**	62.43

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				3	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =	11875.9502			(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							163.4005	(35)

Thermal bridges (User defined value 0.030 * total exposed area)												4.9323	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	41.0691	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3094	(42)
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)											Total = Sum(45)m =	1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =		2611.4378	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)
Total internal gains	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.2200	11.2829	0.7300	0.7000	0.7700	4.8746	(75)
Southeast	1.2200	36.7938	0.7300	0.7000	0.7700	15.8960	(77)
Northwest	4.8400	11.2829	0.7300	0.7000	0.7700	19.3385	(81)

Solar gains	40.1091	76.3632	125.8460	191.7362	247.4434	260.0301	244.7141	200.9562	148.3169	90.1575	49.5060	33.3773	(83)
Total gains	618.8576	652.8565	685.3389	719.6174	744.1387	728.5860	696.7382	656.1073	619.7225	590.3077	584.2687	598.2216	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area	0.9651	0.9537	0.9270	0.8664	0.7505	0.5832	0.4360	0.4799	0.6971	0.8808	0.9483	0.9694	(86)
MIT	19.7677	19.9115	20.1784	20.5128	20.7942	20.9447	20.9868	20.9804	20.8848	20.5475	20.0954	19.7157	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house	0.9585	0.9449	0.9129	0.8402	0.7041	0.5134	0.3516	0.3928	0.6307	0.8521	0.9370	0.9635	(89)
MIT 2	18.6878	18.8680	19.1996	19.6038	19.9220	20.0705	20.1029	20.0992	20.0202	19.6533	19.1016	18.6227	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.0839	19.2508	19.5586	19.9373	20.2419	20.3912	20.4271	20.4225	20.3374	19.9813	19.4661	19.0236	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0839	19.2508	19.5586	19.9373	20.2419	20.3912	20.4271	20.4225	20.3374	19.9813	19.4661	19.0236	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9490	0.9346	0.9027	0.8346	0.7114	0.5362	0.3822	0.4241	0.6487	0.8474	0.9271	0.9544	(94)
Useful gains	587.2805	610.1844	618.6386	600.5968	529.4021	390.6498	266.2918	278.2548	401.9992	500.2047	541.6858	570.9383	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1041.5284	1011.0136	919.9814	777.5744	601.7779	407.9885	269.6194	283.3827	439.4245	660.9095	871.1950	1044.3242	(97)
Space heating kWh	337.9605	269.3572	224.1991	127.4239	53.8476	0.0000	0.0000	0.0000	0.0000	119.5644	237.2466	352.1991	(98a)
Space heating requirement - total per year (kWh/year)												1721.7983	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	337.9605	269.3572	224.1991	127.4239	53.8476	0.0000	0.0000	0.0000	0.0000	119.5644	237.2466	352.1991	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1721.7983	
Space heating per m2											(98c) / (4) =	23.6901	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	337.9605	269.3572	224.1991	127.4239	53.8476	0.0000	0.0000	0.0000	0.0000	119.5644	237.2466	352.1991	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	506.9407	404.0358	336.2986	191.1358	80.7713	0.0000	0.0000	0.0000	0.0000	179.3466	355.8700	528.2986	
Space heating requirement													
	506.9407	404.0358	336.2986	191.1358	80.7713	0.0000	0.0000	0.0000	0.0000	179.3466	355.8700	528.2986	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	
Water heating fuel													
	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9032	-24.7478	-42.1903	-54.3464	-63.2831	-60.6270	-59.4769	-53.4801	-43.2885	-30.7805	-17.3978	-12.3224	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5955	-11.8305	-29.8051	-54.5176	-80.7077	-84.5250	-82.2640	-64.2624	-40.1739	-18.7163	-6.5523	-3.4266	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2582.6974	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3917.1568	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	25.8270	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
Total electricity for the above, kWh/year	19.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5755.0595	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2582.6974	4.4400	114.6718	(340a)
Space heating total			114.6718	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3917.1568	4.4400	173.9218	(342a)
Water heating total			173.9218	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	16.4900	3.2957	(349)
Energy for lighting	193.4401	16.4900	31.8983	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	16.4900	-78.6316	
PV Unit electricity exported	-481.3770	5.5900	-26.9090	
Total			-105.5405	(352)
Total energy cost			310.2470	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9491 (357)
SAP value		84.6153
SAP rating (Section 12)		85 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1733.2945	0.1553	106.9240	(367)
Electrical energy for heat distribution (space & water)	25.8270	0.0000	9.5275	(372)
Overall CO2 factor for heat network			0.0406	(386)
Total CO2 associated with community systems			263.5945	(373)
Space and water heating			263.5945	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	0.1320	-62.9388	
PV Unit electricity exported	-481.3770	0.1213	-58.4056	
Total			-121.3444	(380)
Total CO2, kg/year			172.9418	(383)
CO2 emissions per m2			2.3800	(384)
EI value			98.0307	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b)	x 2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c)	x 2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11875.9502 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

Thermal bridges (User defined value 0.030 * total exposed area) 4.9323 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)

Average = Sum(39)m / 12 = 70.4500

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 118.0387 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =		2611.4378	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
303.6858 306.8371 298.8959 281.9900 260.6494 240.5922 227.1928 224.0415 231.9827 248.8885 270.2292 290.2863 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 (71)
Water heating gains (Table 5)
150.3258 147.9809 143.4637 133.5631 127.4987 121.1599 117.2665 120.4831 124.2544 131.2879 140.7789 149.0599 (72)
Total internal gains
578.7486 576.4933 559.4929 527.8812 496.6954 468.5559 452.0241 455.1511 471.4055 500.1502 534.7626 564.8443 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.2200	13.7758	0.7300	0.7000	0.7700	5.9515	(75)
Southeast	1.2200	42.9509	0.7300	0.7000	0.7700	18.5561	(77)
Northwest	4.8400	13.7758	0.7300	0.7000	0.7700	23.6110	(81)

Solar gains	48.1187	81.8906	133.8929	207.1252	257.5021	290.0510	267.9526	224.4946	166.9156	102.2930	58.6028	40.2103	(83)
Total gains	626.8673	658.3839	693.3858	735.0064	754.1975	758.6069	719.9767	679.6458	638.3211	602.4432	593.3655	605.0546	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9615	0.9497	0.9168	0.8479	0.7191	0.5184	0.3771	0.4177	0.6617	0.8588	0.9409	0.9663	(86)
MIT	19.8243	19.9621	20.2541	20.5723	20.8348	20.9673	20.9931	20.9895	20.9093	20.6169	20.1644	19.7708	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9542	0.9401	0.9006	0.8187	0.6685	0.4460	0.2931	0.3302	0.5918	0.8251	0.9279	0.9598	(89)
MIT 2	18.7591	18.9313	19.2926	19.6729	19.9642	20.0884	20.1063	20.1046	20.0422	19.7334	19.1871	18.6923	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.1498	19.3094	19.6453	20.0028	20.2835	20.4108	20.4316	20.4292	20.3603	20.0575	19.5456	19.0879	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1498	19.3094	19.6453	20.0028	20.2835	20.4108	20.4316	20.4292	20.3603	20.0575	19.5456	19.0879	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9443	0.9297	0.8909	0.8149	0.6789	0.4711	0.3238	0.3621	0.6125	0.8230	0.9181	0.9504	(94)
Useful gains	591.9739	612.0755	617.7042	598.9480	512.0431	357.3550	233.1488	246.1160	390.9437	495.7857	544.7424	575.0359	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	1025.0324	994.0052	890.8604	754.0148	569.4849	367.1027	234.7127	248.6291	419.9010	631.0536	848.6095	1027.7168	(97)
Space heating kWh													
	322.1955	256.6568	203.2282	111.6481	42.7367	0.0000	0.0000	0.0000	0.0000	100.6393	218.7843	336.7946	(98a)
Space heating requirement - total per year (kWh/year)												1592.6835	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	322.1955	256.6568	203.2282	111.6481	42.7367	0.0000	0.0000	0.0000	0.0000	100.6393	218.7843	336.7946	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1592.6835	
Space heating per m2											(98c) / (4) =	21.9136	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement
322.1955 256.6568 203.2282 111.6481 42.7367 0.0000 0.0000 0.0000 0.0000 100.6393 218.7843 336.7946 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50
307a 483.2932 384.9851 304.8423 167.4722 64.1050 0.0000 0.0000 0.0000 0.0000 150.9590 328.1764 505.1920
Space heating requirement
483.2932 384.9851 304.8423 167.4722 64.1050 0.0000 0.0000 0.0000 0.0000 150.9590 328.1764 505.1920 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)

Water heating
Annual water heating requirement
258.6481 228.8785 243.2936 214.0064 207.5704 187.1484 184.6748 191.8723 193.8492 216.0491 229.6316 255.8155 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50
310a 387.9721 343.3178 364.9404 321.0096 311.3556 280.7226 277.0123 287.8084 290.7737 324.0737 344.4473 383.7233
Water heating fuel
387.9721 343.3178 364.9404 321.0096 311.3556 280.7226 277.0123 287.8084 290.7737 324.0737 344.4473 383.7233 (310)
Cooling System Energy Efficiency Ratio 0.0000 (314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (315)
Pumps and Fa 1.6975 1.5332 1.6975 1.6427 1.6975 1.6427 1.6975 1.6975 1.6427 1.6975 1.6427 1.6975 (331)
Lighting 23.9686 19.2285 17.3131 12.6843 9.7977 8.0048 8.9378 11.6177 15.0903 19.7993 22.3632 24.6347 (332)
Electricity generated by PVs (Appendix M) (negative quantity)
(333a)m -17.7988 -26.5546 -44.3894 -57.0811 -64.6020 -64.1536 -62.3425 -56.9881 -46.9012 -34.2077 -20.4034 -14.8306 (333a)

Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.1997	-13.4106	-32.8557	-60.4920	-84.6385	-96.9652	-92.1477	-74.2535	-47.4476	-22.7886	-8.6270	-4.6681	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2389.0253	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3917.1568	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	23.8903	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
Total electricity for the above, kWh/year	19.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5464.8613	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2389.0253	6.5500	156.4812	(340a)
Space heating total			156.4812	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3917.1568	6.5500	256.5738	(342a)
Water heating total			256.5738	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	28.4300	5.6821	(349)
Energy for lighting	193.4401	28.4300	54.9950	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.2528	28.4300	-145.0649	
PV Unit electricity exported	-544.4942	5.8100	-31.6351	
Total			-176.7000	(352)
Total energy cost			401.0320	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1681.6485	0.1557	99.1619	(367)
Electrical energy for heat distribution (space & water)	23.8903	0.0000	9.2364	(372)
Overall CO2 factor for heat network			0.0405	(386)
Total CO2 associated with community systems			255.5412	(373)
Space and water heating			255.5412	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.2528	0.1323	-67.5052	
PV Unit electricity exported	-544.4942	0.1214	-66.0897	
Total			-133.5948	(380)
Total CO2, kg/year			152.6381	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1681.6485	1.5763	1004.1962	(467)
Electrical energy for heat distribution (space & water)	23.8903	0.0000	97.2319	(472)
Overall CO2 factor for heat network			0.4266	(486)
Total CO2 associated with community systems			2690.0826	(473)
Space and water heating			2690.0826	(476)
Pumps, fans and electric keep-hot	19.9861	1.5128	30.2350	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.2528	1.4888	-759.6722	
PV Unit electricity exported	-544.4942	0.4453	-242.4386	
Total			-1002.1108	(480)
Total Primary energy kWh/year			2014.9117	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Northwest

Current energy efficiency rating: B 85
Current environmental impact rating: A 98

N Solar water heating — Recommended
U Solar photovoltaic panels — Already installed
V2 Wind turbine — Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.4	-£ 47	-26 kg (17.0%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£47	0.36 kg/m²	B 86	A 98
Total Savings	£47	0.36 kg/m²		

Potential energy efficiency rating: B 86
Potential environmental impact rating: A 98

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£61	£83	-£23
Community scheme	£517	£448	£69
Space heating	£266	£289	-£23
Water heating	£257	£188	£69
Lighting	£55	£55	£0
Generated (PV)	-£177	-£178	£1
Total cost of fuels	£401	£353	£47
Total cost of uses	£401	£354	£47
Delivered energy	75 kWh/m²	62 kWh/m²	13 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	2 kg/m²	2 kg/m²	0 kg/m²
Primary energy	28 kWh/m²	23 kWh/m²	4 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330 (1b) - (3b)	
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		4.9323 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3094	(42)
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												624.1873	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												624.1873	
Solar input	-0.0000	-16.2194	-58.0608	-80.0094	-105.2873	-97.2929	-96.7392	-84.2620	-57.6788	-28.6375	-0.0000	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.6481	212.6591	185.2328	133.9970	102.2831	89.8555	87.9356	107.6103	136.1704	187.4116	229.6316	255.8155	(64)
									Total per year (kWh/year) = Sum(64)m =			1987.2506	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757 (71)
Water heating gains (Table 5)												
	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599 (72)
Total internal gains												
	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.2200	11.2829	0.7300	0.7000	0.7700	4.8746	(75)
Southeast	1.2200	36.7938	0.7300	0.7000	0.7700	15.8960	(77)
Northwest	4.8400	11.2829	0.7300	0.7000	0.7700	19.3385	(81)

Solar gains	40.1091	76.3632	125.8460	191.7362	247.4434	260.0301	244.7141	200.9562	148.3169	90.1575	49.5060	33.3773	(83)
Total gains	618.8576	652.8565	685.3389	719.6174	744.1387	728.5860	696.7382	656.1073	619.7225	590.3077	584.2687	598.2216	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9651	0.9537	0.9270	0.8664	0.7505	0.5832	0.4360	0.4799	0.6971	0.8808	0.9483	0.9694	(86)
MIT	19.7677	19.9115	20.1784	20.5128	20.7942	20.9447	20.9868	20.9804	20.8848	20.5475	20.0954	19.7157	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9585	0.9449	0.9129	0.8402	0.7041	0.5134	0.3516	0.3928	0.6307	0.8521	0.9370	0.9635	(89)
MIT 2	18.6878	18.8680	19.1996	19.6038	19.9220	20.0705	20.1029	20.0992	20.0202	19.6533	19.1016	18.6227	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.0839	19.2508	19.5586	19.9373	20.2419	20.3912	20.4271	20.4225	20.3374	19.9813	19.4661	19.0236	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0839	19.2508	19.5586	19.9373	20.2419	20.3912	20.4271	20.4225	20.3374	19.9813	19.4661	19.0236	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9490	0.9346	0.9027	0.8346	0.7114	0.5362	0.3822	0.4241	0.6487	0.8474	0.9271	0.9544	(94)
Useful gains	587.2805	610.1844	618.6386	600.5968	529.4021	390.6498	266.2918	278.2548	401.9992	500.2047	541.6858	570.9383	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1041.5284	1011.0136	919.9814	777.5744	601.7779	407.9885	269.6194	283.3827	439.4245	660.9095	871.1950	1044.3242	(97)
Space heating kWh													
	337.9605	269.3572	224.1991	127.4239	53.8476	0.0000	0.0000	0.0000	0.0000	119.5644	237.2466	352.1991	(98a)
Space heating requirement - total per year (kWh/year)												1721.7983	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	337.9605	269.3572	224.1991	127.4239	53.8476	0.0000	0.0000	0.0000	0.0000	119.5644	237.2466	352.1991	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1721.7983	
Space heating per m2											(98c) / (4) =	23.6901	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	337.9605	269.3572	224.1991	127.4239	53.8476	0.0000	0.0000	0.0000	0.0000	119.5644	237.2466	352.1991	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	506.9407	404.0358	336.2986	191.1358	80.7713	0.0000	0.0000	0.0000	0.0000	179.3466	355.8700	528.2986	
Space heating requirement													
	506.9407	404.0358	336.2986	191.1358	80.7713	0.0000	0.0000	0.0000	0.0000	179.3466	355.8700	528.2986	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	212.6591	185.2328	133.9970	102.2831	89.8555	87.9356	107.6103	136.1704	187.4116	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	318.9886	277.8492	200.9955	153.4247	134.7833	131.9034	161.4154	204.2556	281.1174	344.4473	383.7233	
Water heating fuel													
	387.9721	318.9886	277.8492	200.9955	153.4247	134.7833	131.9034	161.4154	204.2556	281.1174	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	8.4920	7.6702	8.4920	8.2180	8.4920	8.2180	8.4920	8.4920	8.2180	8.4920	8.2180	8.4920	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9541	-24.8708	-42.4882	-54.8798	-64.0812	-61.5030	-60.3713	-54.2093	-43.7560	-31.0030	-17.4758	-12.3621	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5447	-11.7075	-29.5072	-53.9842	-79.9096	-83.6490	-81.3696	-63.5332	-39.7064	-18.4938	-6.4743	-3.3869	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2582.6974	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2980.8759	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	25.8270	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4898.7786	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2582.6974	4.4400	114.6718	(340a)
Space heating total			114.6718	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2980.8759	4.4400	132.3509	(342a)
Water heating total			132.3509	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	16.4900	3.2957	(349)
Pump for solar water heating	80.0000	16.4900	13.1920	(349)
Energy for lighting	193.4401	16.4900	31.8983	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-481.9545	16.4900	-79.4743	
PV Unit electricity exported	-476.2665	5.5900	-26.6233	
Total			-106.0976	(352)
Total energy cost			281.3111	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.8606	(357)
SAP value	86.0501	
SAP rating (Section 12)	86	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1483.6195	0.1553	106.9240	(367)
Electrical energy for heat distribution (space & water)	25.8270	0.0000	8.3335	(372)
Overall CO2 factor for heat network			0.0414	(386)
Total CO2 associated with community systems			230.5606	(373)
Space and water heating			230.5606	(376)
Pumps, fans and electric keep-hot	99.9861	0.1387	13.8693	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-481.9545	0.1319	-63.5856	
PV Unit electricity exported	-476.2665	0.1213	-57.7895	
Total			-121.3751	(380)
Total CO2, kg/year			150.9742	(383)
CO2 emissions per m2			2.0800	(384)
EI value			98.2809	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330 (1b) - (3b)	
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		4.9323 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.3094	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day)	118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	

Distribution loss (46)m = 0.15 x (45)m

30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)

Water storage loss:

Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												698.3818	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												698.3818	
Solar input	-0.2882	-19.8943	-63.0504	-86.9122	-108.6771	-108.6071	-105.7317	-94.9883	-67.4759	-37.8323	-4.9243	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	258.3599	208.9842	180.2432	127.0942	98.8933	78.5413	78.9431	96.8840	126.3733	178.2168	224.7072	255.8155	(64)
									Total per year (kWh/year) = Sum(64)m =			1913.0561	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month													
	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)													
	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)
Total internal gains													
	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.2200	13.7758	0.7300	0.7000	0.7700	5.9515	(75)
Southeast	1.2200	42.9509	0.7300	0.7000	0.7700	18.5561	(77)
Northwest	4.8400	13.7758	0.7300	0.7000	0.7700	23.6110	(81)

Solar gains	48.1187	81.8906	133.8929	207.1252	257.5021	290.0510	267.9526	224.4946	166.9156	102.2930	58.6028	40.2103	(83)
Total gains	626.8673	658.3839	693.3858	735.0064	754.1975	758.6069	719.9767	679.6458	638.3211	602.4432	593.3655	605.0546	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9615	0.9497	0.9168	0.8479	0.7191	0.5184	0.3771	0.4177	0.6617	0.8588	0.9409	0.9663	(86)
MIT	19.8243	19.9621	20.2541	20.5723	20.8348	20.9673	20.9931	20.9895	20.9093	20.6169	20.1644	19.7708	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9542	0.9401	0.9006	0.8187	0.6685	0.4460	0.2931	0.3302	0.5918	0.8251	0.9279	0.9598	(89)
MIT 2	18.7591	18.9313	19.2926	19.6729	19.9642	20.0884	20.1063	20.1046	20.0422	19.7334	19.1871	18.6923	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.1498	19.3094	19.6453	20.0028	20.2835	20.4108	20.4316	20.4292	20.3603	20.0575	19.5456	19.0879	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1498	19.3094	19.6453	20.0028	20.2835	20.4108	20.4316	20.4292	20.3603	20.0575	19.5456	19.0879	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9443	0.9297	0.8909	0.8149	0.6789	0.4711	0.3238	0.3621	0.6125	0.8230	0.9181	0.9504	(94)
Useful gains	591.9739	612.0755	617.7042	598.9480	512.0431	357.3550	233.1488	246.1160	390.9437	495.7857	544.7424	575.0359	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	1025.0324	994.0052	890.8604	754.0148	569.4849	367.1027	234.7127	248.6291	419.9010	631.0536	848.6095	1027.7168	(97)
Space heating kWh													
	322.1955	256.6568	203.2282	111.6481	42.7367	0.0000	0.0000	0.0000	0.0000	100.6393	218.7843	336.7946	(98a)
Space heating requirement - total per year (kWh/year)												1592.6835	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	322.1955	256.6568	203.2282	111.6481	42.7367	0.0000	0.0000	0.0000	0.0000	100.6393	218.7843	336.7946	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1592.6835	
Space heating per m2											(98c) / (4) =	21.9136	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement

	322.1955	256.6568	203.2282	111.6481	42.7367	0.0000	0.0000	0.0000	0.0000	100.6393	218.7843	336.7946	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	483.2932	384.9851	304.8423	167.4722	64.1050	0.0000	0.0000	0.0000	0.0000	150.9590	328.1764	505.1920	
Space heating requirement													
	483.2932	384.9851	304.8423	167.4722	64.1050	0.0000	0.0000	0.0000	0.0000	150.9590	328.1764	505.1920	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement

	258.3599	208.9842	180.2432	127.0942	98.8933	78.5413	78.9431	96.8840	126.3733	178.2168	224.7072	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.5399	313.4764	270.3648	190.6413	148.3399	117.8120	118.4147	145.3260	189.5599	267.3252	337.0608	383.7233	
Water heating fuel													
	387.5399	313.4764	270.3648	190.6413	148.3399	117.8120	118.4147	145.3260	189.5599	267.3252	337.0608	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	8.4920	7.6702	8.4920	8.2180	8.4920	8.2180	8.4920	8.4920	8.2180	8.4920	8.2180	8.4920	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.8663	-26.6927	-44.7143	-57.6640	-65.4319	-65.1316	-63.3225	-57.8097	-47.4406	-34.4735	-20.5043	-14.8840	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.1321	-13.2725	-32.5307	-59.9091	-83.8086	-95.9871	-91.1676	-73.4319	-46.9082	-22.5228	-8.5261	-4.6148	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2389.0253	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2869.5841	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	23.8903	(313)
Space cooling fuel	0.0000	(321)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)

mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4497.2887	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2389.0253	6.5500	156.4812	(340a)
Space heating total			156.4812	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2869.5841	6.5500	187.9578	(342a)
Water heating total			187.9578	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	28.4300	5.6821	(349)
Pump for solar water heating	80.0000	28.4300	22.7440	(349)
Energy for lighting	193.4401	28.4300	54.9950	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-515.9355	28.4300	-146.6805	
PV Unit electricity exported	-538.8116	5.8100	-31.3050	
Total			-177.9854	(352)
Total energy cost			353.8746	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1402.2958	0.1557	99.1619	(367)
Electrical energy for heat distribution (space & water)	23.8903	0.0000	7.8987	(372)
Overall CO2 factor for heat network			0.0416	(386)
Total CO2 associated with community systems			218.5319	(373)
Space and water heating			218.5319	(376)
Pumps, fans and electric keep-hot	99.9861	0.1387	13.8693	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-515.9355	0.1322	-68.2250	
PV Unit electricity exported	-538.8116	0.1214	-65.4032	
Total			-133.6282	(380)
Total CO2, kg/year			126.6924	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1402.2958	1.5763	1004.1962	(467)
Electrical energy for heat distribution (space & water)	23.8903	0.0000	81.8158	(472)
Overall CO2 factor for heat network			0.4305	(486)
Total CO2 associated with community systems			2263.5695	(473)
Space and water heating			2263.5695	(476)
Pumps, fans and electric keep-hot	99.9861	1.5128	151.2590	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-515.9355	1.4886	-768.0122	
PV Unit electricity exported	-538.8116	0.4453	-239.9213	
Total			-1007.9335	(480)
Total Primary energy kWh/year			1703.6000	(483)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.31	**TER**	11.37
Environmental	98 A	**% DER < TER**			79.68
CO_2 Emissions (t/year)	0.14	**DFEE**	30.81	**TFEE**	33.49
Compliance Check	See BREL	**% DFEE < TFEE**			8.00
% DPER < TPER	50.88	**DPER**	29.24	**TPER**	59.53

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				3	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =	11875.9502			(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							163.4005	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 4.9323 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 118.0387 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)											Total = Sum(45)m =	1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =	2611.4378	(64)
12Total per year (kWh/year)											2611	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)

Water heating gains (Table 5)

150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)

Total internal gains

529.9009	542.3600	519.8296	502.5508	478.2395	462.4112	445.5913	446.6965	459.7372	474.1489	501.8869	519.6574	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.2200	10.6334	0.7300	0.7000	0.7700	4.5939	(74)
South	4.8400	46.7521	0.7300	0.7000	0.7700	80.1310	(78)
West	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(80)

Solar gains 93.2101	156.6119	209.4227	252.7669	278.0228	274.0464	265.0077	246.2835	224.3566	171.6945	111.2298	80.0481	(83)
Total gains 623.1110	698.9720	729.2523	755.3178	756.2622	736.4576	710.5990	692.9801	684.0938	645.8434	613.1166	599.7054	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9644	0.9431	0.9132	0.8502	0.7432	0.5780	0.4281	0.4566	0.6497	0.8519	0.9403	0.9691	(86)
MIT	19.7754	19.9893	20.2436	20.5526	20.8018	20.9464	20.9877	20.9837	20.9114	20.6118	20.1432	19.7184	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9576	0.9327	0.8972	0.8222	0.6964	0.5085	0.3450	0.3728	0.5831	0.8192	0.9276	0.9632	(89)
MIT 2	18.6974	18.9636	19.2777	19.6486	19.9295	20.0718	20.1033	20.1009	20.0423	19.7245	19.1596	18.6261	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.0928	19.3398	19.6320	19.9802	20.2495	20.3926	20.4277	20.4247	20.3611	20.0500	19.5204	19.0268	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0928	19.3398	19.6320	19.9802	20.2495	20.3926	20.4277	20.4247	20.3611	20.0500	19.5204	19.0268	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9480	0.9220	0.8873	0.8178	0.7043	0.5313	0.3751	0.4030	0.6028	0.8168	0.9176	0.9541	(94)
Useful gains	590.7081	644.4216	647.0318	617.6754	532.6001	391.3095	266.5545	279.2876	412.3891	527.5063	562.5819	572.1624	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1042.1558	1017.2845	925.1501	780.5992	602.3117	408.0917	269.6603	283.5429	441.0961	665.7498	875.0178	1044.5480	(97)
Space heating kWh	335.8771	250.5639	206.9200	117.3052	51.8654	0.0000	0.0000	0.0000	0.0000	102.8532	224.9538	351.4549	(98a)
Space heating requirement - total per year (kWh/year)												1641.7935	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	335.8771	250.5639	206.9200	117.3052	51.8654	0.0000	0.0000	0.0000	0.0000	102.8532	224.9538	351.4549	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1641.7935	
Space heating per m2											(98c) / (4) =	22.5893	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	335.8771	250.5639	206.9200	117.3052	51.8654	0.0000	0.0000	0.0000	0.0000	102.8532	224.9538	351.4549	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	503.8157	375.8458	310.3800	175.9578	77.7981	0.0000	0.0000	0.0000	0.0000	154.2798	337.4307	527.1823	
Space heating requirement													
	503.8157	375.8458	310.3800	175.9578	77.7981	0.0000	0.0000	0.0000	0.0000	154.2798	337.4307	527.1823	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	
Water heating fuel													
	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9032	-24.7478	-42.1903	-54.3464	-63.2831	-60.6270	-59.4769	-53.4801	-43.2885	-30.7805	-17.3978	-12.3224	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5955	-11.8305	-29.8051	-54.5176	-80.7077	-84.5250	-82.2640	-64.2624	-40.1739	-18.7163	-6.5523	-3.4266	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												2462.6902	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3917.1568	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												24.6269	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.9861	(330a)
Total electricity for the above, kWh/year												19.9861	(331)
Electricity for lighting (calculated in Appendix L)												193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5635.0523	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1701.2925	0.1555	102.1444	(367)
Electrical energy for heat distribution (space & water)	24.6269	0.0000	9.3483	(372)
Overall CO2 factor for heat network			0.0405	(386)
Total CO2 associated with community systems			258.6356	(373)
Space and water heating			258.6356	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	0.1320	-62.9388	
PV Unit electricity exported	-481.3770	0.1213	-58.4056	
Total			-121.3444	(380)
Total CO2, kg/year			167.9829	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.3100	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1701.2925	1.5758	1034.8710	(467)
Electrical energy for heat distribution (space & water)	24.6269	0.0000	98.3822	(472)
Overall CO2 factor for heat network			0.4266	(486)
Total CO2 associated with community systems			2721.9078	(473)
Space and water heating			2721.9078	(476)
Pumps, fans and electric keep-hot	19.9861	1.5128	30.2350	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	1.4877	-709.3875	
PV Unit electricity exported	-481.3770	0.4451	-214.2796	
Total			-923.6671	(480)
Total Primary energy kWh/year			2125.1807	(483)
Dwelling Primary energy Rate (DPER)			29.2400	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b) x	2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c) x	2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4185	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3243	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4135	0.4054	0.3973	0.3568	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3649	0.3811	(22b)
Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			7.2800	1.1450	8.3359			(27)
Heatloss floor			36.3400	0.1300	4.7242			(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.1800	14.8338			(29a)
500mm mineral wool	36.3400		36.3400	0.1100	3.9974			(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.9313			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	3.6500	0.0500	0.1825
E3 Sill	2.7400	0.0500	0.1370
E4 Jamb	14.8400	0.0500	0.7420
E5 Ground floor (normal)	18.7200	0.1600	2.9952
E6 Intermediate floor within a dwelling	18.7200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.7200	0.0600	1.1232
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	5.5000	0.0800	0.4400
P2 Party wall - Intermediate floor within a dwelling	5.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	5.5000	0.1200	0.6600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8399 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.7712 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.4047	34.2096	34.0184	33.1202	32.9522	32.1700	32.1700	32.0251	32.4713	32.9522	33.2921	33.6475	(38)
Heat transfer coeff	76.1759	75.9808	75.7896	74.8914	74.7234	73.9411	73.9411	73.7963	74.2424	74.7234	75.0633	75.4187	(39)
Average = Sum(39)m / 12 =												74.8906	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0481	1.0454	1.0428	1.0304	1.0281	1.0174	1.0174	1.0154	1.0215	1.0281	1.0328	1.0377	(40)
HLP (average)												1.0304	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	249.9662	221.0368	234.6117	205.6045	198.8885	178.7466	175.9929	183.1904	185.4473	207.3672	221.2297	247.1336	(62)
WWHRS	-28.7738	-25.4478	-26.6475	-22.0651	-20.5639	-17.5967	-16.4941	-17.5398	-18.2062	-21.4631	-24.3151	-28.2410	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
										Total per year (kWh/year) = Sum(64)m =		2241.8614	(64)
12Total per year (kWh/year)												2242	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	104.8969	93.1698	99.7915	89.4439	87.9135	80.5137	80.3008	82.6939	82.7417	90.7327	94.6393	103.9551	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	140.9904	138.6456	134.1284	124.2277	118.1634	111.8245	107.9311	111.1477	114.9190	121.9526	131.4435	139.7245	(72)
Total internal gains	523.5655	536.0247	513.4942	496.2155	471.9041	453.0758	436.2560	437.3612	450.4018	467.8135	495.5515	513.3220	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.2200	10.6334	0.6300	0.7000	0.7700	3.9646	(74)
South	4.8400	46.7521	0.6300	0.7000	0.7700	69.1541	(78)
West	1.2200	19.6403	0.6300	0.7000	0.7700	7.3228	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	80.4416	135.1582	180.7346	218.1413	239.9375	236.5058	228.7053	212.5461	193.6228	148.1747	95.9928	69.0826	(83)
Total gains	604.0071	671.1829	694.2289	714.3568	711.8416	689.5816	664.9612	649.9072	644.0246	615.9882	591.5443	582.4046	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3060	43.4172	43.5268	44.0488	44.1478	44.6149	44.6149	44.7025	44.4338	44.1478	43.9479	43.7408	
alpha	3.8871	3.8945	3.9018	3.9366	3.9432	3.9743	3.9743	3.9802	3.9623	3.9432	3.9299	3.9161	
util living area	0.9702	0.9540	0.9314	0.8799	0.7880	0.6293	0.4743	0.5027	0.6986	0.8786	0.9504	0.9737	(86)
MIT	19.5698	19.7840	20.0559	20.4187	20.7193	20.9175	20.9790	20.9732	20.8692	20.5057	19.9931	19.5371	(87)
Th 2	20.0434	20.0457	20.0478	20.0581	20.0600	20.0689	20.0689	20.0706	20.0655	20.0600	20.0561	20.0521	(88)
util rest of house	0.9642	0.9450	0.9176	0.8547	0.7426	0.5551	0.3803	0.4092	0.6300	0.8486	0.9392	0.9684	(89)
MIT 2	18.3935	18.6632	19.0039	19.4533	19.8017	20.0108	20.0592	20.0573	19.9653	19.5649	18.9365	18.3583	(90)
Living area fraction									fLA = Living area / (4) =			0.3668	(91)
MIT	18.8250	19.0743	19.3897	19.8074	20.1383	20.3433	20.3966	20.3933	20.2969	19.9100	19.3241	18.7907	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8250	19.0743	19.3897	19.8074	20.1383	20.3433	20.3966	20.3933	20.2969	19.9100	19.3241	18.7907	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9545	0.9337	0.9061	0.8471	0.7467	0.5780	0.4141	0.4426	0.6481	0.8431	0.9285	0.9593	(94)
Useful gains	576.4984	626.6855	629.0296	605.1423	531.5358	398.5694	275.3831	287.6357	417.3639	519.3506	549.2453	558.6726	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1106.4552	1076.9778	976.9084	816.8730	630.5347	424.6696	280.7242	294.6893	460.0713	695.6716	917.5814	1100.4133	(97)
Space heating kWh	394.2879	302.5965	258.8218	152.4461	73.6552	0.0000	0.0000	0.0000	0.0000	131.1828	265.2020	403.0551	(98a)
Space heating requirement - total per year (kWh/year)												1981.2474	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	394.2879	302.5965	258.8218	152.4461	73.6552	0.0000	0.0000	0.0000	0.0000	131.1828	265.2020	403.0551	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1981.2474	
Space heating per m2											(98c) / (4) =	27.2599	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	394.2879	302.5965	258.8218	152.4461	73.6552	0.0000	0.0000	0.0000	0.0000	131.1828	265.2020	403.0551	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	427.1808	327.8402	280.4137	165.1637	79.7998	0.0000	0.0000	0.0000	0.0000	142.1266	287.3261	436.6794	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.3410	85.0348	84.5515	83.6466	82.2363	79.8000	79.8000	79.8000	79.8000	83.2925	84.7281	85.4098	(217)
Fuel for water heating, kWh/month	259.1866	230.0106	245.9615	219.4225	216.8441	201.9422	199.8732	207.5821	209.5753	223.1943	232.4076	256.2852	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.6146	19.7468	17.7798	13.0262	10.0618	8.2206	9.1787	11.9309	15.4970	20.3329	22.9660	25.2988	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-34.1427	-48.1921	-69.3402	-78.0353	-84.2042	-78.6248	-77.6860	-73.3488	-65.6465	-55.1924	-37.5712	-29.5143	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.0663	-40.1520	-79.8860	-120.0915	-158.8866	-159.6687	-157.7568	-133.4905	-97.7594	-57.4135	-25.4553	-15.0706	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2146.5302	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2702.2853	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	198.6542	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1796.1956	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3337.2742	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2146.5302	0.2100	450.7713	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2702.2853	0.2100	567.4799	(264)
Space and water heating			1018.2513	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	198.6542	0.1443	28.6719	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	0.1346	-98.4313	
PV Unit electricity exported	-1064.6971	0.1259	-134.0169	
Total			-232.4482	(269)
Total CO2, kg/year			826.4043	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.3700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2146.5302	1.1300	2425.5791	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2702.2853	1.1300	3053.5824	(278)
Space and water heating			5479.1616	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	198.6542	1.5338	304.7025	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	1.4973	-1095.2830	
PV Unit electricity exported	-1064.6971	0.4620	-491.9332	
Total			-1587.2162	(283)
Total Primary energy kWh/year			4326.7486	(286)
Target Primary Energy Rate (TPER)			59.5300	(287)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.31	**TER**	11.37
Environmental	98 A	**% DER < TER**			79.68
CO_2 Emissions (t/year)	0.14	**DFEE**	30.81	**TFEE**	33.49
Compliance Check	See BREL	**% DFEE < TFEE**			8.00
% DPER < TPER	50.88	**DPER**	29.24	**TPER**	59.53

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3185	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2468	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3147	0.3085	0.3024	0.2715	0.2653	0.2345	0.2345	0.2283	0.2468	0.2653	0.2777	0.2900	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5495	0.5476	0.5457	0.5369	0.5352	0.5275	0.5275	0.5261	0.5305	0.5352	0.5386	0.5421	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005	(35)
Thermal bridges (User defined value 0.030 * total exposed area)		4.9323	(36)
Point Thermal bridges	(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.2906	32.1776	32.0668	31.5466	31.4493	30.9963	30.9963	30.9124	31.1708	31.4493	31.6462	31.8520	(38)
Heat transfer coeff	73.3597	73.2467	73.1359	72.6157	72.5184	72.0654	72.0654	71.9815	72.2399	72.5184	72.7153	72.9211	(39)
Average = Sum(39)m / 12 =												72.6153	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0094	1.0078	1.0063	0.9991	0.9978	0.9915	0.9915	0.9904	0.9939	0.9978	1.0005	1.0033	(40)
HLP (average)												0.9991	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 60.0096 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.4702	63.6744	61.7137	59.2732	57.0961	54.8336	54.3634	56.3200	58.3269	60.6504	63.1125	65.3783	(44)
Energy conte	103.6888	90.6715	94.8517	81.1421	76.8624	67.4243	65.7478	69.7360	71.9229	82.3020	89.9153	102.3666	(45)
Energy content (annual)										Total = Sum(45)m =		996.6312	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(64)
								Total per year (kWh/year) = Sum(64)m =			847.1365	(64)
12Total per year (kWh/year)											847	(64)

Electric shower(s)

50.4049	44.9112	49.0413	46.7995	47.6777	45.4799	46.9959	47.6777	46.7995	49.0413	48.1191	50.4049	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 573.3528 (64a)

Heat gains from water heating, kWh/month

34.6351	30.4955	32.4163	28.9426	28.2527	25.6976	25.7204	26.7383	26.9835	29.7495	31.1368	34.3541	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	46.5525	45.3802	43.5703	40.1980	37.9740	35.6912	34.5704	35.9386	37.4771	39.9859	43.2455	46.1749	(72)
Total internal gains	426.1276	439.7593	419.9362	409.1858	388.7147	376.9424	362.8952	362.1520	372.9599	382.8469	404.3535	416.7724	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.2200	10.6334	0.7300	0.7000	0.7700	4.5939	(74)
South	4.8400	46.7521	0.7300	0.7000	0.7700	80.1310	(78)
West	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(80)

Solar gains	93.2101	156.6119	209.4227	252.7669	278.0228	274.0464	265.0077	246.2835	224.3566	171.6945	111.2298	80.0481	(83)
Total gains	519.3377	596.3712	629.3588	661.9527	666.7375	650.9888	627.9029	608.4356	597.3165	554.5413	515.5833	496.8204	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	44.9685	45.0379	45.1061	45.4292	45.4902	45.7762	45.7762	45.8295	45.6656	45.4902	45.3670	45.2389	
alpha	3.9979	4.0025	4.0071	4.0286	4.0327	4.0517	4.0517	4.0553	4.0444	4.0327	4.0245	4.0159	
util living area	0.9811	0.9666	0.9458	0.8962	0.8059	0.6465	0.4888	0.5222	0.7235	0.9027	0.9662	0.9840	(86)

MIT	19.4934	19.7303	20.0197	20.3975	20.7104	20.9146	20.9785	20.9716	20.8598	20.4644	19.9183	19.4475	(87)
Th 2	20.0755	20.0768	20.0781	20.0841	20.0852	20.0904	20.0904	20.0914	20.0884	20.0852	20.0829	20.0806	(88)
util rest of house													
	0.9772	0.9599	0.9344	0.8737	0.7628	0.5733	0.3946	0.4280	0.6568	0.8772	0.9582	0.9806	(89)
MIT 2	18.7075	18.9411	19.2248	19.5905	19.8751	20.0429	20.0825	20.0802	20.0033	19.6598	19.1333	18.6660	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.9958	19.2306	19.5164	19.8865	20.1815	20.3627	20.4111	20.4072	20.3175	19.9550	19.4212	18.9527	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9958	19.2306	19.5164	19.8865	20.1815	20.3627	20.4111	20.4072	20.3175	19.9550	19.4212	18.9527	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9713	0.9522	0.9262	0.8682	0.7677	0.5963	0.4286	0.4617	0.6747	0.8730	0.9510	0.9753	(94)
Useful gains	504.4335	567.8908	582.8818	574.6770	511.8789	388.1580	269.1474	280.9163	403.0305	484.0956	490.3291	484.5520	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1078.0763	1049.6712	951.9663	797.7948	615.0649	415.2884	274.6512	288.4417	449.1495	678.4074	895.9431	1075.7817	(97)
Space heating kWh													
	426.7902	323.7564	274.5989	160.6448	76.7704	0.0000	0.0000	0.0000	0.0000	144.5680	292.0421	439.8749	(98a)
Space heating requirement - total per year (kWh/year)												2139.0457	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	426.7902	323.7564	274.5989	160.6448	76.7704	0.0000	0.0000	0.0000	0.0000	144.5680	292.0421	439.8749	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2139.0457	
Space heating per m2											(98c) / (4) =	29.4310	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	677.4144	533.2836	547.0591	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8173	0.8860	0.8694	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	553.6840	472.5115	475.6310	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	704.3161	680.0660	659.7557	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	108.4551	154.4205	136.9887	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	27.1138	38.6051	34.2472	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												99.9661	(107)
Energy for space heating												29.4310	(99)
Energy for space cooling												1.3754	(108)
Total												30.8064	(109)
Fabric Energy Efficiency (DFEE)												30.8	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor		36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		3 * 10 =	30.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1685 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.4185 (18)
Number of sides sheltered			3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3243 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4135	0.4054	0.3973	0.3568	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3649	0.3811	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			7.2800	1.1450	8.3359			(27)
Heatloss floor			36.3400	0.1300	4.7242			(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.1800	14.8338			(29a)
500mm mineral wool	36.3400		36.3400	0.1100	3.9974			(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.9313			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	3.6500	0.0500	0.1825
E3 Sill	2.7400	0.0500	0.1370
E4 Jamb	14.8400	0.0500	0.7420
E5 Ground floor (normal)	18.7200	0.1600	2.9952
E6 Intermediate floor within a dwelling	18.7200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.7200	0.0600	1.1232
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	5.5000	0.0800	0.4400
P2 Party wall - Intermediate floor within a dwelling	5.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	5.5000	0.1200	0.6600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8399 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.7712 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.4047	34.2096	34.0184	33.1202	32.9522	32.1700	32.1700	32.0251	32.4713	32.9522	33.2921	33.6475	(38)
Heat transfer coeff	76.1759	75.9808	75.7896	74.8914	74.7234	73.9411	73.9411	73.7963	74.2424	74.7234	75.0633	75.4187	(39)
Average = Sum(39)m / 12 =												74.8906	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0481	1.0454	1.0428	1.0304	1.0281	1.0174	1.0174	1.0154	1.0215	1.0281	1.0328	1.0377	(40)
HLP (average)												1.0304	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 60.0096 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.4702	63.6744	61.7137	59.2732	57.0961	54.8336	54.3634	56.3200	58.3269	60.6504	63.1125	65.3783	(44)
Energy conte	103.6888	90.6715	94.8517	81.1421	76.8624	67.4243	65.7478	69.7360	71.9229	82.3020	89.9153	102.3666	(45)
Energy content (annual)										Total = Sum(45)m =		996.6312	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(64)
								Total per year (kWh/year) = Sum(64)m =			847.1365	(64)
12Total per year (kWh/year)											847	(64)	

Electric shower(s)

50.4049	44.9112	49.0413	46.7995	47.6777	45.4799	46.9959	47.6777	46.7995	49.0413	48.1191	50.4049	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				573.3528	(64a)

Heat gains from water heating, kWh/month

34.6351	30.4955	32.4163	28.9426	28.2527	25.6976	25.7204	26.7383	26.9835	29.7495	31.1368	34.3541	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)													
	46.5525	45.3802	43.5703	40.1980	37.9740	35.6912	34.5704	35.9386	37.4771	39.9859	43.2455	46.1749	(72)
Total internal gains													
	426.1276	439.7593	419.9362	409.1858	388.7147	376.9424	362.8952	362.1520	372.9599	382.8469	404.3535	416.7724	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.2200	10.6334	0.6300	0.7000	0.7700	3.9646	(74)
South	4.8400	46.7521	0.6300	0.7000	0.7700	69.1541	(78)
West	1.2200	19.6403	0.6300	0.7000	0.7700	7.3228	(80)

Solar gains	80.4416	135.1582	180.7346	218.1413	239.9375	236.5058	228.7053	212.5461	193.6228	148.1747	95.9928	69.0826	(83)
Total gains	506.5692	574.9175	600.6708	627.3271	628.6522	613.4482	591.6005	574.6981	566.5827	531.0215	500.3463	485.8550	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3060	43.4172	43.5268	44.0488	44.1478	44.6149	44.6149	44.7025	44.4338	44.1478	43.9479	43.7408	
alpha	3.8871	3.8945	3.9018	3.9366	3.9432	3.9743	3.9743	3.9802	3.9623	3.9432	3.9299	3.9161	
util living area													
	0.9830	0.9713	0.9547	0.9136	0.8356	0.6847	0.5257	0.5586	0.7564	0.9168	0.9702	0.9854	(86)
MIT	19.3863	19.6132	19.9032	20.3026	20.6446	20.8882	20.9699	20.9613	20.8243	20.3918	19.8324	19.3525	(87)
Th 2	20.0434	20.0457	20.0478	20.0581	20.0600	20.0689	20.0689	20.0706	20.0655	20.0600	20.0561	20.0521	(88)
util rest of house													
	0.9794	0.9653	0.9448	0.8935	0.7952	0.6101	0.4246	0.4585	0.6905	0.8936	0.9630	0.9823	(89)
MIT 2	18.5779	18.8029	19.0892	19.4820	19.7985	20.0057	20.0577	20.0551	19.9570	19.5731	19.0292	18.5509	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.8744	19.1001	19.3878	19.7830	20.1089	20.3294	20.3923	20.3875	20.2752	19.8734	19.3238	18.8449	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8744	19.1001	19.3878	19.7830	20.1089	20.3294	20.3923	20.3875	20.2752	19.8734	19.3238	18.8449	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9737	0.9578	0.9364	0.8867	0.7975	0.6323	0.4608	0.4940	0.7066	0.8882	0.9558	0.9771	(94)
Useful gains	493.2368	550.6652	562.4492	556.2500	501.3514	387.8698	272.6291	283.8907	400.3236	471.6443	478.2446	474.7423	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1110.2185	1078.9352	976.7590	815.0428	628.3380	423.6399	280.4074	294.2623	458.4598	692.9419	917.5626	1104.5012	(97)
Space heating kWh													
	459.0343	354.9975	308.2465	186.3308	94.4780	0.0000	0.0000	0.0000	0.0000	164.6454	316.3090	468.5406	(98a)
Space heating requirement - total per year (kWh/year)												2352.5821	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	459.0343	354.9975	308.2465	186.3308	94.4780	0.0000	0.0000	0.0000	0.0000	164.6454	316.3090	468.5406	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2352.5821	
Space heating per m2											(98c) / (4) =	32.3690	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	695.0467	547.1644	560.8517	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7781	0.8551	0.8373	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	540.7917	467.8561	469.6223	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	660.4375	637.6346	620.3223	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	86.1450	126.3152	112.1207	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	21.5362	31.5788	28.0302	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												81.1452	(107)
Energy for space heating												32.3690	(99)
Energy for space cooling												1.1165	(108)
Total												33.4855	(109)
Fabric Energy Efficiency (TFEE)												33.5	(109)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.31	**TER**	11.37
Environmental	98 A	**% DER < TER**			79.68
CO_2 Emissions (t/year)	0.14	**DFEE**	30.81	**TFEE**	33.49
Compliance Check	See BREL	**% DFEE < TFEE**			8.00
% DPER < TPER	50.88	**DPER**	29.24	**TPER**	59.53

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				3	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =	11875.9502			(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							163.4005	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 4.9323 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 118.0387 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)											Total = Sum(45)m =	1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =	2611.4378	(64)
12Total per year (kWh/year)											2611	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)

Water heating gains (Table 5)

150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)

Total internal gains

529.9009	542.3600	519.8296	502.5508	478.2395	462.4112	445.5913	446.6965	459.7372	474.1489	501.8869	519.6574	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.2200	10.6334	0.7300	0.7000	0.7700	4.5939	(74)
South	4.8400	46.7521	0.7300	0.7000	0.7700	80.1310	(78)
West	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(80)

Solar gains 93.2101	156.6119	209.4227	252.7669	278.0228	274.0464	265.0077	246.2835	224.3566	171.6945	111.2298	80.0481	(83)
Total gains 623.1110	698.9720	729.2523	755.3178	756.2622	736.4576	710.5990	692.9801	684.0938	645.8434	613.1166	599.7054	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9644	0.9431	0.9132	0.8502	0.7432	0.5780	0.4281	0.4566	0.6497	0.8519	0.9403	0.9691	(86)
MIT	19.7754	19.9893	20.2436	20.5526	20.8018	20.9464	20.9877	20.9837	20.9114	20.6118	20.1432	19.7184	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9576	0.9327	0.8972	0.8222	0.6964	0.5085	0.3450	0.3728	0.5831	0.8192	0.9276	0.9632	(89)
MIT 2	18.6974	18.9636	19.2777	19.6486	19.9295	20.0718	20.1033	20.1009	20.0423	19.7245	19.1596	18.6261	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.0928	19.3398	19.6320	19.9802	20.2495	20.3926	20.4277	20.4247	20.3611	20.0500	19.5204	19.0268	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0928	19.3398	19.6320	19.9802	20.2495	20.3926	20.4277	20.4247	20.3611	20.0500	19.5204	19.0268	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9480	0.9220	0.8873	0.8178	0.7043	0.5313	0.3751	0.4030	0.6028	0.8168	0.9176	0.9541	(94)
Useful gains	590.7081	644.4216	647.0318	617.6754	532.6001	391.3095	266.5545	279.2876	412.3891	527.5063	562.5819	572.1624	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1042.1558	1017.2845	925.1501	780.5992	602.3117	408.0917	269.6603	283.5429	441.0961	665.7498	875.0178	1044.5480	(97)
Space heating kWh	335.8771	250.5639	206.9200	117.3052	51.8654	0.0000	0.0000	0.0000	0.0000	102.8532	224.9538	351.4549	(98a)
Space heating requirement - total per year (kWh/year)												1641.7935	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	335.8771	250.5639	206.9200	117.3052	51.8654	0.0000	0.0000	0.0000	0.0000	102.8532	224.9538	351.4549	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1641.7935	
Space heating per m2											(98c) / (4) =	22.5893	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	335.8771	250.5639	206.9200	117.3052	51.8654	0.0000	0.0000	0.0000	0.0000	102.8532	224.9538	351.4549	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	503.8157	375.8458	310.3800	175.9578	77.7981	0.0000	0.0000	0.0000	0.0000	154.2798	337.4307	527.1823	
Space heating requirement													
	503.8157	375.8458	310.3800	175.9578	77.7981	0.0000	0.0000	0.0000	0.0000	154.2798	337.4307	527.1823	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	
Water heating fuel													
	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9032	-24.7478	-42.1903	-54.3464	-63.2831	-60.6270	-59.4769	-53.4801	-43.2885	-30.7805	-17.3978	-12.3224	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5955	-11.8305	-29.8051	-54.5176	-80.7077	-84.5250	-82.2640	-64.2624	-40.1739	-18.7163	-6.5523	-3.4266	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												2462.6902	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3917.1568	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												24.6269	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.9861	(330a)
Total electricity for the above, kWh/year												19.9861	(331)
Electricity for lighting (calculated in Appendix L)												193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5635.0523	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1701.2925	0.1555	102.1444	(367)
Electrical energy for heat distribution (space & water)	24.6269	0.0000	9.3483	(372)
Overall CO2 factor for heat network			0.0405	(386)
Total CO2 associated with community systems			258.6356	(373)
Space and water heating			258.6356	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	0.1320	-62.9388	
PV Unit electricity exported	-481.3770	0.1213	-58.4056	
Total			-121.3444	(380)
Total CO2, kg/year			167.9829	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.3100	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1701.2925	1.5758	1034.8710	(467)
Electrical energy for heat distribution (space & water)	24.6269	0.0000	98.3822	(472)
Overall CO2 factor for heat network			0.4266	(486)
Total CO2 associated with community systems			2721.9078	(473)
Space and water heating			2721.9078	(476)
Pumps, fans and electric keep-hot	19.9861	1.5128	30.2350	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	1.4877	-709.3875	
PV Unit electricity exported	-481.3770	0.4451	-214.2796	
Total			-923.6671	(480)
Total Primary energy kWh/year			2125.1807	(483)
Dwelling Primary energy Rate (DPER)			29.2400	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b) x	2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c) x	2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4185	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3243	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4135	0.4054	0.3973	0.3568	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3649	0.3811	(22b)
Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			7.2800	1.1450	8.3359			(27)
Heatloss floor			36.3400	0.1300	4.7242			(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.1800	14.8338			(29a)
500mm mineral wool	36.3400		36.3400	0.1100	3.9974			(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.9313			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	3.6500	0.0500	0.1825
E3 Sill	2.7400	0.0500	0.1370
E4 Jamb	14.8400	0.0500	0.7420
E5 Ground floor (normal)	18.7200	0.1600	2.9952
E6 Intermediate floor within a dwelling	18.7200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.7200	0.0600	1.1232
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	5.5000	0.0800	0.4400
P2 Party wall - Intermediate floor within a dwelling	5.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	5.5000	0.1200	0.6600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8399 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.7712 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.4047	34.2096	34.0184	33.1202	32.9522	32.1700	32.1700	32.0251	32.4713	32.9522	33.2921	33.6475	(38)
Heat transfer coeff	76.1759	75.9808	75.7896	74.8914	74.7234	73.9411	73.9411	73.7963	74.2424	74.7234	75.0633	75.4187	(39)
Average = Sum(39)m / 12 =												74.8906	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0481	1.0454	1.0428	1.0304	1.0281	1.0174	1.0174	1.0154	1.0215	1.0281	1.0328	1.0377	(40)
HLP (average)												1.0304	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	249.9662	221.0368	234.6117	205.6045	198.8885	178.7466	175.9929	183.1904	185.4473	207.3672	221.2297	247.1336	(62)
WWHRS	-28.7738	-25.4478	-26.6475	-22.0651	-20.5639	-17.5967	-16.4941	-17.5398	-18.2062	-21.4631	-24.3151	-28.2410	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
										Total per year (kWh/year) = Sum(64)m =		2241.8614	(64)
12Total per year (kWh/year)												2242	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	104.8969	93.1698	99.7915	89.4439	87.9135	80.5137	80.3008	82.6939	82.7417	90.7327	94.6393	103.9551	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	140.9904	138.6456	134.1284	124.2277	118.1634	111.8245	107.9311	111.1477	114.9190	121.9526	131.4435	139.7245	(72)
Total internal gains	523.5655	536.0247	513.4942	496.2155	471.9041	453.0758	436.2560	437.3612	450.4018	467.8135	495.5515	513.3220	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.2200	10.6334	0.6300	0.7000	0.7700	3.9646	(74)
South	4.8400	46.7521	0.6300	0.7000	0.7700	69.1541	(78)
West	1.2200	19.6403	0.6300	0.7000	0.7700	7.3228	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	80.4416	135.1582	180.7346	218.1413	239.9375	236.5058	228.7053	212.5461	193.6228	148.1747	95.9928	69.0826	(83)
Total gains	604.0071	671.1829	694.2289	714.3568	711.8416	689.5816	664.9612	649.9072	644.0246	615.9882	591.5443	582.4046	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3060	43.4172	43.5268	44.0488	44.1478	44.6149	44.6149	44.7025	44.4338	44.1478	43.9479	43.7408	
alpha	3.8871	3.8945	3.9018	3.9366	3.9432	3.9743	3.9743	3.9802	3.9623	3.9432	3.9299	3.9161	
util living area	0.9702	0.9540	0.9314	0.8799	0.7880	0.6293	0.4743	0.5027	0.6986	0.8786	0.9504	0.9737	(86)
MIT	19.5698	19.7840	20.0559	20.4187	20.7193	20.9175	20.9790	20.9732	20.8692	20.5057	19.9931	19.5371	(87)
Th 2	20.0434	20.0457	20.0478	20.0581	20.0600	20.0689	20.0689	20.0706	20.0655	20.0600	20.0561	20.0521	(88)
util rest of house	0.9642	0.9450	0.9176	0.8547	0.7426	0.5551	0.3803	0.4092	0.6300	0.8486	0.9392	0.9684	(89)
MIT 2	18.3935	18.6632	19.0039	19.4533	19.8017	20.0108	20.0592	20.0573	19.9653	19.5649	18.9365	18.3583	(90)
Living area fraction									fLA = Living area / (4) =			0.3668	(91)
MIT	18.8250	19.0743	19.3897	19.8074	20.1383	20.3433	20.3966	20.3933	20.2969	19.9100	19.3241	18.7907	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8250	19.0743	19.3897	19.8074	20.1383	20.3433	20.3966	20.3933	20.2969	19.9100	19.3241	18.7907	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9545	0.9337	0.9061	0.8471	0.7467	0.5780	0.4141	0.4426	0.6481	0.8431	0.9285	0.9593	(94)
Useful gains	576.4984	626.6855	629.0296	605.1423	531.5358	398.5694	275.3831	287.6357	417.3639	519.3506	549.2453	558.6726	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1106.4552	1076.9778	976.9084	816.8730	630.5347	424.6696	280.7242	294.6893	460.0713	695.6716	917.5814	1100.4133	(97)
Space heating kWh	394.2879	302.5965	258.8218	152.4461	73.6552	0.0000	0.0000	0.0000	0.0000	131.1828	265.2020	403.0551	(98a)
Space heating requirement - total per year (kWh/year)												1981.2474	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	394.2879	302.5965	258.8218	152.4461	73.6552	0.0000	0.0000	0.0000	0.0000	131.1828	265.2020	403.0551	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1981.2474	
Space heating per m2											(98c) / (4) =	27.2599	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	394.2879	302.5965	258.8218	152.4461	73.6552	0.0000	0.0000	0.0000	0.0000	131.1828	265.2020	403.0551	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	427.1808	327.8402	280.4137	165.1637	79.7998	0.0000	0.0000	0.0000	0.0000	142.1266	287.3261	436.6794	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.3410	85.0348	84.5515	83.6466	82.2363	79.8000	79.8000	79.8000	79.8000	83.2925	84.7281	85.4098	(217)
Fuel for water heating, kWh/month	259.1866	230.0106	245.9615	219.4225	216.8441	201.9422	199.8732	207.5821	209.5753	223.1943	232.4076	256.2852	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.6146	19.7468	17.7798	13.0262	10.0618	8.2206	9.1787	11.9309	15.4970	20.3329	22.9660	25.2988	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-34.1427	-48.1921	-69.3402	-78.0353	-84.2042	-78.6248	-77.6860	-73.3488	-65.6465	-55.1924	-37.5712	-29.5143	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.0663	-40.1520	-79.8860	-120.0915	-158.8866	-159.6687	-157.7568	-133.4905	-97.7594	-57.4135	-25.4553	-15.0706	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2146.5302	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2702.2853	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	198.6542	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1796.1956	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3337.2742	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2146.5302	0.2100	450.7713	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2702.2853	0.2100	567.4799	(264)
Space and water heating			1018.2513	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	198.6542	0.1443	28.6719	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	0.1346	-98.4313	
PV Unit electricity exported	-1064.6971	0.1259	-134.0169	
Total			-232.4482	(269)
Total CO2, kg/year			826.4043	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.3700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2146.5302	1.1300	2425.5791	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2702.2853	1.1300	3053.5824	(278)
Space and water heating			5479.1616	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	198.6542	1.5338	304.7025	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	1.4973	-1095.2830	
PV Unit electricity exported	-1064.6971	0.4620	-491.9332	
Total			-1587.2162	(283)
Total Primary energy kWh/year			4326.7486	(286)
Target Primary Energy Rate (TPER)			59.5300	(287)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.31	**TER**	11.37
Environmental	98 A	**% DER < TER**			79.68
CO_2 Emissions (t/year)	0.14	**DFEE**	30.81	**TFEE**	33.49
Compliance Check	See BREL	**% DFEE < TFEE**			8.00
% DPER < TPER	50.88	**DPER**	29.24	**TPER**	59.53

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 11875.9502	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	163.4005	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 4.9323 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =		2611.4378	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)
Total internal gains	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.2200	10.6334	0.7300	0.7000	0.7700	4.5939	(74)
South	4.8400	46.7521	0.7300	0.7000	0.7700	80.1310	(78)
West	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(80)

Solar gains	93.2101	156.6119	209.4227	252.7669	278.0228	274.0464	265.0077	246.2835	224.3566	171.6945	111.2298	80.0481	(83)
Total gains	671.9587	733.1052	768.9156	780.6482	774.7181	742.6023	717.0318	701.4347	695.7621	671.8447	645.9924	644.8924	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area	0.9548	0.9345	0.9000	0.8384	0.7322	0.5741	0.4245	0.4515	0.6415	0.8380	0.9305	0.9610	(86)
MIT	19.8619	20.0443	20.2989	20.5789	20.8129	20.9477	20.9880	20.9843	20.9154	20.6390	20.1954	19.8005	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house	0.9466	0.9229	0.8822	0.8094	0.6850	0.5048	0.3419	0.3685	0.5751	0.8036	0.9162	0.9538	(89)
MIT 2	18.8049	19.0309	19.3435	19.6780	19.9404	20.0728	20.1035	20.1013	20.0456	19.7540	19.2228	18.7284	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.1926	19.4026	19.6939	20.0085	20.2604	20.3937	20.4279	20.4252	20.3647	20.0786	19.5796	19.1216	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1926	19.4026	19.6939	20.0085	20.2604	20.3937	20.4279	20.4252	20.3647	20.0786	19.5796	19.1216	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9362	0.9120	0.8728	0.8058	0.6935	0.5276	0.3719	0.3985	0.5950	0.8023	0.9062	0.9438	(94)
Useful gains	629.0782	668.6070	671.1015	629.0097	537.2302	391.8074	266.6693	279.4938	413.9646	539.0192	585.3902	608.6595	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1049.1838	1021.7096	929.5126	782.5934	603.0814	408.1694	269.6781	283.5749	441.3471	667.7697	879.1842	1051.2279	(97)
Space heating kWh	312.5586	237.2850	192.2578	110.5803	48.9933	0.0000	0.0000	0.0000	0.0000	95.7904	211.5317	329.2709	(98a)
Space heating requirement - total per year (kWh/year)												1538.2680	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	312.5586	237.2850	192.2578	110.5803	48.9933	0.0000	0.0000	0.0000	0.0000	95.7904	211.5317	329.2709	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1538.2680	
Space heating per m2											(98c) / (4) =	21.1649	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	312.5586	237.2850	192.2578	110.5803	48.9933	0.0000	0.0000	0.0000	0.0000	95.7904	211.5317	329.2709	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	468.8379	355.9275	288.3867	165.8704	73.4899	0.0000	0.0000	0.0000	0.0000	143.6856	317.2976	493.9063	
Space heating requirement													
	468.8379	355.9275	288.3867	165.8704	73.4899	0.0000	0.0000	0.0000	0.0000	143.6856	317.2976	493.9063	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	
Water heating fuel													
	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9032	-24.7478	-42.1903	-54.3464	-63.2831	-60.6270	-59.4769	-53.4801	-43.2885	-30.7805	-17.3978	-12.3224	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5955	-11.8305	-29.8051	-54.5176	-80.7077	-84.5250	-82.2640	-64.2624	-40.1739	-18.7163	-6.5523	-3.4266	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2307.4020	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3917.1568	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	23.0740	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
Total electricity for the above, kWh/year	19.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5479.7641	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2307.4020	4.4400	102.4486	(340a)
Space heating total			102.4486	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3917.1568	4.4400	173.9218	(342a)
Water heating total			173.9218	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	16.4900	3.2957	(349)
Energy for lighting	193.4401	16.4900	31.8983	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	16.4900	-78.6316	
PV Unit electricity exported	-481.3770	5.5900	-26.9090	
Total			-105.5405	(352)
Total energy cost			298.0239	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9117 (357)
SAP value		85.2214
SAP rating (Section 12)		85 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1659.8823	0.1555	95.6993	(367)
Electrical energy for heat distribution (space & water)	23.0740	0.0000	9.1066	(372)
Overall CO2 factor for heat network			0.0405	(386)
Total CO2 associated with community systems			251.9488	(373)
Space and water heating			251.9488	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	0.1320	-62.9388	
PV Unit electricity exported	-481.3770	0.1213	-58.4056	
Total			-121.3444	(380)
Total CO2, kg/year			161.2961	(383)
CO2 emissions per m2			2.2200	(384)
EI value			98.1634	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b)	x 2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c)	x 2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11875.9502 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

Thermal bridges (User defined value 0.030 * total exposed area) 4.9323 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)

Average = Sum(39)m / 12 = 70.4500

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 118.0387 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =		2611.4378	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)													
	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)
Total internal gains													
	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.2200	12.7500	0.7300	0.7000	0.7700	5.5084	(74)
South	4.8400	54.0600	0.7300	0.7000	0.7700	92.6564	(78)
West	1.2200	23.7835	0.7300	0.7000	0.7700	10.2752	(80)

Solar gains	108.4400	161.8046	213.5379	262.3798	280.1011	297.2778	281.6193	265.1152	241.9720	187.1783	127.4265	93.7101	(83)
Total gains	687.1886	738.2979	773.0309	790.2610	776.7965	765.8336	733.6434	720.2663	713.3775	687.3284	662.1891	658.5544	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9488	0.9294	0.8889	0.8213	0.7052	0.5141	0.3704	0.3954	0.6080	0.8106	0.9190	0.9559	(86)
MIT	19.9291	20.0916	20.3635	20.6272	20.8465	20.9683	20.9936	20.9914	20.9336	20.7015	20.2713	19.8662	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9395	0.9169	0.8691	0.7896	0.6542	0.4421	0.2877	0.3121	0.5393	0.7714	0.9025	0.9477	(89)
MIT 2	18.8887	19.0895	19.4218	19.7335	19.9753	20.0891	20.1065	20.1054	20.0613	19.8238	19.3154	18.8108	(90)
Living area fraction									fLA = Living area / (4) =			0.3668	(91)
MIT	19.2703	19.4571	19.7672	20.0613	20.2949	20.4116	20.4319	20.4304	20.3813	20.1458	19.6660	19.1980	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2703	19.4571	19.7672	20.0613	20.2949	20.4116	20.4319	20.4304	20.3813	20.1458	19.6660	19.1980	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9289	0.9061	0.8605	0.7877	0.6654	0.4671	0.3180	0.3425	0.5611	0.7732	0.8929	0.9375	(94)
Useful gains	638.3205	668.9628	665.1872	622.4915	516.9036	357.7048	233.2717	246.6736	400.2627	531.4389	591.2796	617.3812	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	1033.5228	1004.4131	899.4519	758.1356	570.2830	367.1568	234.7322	248.7165	421.3804	637.2735	857.0980	1035.4713	(97)
Space heating kWh													
	294.0305	225.4226	174.2929	97.6637	39.7143	0.0000	0.0000	0.0000	0.0000	78.7409	191.3892	311.0590	(98a)
Space heating requirement - total per year (kWh/year)												1412.3132	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	294.0305	225.4226	174.2929	97.6637	39.7143	0.0000	0.0000	0.0000	0.0000	78.7409	191.3892	311.0590	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1412.3132	
Space heating per m2										(98c) / (4) =		19.4319	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	294.0305	225.4226	174.2929	97.6637	39.7143	0.0000	0.0000	0.0000	0.0000	78.7409	191.3892	311.0590	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	441.0457	338.1339	261.4394	146.4956	59.5714	0.0000	0.0000	0.0000	0.0000	118.1114	287.0839	466.5885	
Space heating requirement													
	441.0457	338.1339	261.4394	146.4956	59.5714	0.0000	0.0000	0.0000	0.0000	118.1114	287.0839	466.5885	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	
Water heating fuel													
	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.7988	-26.5546	-44.3894	-57.0811	-64.6020	-64.1536	-62.3425	-56.9881	-46.9012	-34.2077	-20.4034	-14.8306	(333a)

Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.1997	-13.4106	-32.8557	-60.4920	-84.6385	-96.9652	-92.1477	-74.2535	-47.4476	-22.7886	-8.6270	-4.6681	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2118.4697	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3917.1568	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	21.1847	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
Total electricity for the above, kWh/year	19.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5194.3057	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2118.4697	6.5500	138.7598	(340a)
Space heating total			138.7598	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3917.1568	6.5500	256.5738	(342a)
Water heating total			256.5738	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	28.4300	5.6821	(349)
Energy for lighting	193.4401	28.4300	54.9950	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.2528	28.4300	-145.0649	
PV Unit electricity exported	-544.4942	5.8100	-31.6351	
Total			-176.7000	(352)
Total energy cost			383.3106	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1609.5004	0.1559	88.0723	(367)
Electrical energy for heat distribution (space & water)	21.1847	0.0000	8.8206	(372)
Overall CO2 factor for heat network			0.0404	(386)
Total CO2 associated with community systems			244.0358	(373)
Space and water heating			244.0358	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.2528	0.1323	-67.5052	
PV Unit electricity exported	-544.4942	0.1214	-66.0897	
Total			-133.5948	(380)
Total CO2, kg/year			141.1327	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1609.5004	1.5772	890.9825	(467)
Electrical energy for heat distribution (space & water)	21.1847	0.0000	92.9864	(472)
Overall CO2 factor for heat network			0.4262	(486)
Total CO2 associated with community systems			2572.6234	(473)
Space and water heating			2572.6234	(476)
Pumps, fans and electric keep-hot	19.9861	1.5128	30.2350	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.2528	1.4888	-759.6722	
PV Unit electricity exported	-544.4942	0.4453	-242.4386	
Total			-1002.1108	(480)
Total Primary energy kWh/year			1897.4526	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - South

Current energy efficiency rating: B 85
Current environmental impact rating: A 98

N Solar water heating	Recommended
U Solar photovoltaic panels	Already installed
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.4	-£ 47	-26 kg (18.4%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£47	0.36 kg/m²	B 87	A 98
Total Savings	£47	0.36 kg/m²		

Potential energy efficiency rating: B 87
Potential environmental impact rating: A 98

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£61	£83	-£23
Community scheme	£499	£431	£69
Space heating	£248	£271	-£23
Water heating	£257	£188	£69
Lighting	£55	£55	£0
Generated (PV)	-£177	-£178	£1
Total cost of fuels	£383	£336	£47
Total cost of uses	£383	£336	£47
Delivered energy	71 kWh/m²	58 kWh/m²	13 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	2 kg/m²	2 kg/m²	0 kg/m²
Primary energy	26 kWh/m²	22 kWh/m²	4 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330 (1b) - (3b)	
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		4.9323 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3094	(42)
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												624.1873	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												624.1873	
Solar input	-0.0000	-16.2194	-58.0608	-80.0094	-105.2873	-97.2929	-96.7392	-84.2620	-57.6788	-28.6375	-0.0000	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.6481	212.6591	185.2328	133.9970	102.2831	89.8555	87.9356	107.6103	136.1704	187.4116	229.6316	255.8155	(64)
									Total per year (kWh/year) = Sum(64)m =			1987.2506	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757 (71)
Water heating gains (Table 5)												
	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599 (72)
Total internal gains												
	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.2200	10.6334	0.7300	0.7000	0.7700	4.5939	(74)
South	4.8400	46.7521	0.7300	0.7000	0.7700	80.1310	(78)
West	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(80)

Solar gains	93.2101	156.6119	209.4227	252.7669	278.0228	274.0464	265.0077	246.2835	224.3566	171.6945	111.2298	80.0481 (83)
Total gains	671.9587	733.1052	768.9156	780.6482	774.7181	742.6023	717.0318	701.4347	695.7621	671.8447	645.9924	644.8924 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217
util living area												
	0.9548	0.9345	0.9000	0.8384	0.7322	0.5741	0.4245	0.4515	0.6415	0.8380	0.9305	0.9610 (86)
MIT	19.8619	20.0443	20.2989	20.5789	20.8129	20.9477	20.9880	20.9843	20.9154	20.6390	20.1954	19.8005 (87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090 (88)
util rest of house												
	0.9466	0.9229	0.8822	0.8094	0.6850	0.5048	0.3419	0.3685	0.5751	0.8036	0.9162	0.9538 (89)
MIT 2	18.8049	19.0309	19.3435	19.6780	19.9404	20.0728	20.1035	20.1013	20.0456	19.7540	19.2228	18.7284 (90)
Living area fraction										fLA = Living area / (4) =		0.3668 (91)
MIT	19.1926	19.4026	19.6939	20.0085	20.2604	20.3937	20.4279	20.4252	20.3647	20.0786	19.5796	19.1216 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1926	19.4026	19.6939	20.0085	20.2604	20.3937	20.4279	20.4252	20.3647	20.0786	19.5796	19.1216 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9362	0.9120	0.8728	0.8058	0.6935	0.5276	0.3719	0.3985	0.5950	0.8023	0.9062	0.9438	(94)
Useful gains	629.0782	668.6070	671.1015	629.0097	537.2302	391.8074	266.6693	279.4938	413.9646	539.0192	585.3902	608.6595	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1049.1838	1021.7096	929.5126	782.5934	603.0814	408.1694	269.6781	283.5749	441.3471	667.7697	879.1842	1051.2279	(97)
Space heating kWh													
	312.5586	237.2850	192.2578	110.5803	48.9933	0.0000	0.0000	0.0000	0.0000	95.7904	211.5317	329.2709	(98a)
Space heating requirement - total per year (kWh/year)												1538.2680	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	312.5586	237.2850	192.2578	110.5803	48.9933	0.0000	0.0000	0.0000	0.0000	95.7904	211.5317	329.2709	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1538.2680	
Space heating per m2											(98c) / (4) =	21.1649	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	312.5586	237.2850	192.2578	110.5803	48.9933	0.0000	0.0000	0.0000	0.0000	95.7904	211.5317	329.2709	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	468.8379	355.9275	288.3867	165.8704	73.4899	0.0000	0.0000	0.0000	0.0000	143.6856	317.2976	493.9063	
Space heating requirement													
	468.8379	355.9275	288.3867	165.8704	73.4899	0.0000	0.0000	0.0000	0.0000	143.6856	317.2976	493.9063	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	212.6591	185.2328	133.9970	102.2831	89.8555	87.9356	107.6103	136.1704	187.4116	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	318.9886	277.8492	200.9955	153.4247	134.7833	131.9034	161.4154	204.2556	281.1174	344.4473	383.7233	
Water heating fuel													
	387.9721	318.9886	277.8492	200.9955	153.4247	134.7833	131.9034	161.4154	204.2556	281.1174	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	8.4920	7.6702	8.4920	8.2180	8.4920	8.2180	8.4920	8.4920	8.2180	8.4920	8.2180	8.4920	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9541	-24.8708	-42.4882	-54.8798	-64.0812	-61.5030	-60.3713	-54.2093	-43.7560	-31.0030	-17.4758	-12.3621	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5447	-11.7075	-29.5072	-53.9842	-79.9096	-83.6490	-81.3696	-63.5332	-39.7064	-18.4938	-6.4743	-3.3869	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2307.4020	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2980.8759	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	23.0740	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4623.4832	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2307.4020	4.4400	102.4486	(340a)
Space heating total			102.4486	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2980.8759	4.4400	132.3509	(342a)
Water heating total			132.3509	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	16.4900	3.2957	(349)
Pump for solar water heating	80.0000	16.4900	13.1920	(349)
Energy for lighting	193.4401	16.4900	31.8983	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-481.9545	16.4900	-79.4743	
PV Unit electricity exported	-476.2665	5.5900	-26.6233	
Total			-106.0976	(352)
Total energy cost			269.0879	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8232	(357)
SAP value		86.6563	
SAP rating (Section 12)		87	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1410.2074	0.1555	95.6993	(367)
Electrical energy for heat distribution (space & water)	23.0740	0.0000	7.9126	(372)
Overall CO2 factor for heat network			0.0414	(386)
Total CO2 associated with community systems			218.9149	(373)
Space and water heating			218.9149	(376)
Pumps, fans and electric keep-hot	99.9861	0.1387	13.8693	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-481.9545	0.1319	-63.5856	
PV Unit electricity exported	-476.2665	0.1213	-57.7895	
Total			-121.3751	(380)
Total CO2, kg/year			139.3285	(383)
CO2 emissions per m2			1.9200	(384)
EI value			98.4135	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330 (1b) - (3b)	
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		4.9323 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.3094	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day)	118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	

Distribution loss (46)m = 0.15 x (45)m

30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)

Water storage loss:

Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												698.3818	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												698.3818	
Solar input	-0.2882	-19.8943	-63.0504	-86.9122	-108.6771	-108.6071	-105.7317	-94.9883	-67.4759	-37.8323	-4.9243	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	258.3599	208.9842	180.2432	127.0942	98.8933	78.5413	78.9431	96.8840	126.3733	178.2168	224.7072	255.8155	(64)
									Total per year (kWh/year) = Sum(64)m =			1913.0561	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month													
	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)													
	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)
Total internal gains													
	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.2200	12.7500	0.7300	0.7000	0.7700	5.5084	(74)
South	4.8400	54.0600	0.7300	0.7000	0.7700	92.6564	(78)
West	1.2200	23.7835	0.7300	0.7000	0.7700	10.2752	(80)

Solar gains	108.4400	161.8046	213.5379	262.3798	280.1011	297.2778	281.6193	265.1152	241.9720	187.1783	127.4265	93.7101	(83)
Total gains	687.1886	738.2979	773.0309	790.2610	776.7965	765.8336	733.6434	720.2663	713.3775	687.3284	662.1891	658.5544	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9488	0.9294	0.8889	0.8213	0.7052	0.5141	0.3704	0.3954	0.6080	0.8106	0.9190	0.9559	(86)
MIT	19.9291	20.0916	20.3635	20.6272	20.8465	20.9683	20.9936	20.9914	20.9336	20.7015	20.2713	19.8662	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9395	0.9169	0.8691	0.7896	0.6542	0.4421	0.2877	0.3121	0.5393	0.7714	0.9025	0.9477	(89)
MIT 2	18.8887	19.0895	19.4218	19.7335	19.9753	20.0891	20.1065	20.1054	20.0613	19.8238	19.3154	18.8108	(90)
Living area fraction									fLA = Living area / (4) =			0.3668	(91)
MIT	19.2703	19.4571	19.7672	20.0613	20.2949	20.4116	20.4319	20.4304	20.3813	20.1458	19.6660	19.1980	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2703	19.4571	19.7672	20.0613	20.2949	20.4116	20.4319	20.4304	20.3813	20.1458	19.6660	19.1980	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9289	0.9061	0.8605	0.7877	0.6654	0.4671	0.3180	0.3425	0.5611	0.7732	0.8929	0.9375	(94)
Useful gains	638.3205	668.9628	665.1872	622.4915	516.9036	357.7048	233.2717	246.6736	400.2627	531.4389	591.2796	617.3812	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	1033.5228	1004.4131	899.4519	758.1356	570.2830	367.1568	234.7322	248.7165	421.3804	637.2735	857.0980	1035.4713	(97)
Space heating kWh													
	294.0305	225.4226	174.2929	97.6637	39.7143	0.0000	0.0000	0.0000	0.0000	78.7409	191.3892	311.0590	(98a)
Space heating requirement - total per year (kWh/year)												1412.3132	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	294.0305	225.4226	174.2929	97.6637	39.7143	0.0000	0.0000	0.0000	0.0000	78.7409	191.3892	311.0590	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1412.3132	
Space heating per m2											(98c) / (4) =	19.4319	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement													
	294.0305	225.4226	174.2929	97.6637	39.7143	0.0000	0.0000	0.0000	0.0000	78.7409	191.3892	311.0590	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	441.0457	338.1339	261.4394	146.4956	59.5714	0.0000	0.0000	0.0000	0.0000	118.1114	287.0839	466.5885	
Space heating requirement													
	441.0457	338.1339	261.4394	146.4956	59.5714	0.0000	0.0000	0.0000	0.0000	118.1114	287.0839	466.5885	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement													
	258.3599	208.9842	180.2432	127.0942	98.8933	78.5413	78.9431	96.8840	126.3733	178.2168	224.7072	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.5399	313.4764	270.3648	190.6413	148.3399	117.8120	118.4147	145.3260	189.5599	267.3252	337.0608	383.7233	
Water heating fuel													
	387.5399	313.4764	270.3648	190.6413	148.3399	117.8120	118.4147	145.3260	189.5599	267.3252	337.0608	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	8.4920	7.6702	8.4920	8.2180	8.4920	8.2180	8.4920	8.4920	8.2180	8.4920	8.2180	8.4920	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.8663	-26.6927	-44.7143	-57.6640	-65.4319	-65.1316	-63.3225	-57.8097	-47.4406	-34.4735	-20.5043	-14.8840	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.1321	-13.2725	-32.5307	-59.9091	-83.8086	-95.9871	-91.1676	-73.4319	-46.9082	-22.5228	-8.5261	-4.6148	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2118.4697	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2869.5841	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	21.1847	(313)
Space cooling fuel	0.0000	(321)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4226.7331	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2118.4697	6.5500	138.7598	(340a)
Space heating total			138.7598	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2869.5841	6.5500	187.9578	(342a)
Water heating total			187.9578	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	28.4300	5.6821	(349)
Pump for solar water heating	80.0000	28.4300	22.7440	(349)
Energy for lighting	193.4401	28.4300	54.9950	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-515.9355	28.4300	-146.6805	
PV Unit electricity exported	-538.8116	5.8100	-31.3050	
Total			-177.9854	(352)
Total energy cost			336.1532	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1330.1477	0.1559	88.0723	(367)
Electrical energy for heat distribution (space & water)	21.1847	0.0000	7.4829	(372)
Overall CO2 factor for heat network			0.0415	(386)
Total CO2 associated with community systems			207.0264	(373)
Space and water heating			207.0264	(376)
Pumps, fans and electric keep-hot	99.9861	0.1387	13.8693	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-515.9355	0.1322	-68.2250	
PV Unit electricity exported	-538.8116	0.1214	-65.4032	
Total			-133.6282	(380)
Total CO2, kg/year			115.1869	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1330.1477	1.5772	890.9825	(467)
Electrical energy for heat distribution (space & water)	21.1847	0.0000	77.5703	(472)
Overall CO2 factor for heat network			0.4303	(486)
Total CO2 associated with community systems			2146.1104	(473)
Space and water heating			2146.1104	(476)
Pumps, fans and electric keep-hot	99.9861	1.5128	151.2590	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-515.9355	1.4886	-768.0122	
PV Unit electricity exported	-538.8116	0.4453	-239.9213	
Total			-1007.9335	(480)
Total Primary energy kWh/year			1586.1409	(483)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.33	**TER**	11.43
Environmental	98 A	**% DER < TER**			79.62
CO_2 Emissions (t/year)	0.14	**DFEE**	31.23	**TFEE**	33.84
Compliance Check	See BREL	**% DFEE < TFEE**			7.72
% DPER < TPER	50.82	**DPER**	29.42	**TPER**	59.83

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				3	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 11875.9502	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	163.4005	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 4.9323 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 118.0387 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)											Total = Sum(45)m =	1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =	2611.4378	(64)
12Total per year (kWh/year)											2611	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)

Water heating gains (Table 5)

150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)

Total internal gains

529.9009	542.3600	519.8296	502.5508	478.2395	462.4112	445.5913	446.6965	459.7372	474.1489	501.8869	519.6574	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	4.8400	36.7938	0.7300	0.7000	0.7700	63.0630	(77)
Southwest	1.2200	36.7938	0.7300	0.7000	0.7700	15.8960	(79)
Northwest	1.2200	11.2829	0.7300	0.7000	0.7700	4.8746	(81)

Solar gains 83.8336	144.4188	201.9008	257.3735	294.8595	295.6214	283.8062	255.3975	221.0422	160.7731	100.7082	71.5533	(83)
Total gains 613.7345	686.7788	721.7304	759.9243	773.0989	758.0326	729.3975	702.0940	680.7794	634.9220	602.5951	591.2107	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9661	0.9460	0.9157	0.8480	0.7331	0.5644	0.4177	0.4511	0.6521	0.8577	0.9433	0.9705	(86)
MIT	19.7583	19.9691	20.2327	20.5575	20.8119	20.9509	20.9887	20.9844	20.9102	20.5998	20.1259	19.7027	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9596	0.9360	0.8999	0.8199	0.6860	0.4956	0.3363	0.3682	0.5855	0.8257	0.9311	0.9648	(89)
MIT 2	18.6762	18.9388	19.2648	19.6541	19.9394	20.0751	20.1038	20.1013	20.0414	19.7114	19.1388	18.6064	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.0732	19.3167	19.6198	19.9855	20.2595	20.3964	20.4284	20.4252	20.3601	20.0373	19.5009	19.0086	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0732	19.3167	19.6198	19.9855	20.2595	20.3964	20.4284	20.4252	20.3601	20.0373	19.5009	19.0086	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9501	0.9254	0.8899	0.8156	0.6944	0.5184	0.3659	0.3981	0.6051	0.8228	0.9211	0.9559	(94)
Useful gains	583.1338	635.5424	642.2990	619.7841	536.8352	392.9948	266.8778	279.5094	411.9260	522.4344	555.0556	565.1331	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1040.7695	1015.6587	924.2901	780.9711	603.0159	408.3546	269.7106	283.5773	441.0222	664.8557	873.6414	1043.2628	(97)
Space heating kWh	340.4809	255.4381	209.8014	116.0546	49.2384	0.0000	0.0000	0.0000	0.0000	105.9614	229.3817	355.7285	(98a)
Space heating requirement - total per year (kWh/year)												1662.0851	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	340.4809	255.4381	209.8014	116.0546	49.2384	0.0000	0.0000	0.0000	0.0000	105.9614	229.3817	355.7285	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1662.0851	
Space heating per m2											(98c) / (4) =	22.8685	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	340.4809	255.4381	209.8014	116.0546	49.2384	0.0000	0.0000	0.0000	0.0000	105.9614	229.3817	355.7285	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	510.7214	383.1571	314.7021	174.0819	73.8576	0.0000	0.0000	0.0000	0.0000	158.9422	344.0726	533.5927	
Space heating requirement													
	510.7214	383.1571	314.7021	174.0819	73.8576	0.0000	0.0000	0.0000	0.0000	158.9422	344.0726	533.5927	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	
Water heating fuel													
	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9032	-24.7478	-42.1903	-54.3464	-63.2831	-60.6270	-59.4769	-53.4801	-43.2885	-30.7805	-17.3978	-12.3224	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5955	-11.8305	-29.8051	-54.5176	-80.7077	-84.5250	-82.2640	-64.2624	-40.1739	-18.7163	-6.5523	-3.4266	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												2493.1277	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3917.1568	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												24.9313	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.9861	(330a)
Total electricity for the above, kWh/year												19.9861	(331)
Electricity for lighting (calculated in Appendix L)												193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5665.4898	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1709.4092	0.1556	103.4378	(367)
Electrical energy for heat distribution (space & water)	24.9313	0.0000	9.3968	(372)
Overall CO2 factor for heat network			0.0406	(386)
Total CO2 associated with community systems			259.9775	(373)
Space and water heating			259.9775	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	0.1320	-62.9388	
PV Unit electricity exported	-481.3770	0.1213	-58.4056	
Total			-121.3444	(380)
Total CO2, kg/year			169.3248	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.3300	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1709.4092	1.5760	1047.7777	(467)
Electrical energy for heat distribution (space & water)	24.9313	0.0000	98.8662	(472)
Overall CO2 factor for heat network			0.4267	(486)
Total CO2 associated with community systems			2735.2984	(473)
Space and water heating			2735.2984	(476)
Pumps, fans and electric keep-hot	19.9861	1.5128	30.2350	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	1.4877	-709.3875	
PV Unit electricity exported	-481.3770	0.4451	-214.2796	
Total			-923.6671	(480)
Total Primary energy kWh/year			2138.5713	(483)
Dwelling Primary energy Rate (DPER)			29.4200	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b) x	2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c) x	2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4185	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3243	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4135	0.4054	0.3973	0.3568	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3649	0.3811	(22b)
Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			7.2800	1.1450	8.3359			(27)
Heatloss floor			36.3400	0.1300	4.7242			(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.1800	14.8338			(29a)
500mm mineral wool	36.3400		36.3400	0.1100	3.9974			(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.9313			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	3.6500	0.0500	0.1825
E3 Sill	2.7400	0.0500	0.1370
E4 Jamb	14.8400	0.0500	0.7420
E5 Ground floor (normal)	18.7200	0.1600	2.9952
E6 Intermediate floor within a dwelling	18.7200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.7200	0.0600	1.1232
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	5.5000	0.0800	0.4400
P2 Party wall - Intermediate floor within a dwelling	5.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	5.5000	0.1200	0.6600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8399 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.7712 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.4047	34.2096	34.0184	33.1202	32.9522	32.1700	32.1700	32.0251	32.4713	32.9522	33.2921	33.6475	(38)
Heat transfer coeff	76.1759	75.9808	75.7896	74.8914	74.7234	73.9411	73.9411	73.7963	74.2424	74.7234	75.0633	75.4187	(39)
Average = Sum(39)m / 12 =												74.8906	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0481	1.0454	1.0428	1.0304	1.0281	1.0174	1.0174	1.0154	1.0215	1.0281	1.0328	1.0377	(40)
HLP (average)												1.0304	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	249.9662	221.0368	234.6117	205.6045	198.8885	178.7466	175.9929	183.1904	185.4473	207.3672	221.2297	247.1336	(62)
WWHRS	-28.7738	-25.4478	-26.6475	-22.0651	-20.5639	-17.5967	-16.4941	-17.5398	-18.2062	-21.4631	-24.3151	-28.2410	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
										Total per year (kWh/year) = Sum(64)m =		2241.8614	(64)
12Total per year (kWh/year)												2242	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	104.8969	93.1698	99.7915	89.4439	87.9135	80.5137	80.3008	82.6939	82.7417	90.7327	94.6393	103.9551	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	140.9904	138.6456	134.1284	124.2277	118.1634	111.8245	107.9311	111.1477	114.9190	121.9526	131.4435	139.7245	(72)
Total internal gains	523.5655	536.0247	513.4942	496.2155	471.9041	453.0758	436.2560	437.3612	450.4018	467.8135	495.5515	513.3220	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	4.8400	36.7938	0.6300	0.7000	0.7700	54.4242	(77)
Southwest	1.2200	36.7938	0.6300	0.7000	0.7700	13.7185	(79)
Northwest	1.2200	11.2829	0.6300	0.7000	0.7700	4.2068	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	72.3495	124.6354	174.2431	222.1168	254.4678	255.1253	244.9286	220.4115	190.7625	138.7494	86.9125	61.7515	(83)
Total gains	595.9150	660.6600	687.7374	718.3323	726.3719	708.2011	681.1846	657.7727	641.1643	606.5629	582.4640	575.0735	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3060	43.4172	43.5268	44.0488	44.1478	44.6149	44.6149	44.7025	44.4338	44.1478	43.9479	43.7408	
alpha	3.8871	3.8945	3.9018	3.9366	3.9432	3.9743	3.9743	3.9802	3.9623	3.9432	3.9299	3.9161	
util living area	0.9714	0.9561	0.9332	0.8783	0.7797	0.6166	0.4640	0.4974	0.7007	0.8830	0.9526	0.9747	(86)
MIT	19.5550	19.7659	20.0458	20.4235	20.7306	20.9232	20.9806	20.9742	20.8678	20.4940	19.9777	19.5234	(87)
Th 2	20.0434	20.0457	20.0478	20.0581	20.0600	20.0689	20.0689	20.0706	20.0655	20.0600	20.0561	20.0521	(88)
util rest of house	0.9657	0.9475	0.9196	0.8529	0.7336	0.5428	0.3717	0.4046	0.6321	0.8538	0.9419	0.9696	(89)
MIT 2	18.3750	18.6410	18.9917	19.4589	19.8131	20.0152	20.0599	20.0578	19.9641	19.5518	18.9177	18.3412	(90)
Living area fraction									fLA = Living area / (4) =			0.3668	(91)
MIT	18.8078	19.0536	19.3783	19.8128	20.1497	20.3482	20.3976	20.3940	20.2956	19.8974	19.3066	18.7748	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8078	19.0536	19.3783	19.8128	20.1497	20.3482	20.3976	20.3940	20.2956	19.8974	19.3066	18.7748	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9561	0.9363	0.9081	0.8454	0.7384	0.5659	0.4050	0.4378	0.6501	0.8479	0.9312	0.9607	(94)
Useful gains	569.7456	618.5765	624.5520	607.2676	536.3274	400.7794	275.8661	287.9524	416.8022	514.3317	542.4000	552.4466	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1105.1451	1075.4028	976.0425	817.2720	631.3870	425.0315	280.8019	294.7401	459.9764	694.7331	916.2650	1099.2162	(97)
Space heating kWh	398.3372	306.9873	261.5089	151.2032	70.7244	0.0000	0.0000	0.0000	0.0000	134.2186	269.1828	406.7966	(98a)
Space heating requirement - total per year (kWh/year)												1998.9590	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	398.3372	306.9873	261.5089	151.2032	70.7244	0.0000	0.0000	0.0000	0.0000	134.2186	269.1828	406.7966	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1998.9590	
Space heating per m2											(98c) / (4) =	27.5036	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	398.3372	306.9873	261.5089	151.2032	70.7244	0.0000	0.0000	0.0000	0.0000	134.2186	269.1828	406.7966	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	431.5680	332.5973	283.3249	163.8171	76.6245	0.0000	0.0000	0.0000	0.0000	145.4156	291.6390	440.7330	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.3627	85.0663	84.5747	83.6285	82.1648	79.8000	79.8000	79.8000	79.8000	83.3415	84.7613	85.4293	(217)
Fuel for water heating, kWh/month	259.1206	229.9254	245.8942	219.4698	217.0327	201.9422	199.8732	207.5821	209.5753	223.0630	232.3166	256.2267	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.6146	19.7468	17.7798	13.0262	10.0618	8.2206	9.1787	11.9309	15.4970	20.3329	22.9660	25.2988	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-34.1427	-48.1921	-69.3402	-78.0353	-84.2042	-78.6248	-77.6860	-73.3488	-65.6465	-55.1924	-37.5712	-29.5143	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.0663	-40.1520	-79.8860	-120.0915	-158.8866	-159.6687	-157.7568	-133.4905	-97.7594	-57.4135	-25.4553	-15.0706	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2165.7194	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2702.0219	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	198.6542	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1796.1956	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3356.2000	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2165.7194	0.2100	454.8011	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2702.0219	0.2100	567.4246	(264)
Space and water heating			1022.2257	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	198.6542	0.1443	28.6719	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	0.1346	-98.4313	
PV Unit electricity exported	-1064.6971	0.1259	-134.0169	
Total			-232.4482	(269)
Total CO2, kg/year			830.3787	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.4300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2165.7194	1.1300	2447.2629	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2702.0219	1.1300	3053.2847	(278)
Space and water heating			5500.5476	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	198.6542	1.5338	304.7025	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	1.4973	-1095.2830	
PV Unit electricity exported	-1064.6971	0.4620	-491.9332	
Total			-1587.2162	(283)
Total Primary energy kWh/year			4348.1347	(286)
Target Primary Energy Rate (TPER)			59.8300	(287)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.33	**TER**	11.43
Environmental	98 A	**% DER < TER**			79.62
CO_2 Emissions (t/year)	0.14	**DFEE**	31.23	**TFEE**	33.84
Compliance Check	See BREL	**% DFEE < TFEE**			7.72
% DPER < TPER	50.82	**DPER**	29.42	**TPER**	59.83

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		3 * 10 =	30.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1685	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.3185	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2468	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3147	0.3085	0.3024	0.2715	0.2653	0.2345	0.2345	0.2283	0.2468	0.2653	0.2777	0.2900	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5495	0.5476	0.5457	0.5369	0.5352	0.5275	0.5275	0.5261	0.5305	0.5352	0.5386	0.5421	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		11875.9502	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							163.4005	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							4.9323	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.2906	32.1776	32.0668	31.5466	31.4493	30.9963	30.9963	30.9124	31.1708	31.4493	31.6462	31.8520	(38)
Heat transfer coeff	73.3597	73.2467	73.1359	72.6157	72.5184	72.0654	72.0654	71.9815	72.2399	72.5184	72.7153	72.9211	(39)
Average = Sum(39)m / 12 =												72.6153	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0094	1.0078	1.0063	0.9991	0.9978	0.9915	0.9915	0.9904	0.9939	0.9978	1.0005	1.0033	(40)
HLP (average)												0.9991	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 60.0096 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.4702	63.6744	61.7137	59.2732	57.0961	54.8336	54.3634	56.3200	58.3269	60.6504	63.1125	65.3783	(44)
Energy conte	103.6888	90.6715	94.8517	81.1421	76.8624	67.4243	65.7478	69.7360	71.9229	82.3020	89.9153	102.3666	(45)
Energy content (annual)										Total = Sum(45)m =		996.6312	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(64)
								Total per year (kWh/year) = Sum(64)m =			847.1365	(64)
12Total per year (kWh/year)											847	(64)

Electric shower(s)

50.4049	44.9112	49.0413	46.7995	47.6777	45.4799	46.9959	47.6777	46.7995	49.0413	48.1191	50.4049	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 573.3528 (64a)

Heat gains from water heating, kWh/month

34.6351	30.4955	32.4163	28.9426	28.2527	25.6976	25.7204	26.7383	26.9835	29.7495	31.1368	34.3541	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	46.5525	45.3802	43.5703	40.1980	37.9740	35.6912	34.5704	35.9386	37.4771	39.9859	43.2455	46.1749	(72)
Total internal gains	426.1276	439.7593	419.9362	409.1858	388.7147	376.9424	362.8952	362.1520	372.9599	382.8469	404.3535	416.7724	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	4.8400	36.7938	0.7300	0.7000	0.7700	63.0630	(77)
Southwest	1.2200	36.7938	0.7300	0.7000	0.7700	15.8960	(79)
Northwest	1.2200	11.2829	0.7300	0.7000	0.7700	4.8746	(81)

Solar gains	83.8336	144.4188	201.9008	257.3735	294.8595	295.6214	283.8062	255.3975	221.0422	160.7731	100.7082	71.5533	(83)
Total gains	509.9612	584.1781	621.8369	666.5593	683.5742	672.5638	646.7014	617.5495	594.0021	543.6199	505.0617	488.3257	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	44.9685	45.0379	45.1061	45.4292	45.4902	45.7762	45.7762	45.8295	45.6656	45.4902	45.3670	45.2389	
alpha	3.9979	4.0025	4.0071	4.0286	4.0327	4.0517	4.0517	4.0553	4.0444	4.0327	4.0245	4.0159	
util living area	0.9822	0.9687	0.9477	0.8943	0.7959	0.6309	0.4760	0.5154	0.7260	0.9077	0.9684	0.9849	(86)

MIT	19.4752	19.7081	20.0072	20.4036	20.7246	20.9219	20.9804	20.9729	20.8580	20.4493	19.8992	19.4309	(87)
Th 2	20.0755	20.0768	20.0781	20.0841	20.0852	20.0904	20.0904	20.0914	20.0884	20.0852	20.0829	20.0806	(88)
util rest of house													
	0.9785	0.9624	0.9366	0.8715	0.7519	0.5580	0.3837	0.4221	0.6595	0.8830	0.9608	0.9817	(89)
MIT 2	18.6896	18.9195	19.2129	19.5960	19.8864	20.0473	20.0832	20.0807	20.0020	19.6463	19.1147	18.6495	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.9778	19.2088	19.5043	19.8922	20.1939	20.3681	20.4123	20.4080	20.3160	19.9409	19.4025	18.9361	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9778	19.2088	19.5043	19.8922	20.1939	20.3681	20.4123	20.4080	20.3160	19.9409	19.4025	18.9361	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9728	0.9549	0.9284	0.8661	0.7575	0.5812	0.4171	0.4556	0.6773	0.8785	0.9538	0.9766	(94)
Useful gains	496.1034	557.8434	577.3129	577.3240	517.8362	390.9036	269.7473	281.3271	402.2969	477.5855	481.7072	476.8868	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1076.7573	1048.0722	951.0790	798.2099	615.9643	415.6802	274.7376	288.5005	449.0423	677.3859	894.5786	1074.5759	(97)
Space heating kWh													
	432.0065	329.4338	278.0820	159.0378	73.0073	0.0000	0.0000	0.0000	0.0000	148.6515	297.2674	444.6806	(98a)
Space heating requirement - total per year (kWh/year)												2162.1670	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	432.0065	329.4338	278.0820	159.0378	73.0073	0.0000	0.0000	0.0000	0.0000	148.6515	297.2674	444.6806	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2162.1670	
Space heating per m2											(98c) / (4) =	29.7491	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	677.4144	533.2836	547.0591	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8306	0.8949	0.8744	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	562.6615	477.2270	478.3476	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	729.5337	702.0382	670.4083	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	120.1480	167.2596	142.8932	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	30.0370	41.8149	35.7233	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												107.5752	(107)
Energy for space heating												29.7491	(99)
Energy for space cooling												1.4801	(108)
Total												31.2293	(109)
Fabric Energy Efficiency (DFEE)												31.2	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor		36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		=	178.0660	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4185	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3243	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4135	0.4054	0.3973	0.3568	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3649	0.3811	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			7.2800	1.1450	8.3359			(27)
Heatloss floor			36.3400	0.1300	4.7242			(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.1800	14.8338			(29a)
500mm mineral wool	36.3400		36.3400	0.1100	3.9974			(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.9313			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	3.6500	0.0500	0.1825
E3 Sill	2.7400	0.0500	0.1370
E4 Jamb	14.8400	0.0500	0.7420
E5 Ground floor (normal)	18.7200	0.1600	2.9952
E6 Intermediate floor within a dwelling	18.7200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.7200	0.0600	1.1232
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	5.5000	0.0800	0.4400
P2 Party wall - Intermediate floor within a dwelling	5.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	5.5000	0.1200	0.6600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8399 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.7712 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.4047	34.2096	34.0184	33.1202	32.9522	32.1700	32.1700	32.0251	32.4713	32.9522	33.2921	33.6475	(38)
Heat transfer coeff	76.1759	75.9808	75.7896	74.8914	74.7234	73.9411	73.9411	73.7963	74.2424	74.7234	75.0633	75.4187	(39)
Average = Sum(39)m / 12 =												74.8906	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0481	1.0454	1.0428	1.0304	1.0281	1.0174	1.0174	1.0154	1.0215	1.0281	1.0328	1.0377	(40)
HLP (average)												1.0304	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 60.0096 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.4702	63.6744	61.7137	59.2732	57.0961	54.8336	54.3634	56.3200	58.3269	60.6504	63.1125	65.3783	(44)
Energy conte	103.6888	90.6715	94.8517	81.1421	76.8624	67.4243	65.7478	69.7360	71.9229	82.3020	89.9153	102.3666	(45)
Energy content (annual)										Total = Sum(45)m =		996.6312	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(64)
								Total per year (kWh/year) = Sum(64)m =			847.1365	(64)
12Total per year (kWh/year)											847	(64)	

Electric shower(s)

50.4049	44.9112	49.0413	46.7995	47.6777	45.4799	46.9959	47.6777	46.7995	49.0413	48.1191	50.4049	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				573.3528	(64a)

Heat gains from water heating, kWh/month

34.6351	30.4955	32.4163	28.9426	28.2527	25.6976	25.7204	26.7383	26.9835	29.7495	31.1368	34.3541	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)													
	46.5525	45.3802	43.5703	40.1980	37.9740	35.6912	34.5704	35.9386	37.4771	39.9859	43.2455	46.1749	(72)
Total internal gains													
	426.1276	439.7593	419.9362	409.1858	388.7147	376.9424	362.8952	362.1520	372.9599	382.8469	404.3535	416.7724	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	4.8400	36.7938	0.6300	0.7000	0.7700	54.4242	(77)
Southwest	1.2200	36.7938	0.6300	0.7000	0.7700	13.7185	(79)
Northwest	1.2200	11.2829	0.6300	0.7000	0.7700	4.2068	(81)

Solar gains	72.3495	124.6354	174.2431	222.1168	254.4678	255.1253	244.9286	220.4115	190.7625	138.7494	86.9125	61.7515	(83)
Total gains	498.4772	564.3947	594.1793	631.3026	643.1825	632.0677	607.8238	582.5635	563.7224	521.5962	491.2661	478.5239	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3060	43.4172	43.5268	44.0488	44.1478	44.6149	44.6149	44.7025	44.4338	44.1478	43.9479	43.7408	
alpha	3.8871	3.8945	3.9018	3.9366	3.9432	3.9743	3.9743	3.9802	3.9623	3.9432	3.9299	3.9161	
util living area													
	0.9839	0.9729	0.9562	0.9121	0.8273	0.6706	0.5135	0.5523	0.7586	0.9207	0.9719	0.9861	(86)
MIT	19.3707	19.5937	19.8920	20.3083	20.6589	20.8963	20.9723	20.9628	20.8224	20.3780	19.8157	19.3382	(87)
Th 2	20.0434	20.0457	20.0478	20.0581	20.0600	20.0689	20.0689	20.0706	20.0655	20.0600	20.0561	20.0521	(88)
util rest of house													
	0.9805	0.9672	0.9465	0.8918	0.7859	0.5960	0.4140	0.4529	0.6929	0.8983	0.9650	0.9832	(89)
MIT 2	18.5624	18.7840	19.0785	19.4872	19.8102	20.0107	20.0587	20.0558	19.9557	19.5606	19.0130	18.5367	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.8589	19.0810	19.3769	19.7884	20.1215	20.3356	20.3938	20.3885	20.2736	19.8604	19.3074	18.8307	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8589	19.0810	19.3769	19.7884	20.1215	20.3356	20.3938	20.3885	20.2736	19.8604	19.3074	18.8307	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9749	0.9599	0.9381	0.8851	0.7889	0.6186	0.4498	0.4882	0.7088	0.8927	0.9580	0.9782	(94)
Useful gains	485.9673	541.7785	557.4208	558.7435	507.4045	390.9717	273.3740	284.3837	399.5515	465.6226	470.6436	468.0700	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1109.0361	1077.4835	975.9359	815.4452	629.2846	424.0954	280.5166	294.3343	458.3433	691.9713	916.3317	1103.4260	(97)
Space heating kWh													
	463.5632	359.9937	311.3753	184.8252	90.6788	0.0000	0.0000	0.0000	0.0000	168.4035	320.8954	472.7049	(98a)
Space heating requirement - total per year (kWh/year)												2372.4401	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	463.5632	359.9937	311.3753	184.8252	90.6788	0.0000	0.0000	0.0000	0.0000	168.4035	320.8954	472.7049	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2372.4401	
Space heating per m2											(98c) / (4) =	32.6423	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	695.0467	547.1644	560.8517	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7914	0.8646	0.8425	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	550.0927	473.0579	472.5323	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	682.2006	656.5969	629.5156	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	95.1177	136.5530	116.7956	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	23.7794	34.1383	29.1989	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												87.1166	(107)
Energy for space heating												32.6423	(99)
Energy for space cooling												1.1986	(108)
Total												33.8409	(109)
Fabric Energy Efficiency (TFEE)												33.8	(109)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.33	**TER**	11.43
Environmental	98 A	**% DER < TER**			79.62
CO_2 Emissions (t/year)	0.14	**DFEE**	31.23	**TFEE**	33.84
Compliance Check	See BREL	**% DFEE < TFEE**			7.72
% DPER < TPER	50.82	**DPER**	29.42	**TPER**	59.83

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				3	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =	11875.9502			(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							163.4005	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 4.9323 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 118.0387 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)											Total = Sum(45)m =	1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =	2611.4378	(64)
12Total per year (kWh/year)											2611	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)

Water heating gains (Table 5)

150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)

Total internal gains

529.9009	542.3600	519.8296	502.5508	478.2395	462.4112	445.5913	446.6965	459.7372	474.1489	501.8869	519.6574	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	4.8400	36.7938	0.7300	0.7000	0.7700	63.0630	(77)
Southwest	1.2200	36.7938	0.7300	0.7000	0.7700	15.8960	(79)
Northwest	1.2200	11.2829	0.7300	0.7000	0.7700	4.8746	(81)

Solar gains 83.8336	144.4188	201.9008	257.3735	294.8595	295.6214	283.8062	255.3975	221.0422	160.7731	100.7082	71.5533	(83)
Total gains 613.7345	686.7788	721.7304	759.9243	773.0989	758.0326	729.3975	702.0940	680.7794	634.9220	602.5951	591.2107	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9661	0.9460	0.9157	0.8480	0.7331	0.5644	0.4177	0.4511	0.6521	0.8577	0.9433	0.9705	(86)
MIT	19.7583	19.9691	20.2327	20.5575	20.8119	20.9509	20.9887	20.9844	20.9102	20.5998	20.1259	19.7027	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9596	0.9360	0.8999	0.8199	0.6860	0.4956	0.3363	0.3682	0.5855	0.8257	0.9311	0.9648	(89)
MIT 2	18.6762	18.9388	19.2648	19.6541	19.9394	20.0751	20.1038	20.1013	20.0414	19.7114	19.1388	18.6064	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.0732	19.3167	19.6198	19.9855	20.2595	20.3964	20.4284	20.4252	20.3601	20.0373	19.5009	19.0086	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0732	19.3167	19.6198	19.9855	20.2595	20.3964	20.4284	20.4252	20.3601	20.0373	19.5009	19.0086	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9501	0.9254	0.8899	0.8156	0.6944	0.5184	0.3659	0.3981	0.6051	0.8228	0.9211	0.9559	(94)
Useful gains	583.1338	635.5424	642.2990	619.7841	536.8352	392.9948	266.8778	279.5094	411.9260	522.4344	555.0556	565.1331	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1040.7695	1015.6587	924.2901	780.9711	603.0159	408.3546	269.7106	283.5773	441.0222	664.8557	873.6414	1043.2628	(97)
Space heating kWh	340.4809	255.4381	209.8014	116.0546	49.2384	0.0000	0.0000	0.0000	0.0000	105.9614	229.3817	355.7285	(98a)
Space heating requirement - total per year (kWh/year)												1662.0851	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	340.4809	255.4381	209.8014	116.0546	49.2384	0.0000	0.0000	0.0000	0.0000	105.9614	229.3817	355.7285	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1662.0851	
Space heating per m2											(98c) / (4) =	22.8685	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	340.4809	255.4381	209.8014	116.0546	49.2384	0.0000	0.0000	0.0000	0.0000	105.9614	229.3817	355.7285	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	510.7214	383.1571	314.7021	174.0819	73.8576	0.0000	0.0000	0.0000	0.0000	158.9422	344.0726	533.5927	
Space heating requirement													
	510.7214	383.1571	314.7021	174.0819	73.8576	0.0000	0.0000	0.0000	0.0000	158.9422	344.0726	533.5927	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	
Water heating fuel													
	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9032	-24.7478	-42.1903	-54.3464	-63.2831	-60.6270	-59.4769	-53.4801	-43.2885	-30.7805	-17.3978	-12.3224	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5955	-11.8305	-29.8051	-54.5176	-80.7077	-84.5250	-82.2640	-64.2624	-40.1739	-18.7163	-6.5523	-3.4266	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												2493.1277	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3917.1568	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												24.9313	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.9861	(330a)
Total electricity for the above, kWh/year												19.9861	(331)
Electricity for lighting (calculated in Appendix L)												193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5665.4898	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1709.4092	0.1556	103.4378	(367)
Electrical energy for heat distribution (space & water)	24.9313	0.0000	9.3968	(372)
Overall CO2 factor for heat network			0.0406	(386)
Total CO2 associated with community systems			259.9775	(373)
Space and water heating			259.9775	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	0.1320	-62.9388	
PV Unit electricity exported	-481.3770	0.1213	-58.4056	
Total			-121.3444	(380)
Total CO2, kg/year			169.3248	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.3300	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1709.4092	1.5760	1047.7777	(467)
Electrical energy for heat distribution (space & water)	24.9313	0.0000	98.8662	(472)
Overall CO2 factor for heat network			0.4267	(486)
Total CO2 associated with community systems			2735.2984	(473)
Space and water heating			2735.2984	(476)
Pumps, fans and electric keep-hot	19.9861	1.5128	30.2350	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	1.4877	-709.3875	
PV Unit electricity exported	-481.3770	0.4451	-214.2796	
Total			-923.6671	(480)
Total Primary energy kWh/year			2138.5713	(483)
Dwelling Primary energy Rate (DPER)			29.4200	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b) x	2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c) x	2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4185	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3243	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4135	0.4054	0.3973	0.3568	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3649	0.3811	(22b)
Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			7.2800	1.1450	8.3359			(27)
Heatloss floor			36.3400	0.1300	4.7242			(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.1800	14.8338			(29a)
500mm mineral wool	36.3400		36.3400	0.1100	3.9974			(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.9313			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	3.6500	0.0500	0.1825
E3 Sill	2.7400	0.0500	0.1370
E4 Jamb	14.8400	0.0500	0.7420
E5 Ground floor (normal)	18.7200	0.1600	2.9952
E6 Intermediate floor within a dwelling	18.7200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.7200	0.0600	1.1232
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	5.5000	0.0800	0.4400
P2 Party wall - Intermediate floor within a dwelling	5.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	5.5000	0.1200	0.6600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8399 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.7712 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.4047	34.2096	34.0184	33.1202	32.9522	32.1700	32.1700	32.0251	32.4713	32.9522	33.2921	33.6475	(38)
Heat transfer coeff	76.1759	75.9808	75.7896	74.8914	74.7234	73.9411	73.9411	73.7963	74.2424	74.7234	75.0633	75.4187	(39)
Average = Sum(39)m / 12 =												74.8906	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0481	1.0454	1.0428	1.0304	1.0281	1.0174	1.0174	1.0154	1.0215	1.0281	1.0328	1.0377	(40)
HLP (average)												1.0304	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	249.9662	221.0368	234.6117	205.6045	198.8885	178.7466	175.9929	183.1904	185.4473	207.3672	221.2297	247.1336	(62)
WWHRS	-28.7738	-25.4478	-26.6475	-22.0651	-20.5639	-17.5967	-16.4941	-17.5398	-18.2062	-21.4631	-24.3151	-28.2410	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
										Total per year (kWh/year) = Sum(64)m =		2241.8614	(64)
12Total per year (kWh/year)												2242	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	104.8969	93.1698	99.7915	89.4439	87.9135	80.5137	80.3008	82.6939	82.7417	90.7327	94.6393	103.9551	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	140.9904	138.6456	134.1284	124.2277	118.1634	111.8245	107.9311	111.1477	114.9190	121.9526	131.4435	139.7245	(72)
Total internal gains	523.5655	536.0247	513.4942	496.2155	471.9041	453.0758	436.2560	437.3612	450.4018	467.8135	495.5515	513.3220	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	4.8400	36.7938	0.6300	0.7000	0.7700	54.4242	(77)
Southwest	1.2200	36.7938	0.6300	0.7000	0.7700	13.7185	(79)
Northwest	1.2200	11.2829	0.6300	0.7000	0.7700	4.2068	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	72.3495	124.6354	174.2431	222.1168	254.4678	255.1253	244.9286	220.4115	190.7625	138.7494	86.9125	61.7515	(83)
Total gains	595.9150	660.6600	687.7374	718.3323	726.3719	708.2011	681.1846	657.7727	641.1643	606.5629	582.4640	575.0735	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3060	43.4172	43.5268	44.0488	44.1478	44.6149	44.6149	44.7025	44.4338	44.1478	43.9479	43.7408	
alpha	3.8871	3.8945	3.9018	3.9366	3.9432	3.9743	3.9743	3.9802	3.9623	3.9432	3.9299	3.9161	
util living area	0.9714	0.9561	0.9332	0.8783	0.7797	0.6166	0.4640	0.4974	0.7007	0.8830	0.9526	0.9747	(86)
MIT	19.5550	19.7659	20.0458	20.4235	20.7306	20.9232	20.9806	20.9742	20.8678	20.4940	19.9777	19.5234	(87)
Th 2	20.0434	20.0457	20.0478	20.0581	20.0600	20.0689	20.0689	20.0706	20.0655	20.0600	20.0561	20.0521	(88)
util rest of house	0.9657	0.9475	0.9196	0.8529	0.7336	0.5428	0.3717	0.4046	0.6321	0.8538	0.9419	0.9696	(89)
MIT 2	18.3750	18.6410	18.9917	19.4589	19.8131	20.0152	20.0599	20.0578	19.9641	19.5518	18.9177	18.3412	(90)
Living area fraction									fLA = Living area / (4) =			0.3668	(91)
MIT	18.8078	19.0536	19.3783	19.8128	20.1497	20.3482	20.3976	20.3940	20.2956	19.8974	19.3066	18.7748	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8078	19.0536	19.3783	19.8128	20.1497	20.3482	20.3976	20.3940	20.2956	19.8974	19.3066	18.7748	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9561	0.9363	0.9081	0.8454	0.7384	0.5659	0.4050	0.4378	0.6501	0.8479	0.9312	0.9607	(94)
Useful gains	569.7456	618.5765	624.5520	607.2676	536.3274	400.7794	275.8661	287.9524	416.8022	514.3317	542.4000	552.4466	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1105.1451	1075.4028	976.0425	817.2720	631.3870	425.0315	280.8019	294.7401	459.9764	694.7331	916.2650	1099.2162	(97)
Space heating kWh	398.3372	306.9873	261.5089	151.2032	70.7244	0.0000	0.0000	0.0000	0.0000	134.2186	269.1828	406.7966	(98a)
Space heating requirement - total per year (kWh/year)												1998.9590	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	398.3372	306.9873	261.5089	151.2032	70.7244	0.0000	0.0000	0.0000	0.0000	134.2186	269.1828	406.7966	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1998.9590	
Space heating per m2											(98c) / (4) =	27.5036	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	398.3372	306.9873	261.5089	151.2032	70.7244	0.0000	0.0000	0.0000	0.0000	134.2186	269.1828	406.7966	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	431.5680	332.5973	283.3249	163.8171	76.6245	0.0000	0.0000	0.0000	0.0000	145.4156	291.6390	440.7330	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.3627	85.0663	84.5747	83.6285	82.1648	79.8000	79.8000	79.8000	79.8000	83.3415	84.7613	85.4293	(217)
Fuel for water heating, kWh/month	259.1206	229.9254	245.8942	219.4698	217.0327	201.9422	199.8732	207.5821	209.5753	223.0630	232.3166	256.2267	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.6146	19.7468	17.7798	13.0262	10.0618	8.2206	9.1787	11.9309	15.4970	20.3329	22.9660	25.2988	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-34.1427	-48.1921	-69.3402	-78.0353	-84.2042	-78.6248	-77.6860	-73.3488	-65.6465	-55.1924	-37.5712	-29.5143	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.0663	-40.1520	-79.8860	-120.0915	-158.8866	-159.6687	-157.7568	-133.4905	-97.7594	-57.4135	-25.4553	-15.0706	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2165.7194	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2702.0219	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	198.6542	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1796.1956	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3356.2000	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2165.7194	0.2100	454.8011	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2702.0219	0.2100	567.4246	(264)
Space and water heating			1022.2257	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	198.6542	0.1443	28.6719	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	0.1346	-98.4313	
PV Unit electricity exported	-1064.6971	0.1259	-134.0169	
Total			-232.4482	(269)
Total CO2, kg/year			830.3787	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.4300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2165.7194	1.1300	2447.2629	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2702.0219	1.1300	3053.2847	(278)
Space and water heating			5500.5476	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	198.6542	1.5338	304.7025	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	1.4973	-1095.2830	
PV Unit electricity exported	-1064.6971	0.4620	-491.9332	
Total			-1587.2162	(283)
Total Primary energy kWh/year			4348.1347	(286)
Target Primary Energy Rate (TPER)			59.8300	(287)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.33	**TER**	11.43
Environmental	98 A	**% DER < TER**			79.62
CO_2 Emissions (t/year)	0.14	**DFEE**	31.23	**TFEE**	33.84
Compliance Check	See BREL	**% DFEE < TFEE**			7.72
% DPER < TPER	50.82	**DPER**	29.42	**TPER**	59.83

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 11875.9502	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	163.4005	(35)

Thermal bridges (User defined value 0.030 * total exposed area)												4.9323	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	41.0691	(37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff													
	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3094	(42)
Hot water usage for mixer showers													
	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths													
	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses													
	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)											Total = Sum(45)m =	1960.5981	
Distribution loss (46)m = 0.15 x (45)m													
	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
Total per year (kWh/year) = Sum(64)m =												2611.4378	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)													
	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)
Total internal gains													
	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	4.8400	36.7938	0.7300	0.7000	0.7700	63.0630	(77)
Southwest	1.2200	36.7938	0.7300	0.7000	0.7700	15.8960	(79)
Northwest	1.2200	11.2829	0.7300	0.7000	0.7700	4.8746	(81)

Solar gains	83.8336	144.4188	201.9008	257.3735	294.8595	295.6214	283.8062	255.3975	221.0422	160.7731	100.7082	71.5533	(83)
Total gains	662.5822	720.9121	761.3937	785.2547	791.5548	764.1773	735.8303	710.5486	692.4477	660.9233	635.4708	636.3976	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area	0.9567	0.9376	0.9025	0.8363	0.7223	0.5606	0.4143	0.4462	0.6438	0.8439	0.9337	0.9626	(86)
MIT	19.8456	20.0249	20.2887	20.5836	20.8224	20.9521	20.9890	20.9850	20.9143	20.6278	20.1789	19.7853	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house	0.9488	0.9264	0.8851	0.8070	0.6747	0.4921	0.3335	0.3640	0.5774	0.8101	0.9199	0.9556	(89)
MIT 2	18.7847	19.0072	19.3313	19.6832	19.9496	20.0760	20.1040	20.1016	20.0447	19.7419	19.2029	18.7095	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.1738	19.3805	19.6825	20.0135	20.2698	20.3974	20.4286	20.4257	20.3637	20.0669	19.5609	19.1041	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1738	19.3805	19.6825	20.0135	20.2698	20.3974	20.4286	20.4257	20.3637	20.0669	19.5609	19.1041	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9385	0.9156	0.8756	0.8036	0.6837	0.5149	0.3628	0.3936	0.5972	0.8084	0.9099	0.9458	(94)
Useful gains	621.8568	660.0813	666.6509	631.0031	541.2148	393.4437	266.9805	279.7047	413.5256	534.2785	578.2078	601.9154	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1047.8607	1020.1504	928.7075	782.9429	603.7407	408.4245	269.7265	283.6076	441.2772	666.9396	877.8731	1049.9929	(97)
Space heating kWh	316.9469	241.9665	194.9701	109.3967	46.5193	0.0000	0.0000	0.0000	0.0000	98.6999	215.7590	333.3696	(98a)
Space heating requirement - total per year (kWh/year)												1557.6280	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	316.9469	241.9665	194.9701	109.3967	46.5193	0.0000	0.0000	0.0000	0.0000	98.6999	215.7590	333.3696	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1557.6280	
Space heating per m2										(98c) / (4) =		21.4313	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	316.9469	241.9665	194.9701	109.3967	46.5193	0.0000	0.0000	0.0000	0.0000	98.6999	215.7590	333.3696	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	475.4204	362.9497	292.4551	164.0950	69.7789	0.0000	0.0000	0.0000	0.0000	148.0499	323.6386	500.0545	
Space heating requirement													
	475.4204	362.9497	292.4551	164.0950	69.7789	0.0000	0.0000	0.0000	0.0000	148.0499	323.6386	500.0545	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	
Water heating fuel													
	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9032	-24.7478	-42.1903	-54.3464	-63.2831	-60.6270	-59.4769	-53.4801	-43.2885	-30.7805	-17.3978	-12.3224	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5955	-11.8305	-29.8051	-54.5176	-80.7077	-84.5250	-82.2640	-64.2624	-40.1739	-18.7163	-6.5523	-3.4266	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												2336.4420	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3917.1568	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												23.3644	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.9861	(330a)
Total electricity for the above, kWh/year												19.9861	(331)
Electricity for lighting (calculated in Appendix L)												193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5508.8041	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2336.4420	4.4400	103.7380	(340a)
Space heating total			103.7380	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3917.1568	4.4400	173.9218	(342a)
Water heating total			173.9218	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	16.4900	3.2957	(349)
Energy for lighting	193.4401	16.4900	31.8983	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	16.4900	-78.6316	
PV Unit electricity exported	-481.3770	5.5900	-26.9090	
Total			-105.5405	(352)
Total energy cost			299.3132	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9156 (357)
SAP value		85.1574
SAP rating (Section 12)		85 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1667.6263	0.1556	96.9335	(367)
Electrical energy for heat distribution (space & water)	23.3644	0.0000	9.1529	(372)
Overall CO2 factor for heat network			0.0405	(386)
Total CO2 associated with community systems			253.2293	(373)
Space and water heating			253.2293	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	0.1320	-62.9388	
PV Unit electricity exported	-481.3770	0.1213	-58.4056	
Total			-121.3444	(380)
Total CO2, kg/year			162.5766	(383)
CO2 emissions per m2			2.2400	(384)
EI value			98.1488	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b)	x 2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c)	x 2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		4.9323 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3094	(42)
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =		2611.4378	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757 (71)

Water heating gains (Table 5)

	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599 (72)

Total internal gains

	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	4.8400	42.9509	0.7300	0.7000	0.7700	73.6160	(77)
Southwest	1.2200	42.9509	0.7300	0.7000	0.7700	18.5561	(79)
Northwest	1.2200	13.7758	0.7300	0.7000	0.7700	5.9515	(81)

Solar gains	98.1236	150.3535	207.8445	269.8258	299.6156	323.0956	304.0148	277.5496	240.7883	176.7601	116.1266	84.2365 (83)
Total gains	676.8722	726.8468	767.3375	797.7070	796.3109	791.6515	756.0389	732.7008	712.1939	676.9103	650.8892	649.0809 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9511	0.9325	0.8910	0.8177	0.6935	0.4992	0.3598	0.3890	0.6088	0.8166	0.9228	0.9579	(86)
MIT	19.9116	20.0738	20.3562	20.6341	20.8559	20.9715	20.9942	20.9919	20.9333	20.6922	20.2545	19.8497	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9422	0.9204	0.8714	0.7856	0.6423	0.4286	0.2793	0.3069	0.5401	0.7780	0.9069	0.9500	(89)
MIT 2	18.8671	19.0679	19.4132	19.7410	19.9841	20.0912	20.1068	20.1056	20.0611	19.8140	19.2954	18.7903	(90)
Living area fraction									fLA = Living area / (4) =			0.3668	(91)
MIT	19.2502	19.4369	19.7591	20.0686	20.3039	20.4141	20.4323	20.4307	20.3810	20.1361	19.6472	19.1789	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2502	19.4369	19.7591	20.0686	20.3039	20.4141	20.4323	20.4307	20.3810	20.1361	19.6472	19.1789	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9316	0.9096	0.8627	0.7840	0.6540	0.4533	0.3088	0.3369	0.5618	0.7793	0.8972	0.9399	(94)
Useful gains	630.6024	661.1517	661.9971	625.4362	520.7993	358.8555	233.4524	246.8183	400.1402	527.5093	583.9733	610.0460	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	1032.1088	1002.9862	898.8776	758.6471	570.9193	367.3343	234.7608	248.7392	421.3612	636.5954	855.7685	1034.1274	(97)
Space heating kWh													
	298.7208	229.7128	176.2391	95.9119	37.2893	0.0000	0.0000	0.0000	0.0000	81.1601	195.6926	315.5166	(98a)
Space heating requirement - total per year (kWh/year)												1430.2430	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	298.7208	229.7128	176.2391	95.9119	37.2893	0.0000	0.0000	0.0000	0.0000	81.1601	195.6926	315.5166	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1430.2430	
Space heating per m2											(98c) / (4) =	19.6786	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	298.7208	229.7128	176.2391	95.9119	37.2893	0.0000	0.0000	0.0000	0.0000	81.1601	195.6926	315.5166	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	448.0811	344.5692	264.3587	143.8678	55.9339	0.0000	0.0000	0.0000	0.0000	121.7401	293.5389	473.2748	
Space heating requirement													
	448.0811	344.5692	264.3587	143.8678	55.9339	0.0000	0.0000	0.0000	0.0000	121.7401	293.5389	473.2748	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	
Water heating fuel													
	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.7988	-26.5546	-44.3894	-57.0811	-64.6020	-64.1536	-62.3425	-56.9881	-46.9012	-34.2077	-20.4034	-14.8306	(333a)

Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.1997	-13.4106	-32.8557	-60.4920	-84.6385	-96.9652	-92.1477	-74.2535	-47.4476	-22.7886	-8.6270	-4.6681	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2145.3645	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3917.1568	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	21.4536	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
Total electricity for the above, kWh/year	19.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5221.2005	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2145.3645	6.5500	140.5214	(340a)
Space heating total			140.5214	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3917.1568	6.5500	256.5738	(342a)
Water heating total			256.5738	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	28.4300	5.6821	(349)
Energy for lighting	193.4401	28.4300	54.9950	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.2528	28.4300	-145.0649	
PV Unit electricity exported	-544.4942	5.8100	-31.6351	
Total			-176.7000	(352)
Total energy cost			385.0722	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1616.6723	0.1560	89.2257	(367)
Electrical energy for heat distribution (space & water)	21.4536	0.0000	8.8638	(372)
Overall CO2 factor for heat network			0.0405	(386)
Total CO2 associated with community systems			245.2324	(373)
Space and water heating			245.2324	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.2528	0.1323	-67.5052	
PV Unit electricity exported	-544.4942	0.1214	-66.0897	
Total			-133.5948	(380)
Total CO2, kg/year			142.3293	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1616.6723	1.5774	902.4251	(467)
Electrical energy for heat distribution (space & water)	21.4536	0.0000	93.4155	(472)
Overall CO2 factor for heat network			0.4263	(486)
Total CO2 associated with community systems			2584.4951	(473)
Space and water heating			2584.4951	(476)
Pumps, fans and electric keep-hot	19.9861	1.5128	30.2350	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.2528	1.4888	-759.6722	
PV Unit electricity exported	-544.4942	0.4453	-242.4386	
Total			-1002.1108	(480)
Total Primary energy kWh/year			1909.3242	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Southeast

Current energy efficiency rating: B 85
Current environmental impact rating: A 98

N	Solar water heating	Recommended
U	Solar photovoltaic panels	Already installed
V2	Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.4	-£ 47	-26 kg (18.2%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£47	0.36 kg/m²	B 87	A 98
Total Savings	£47	0.36 kg/m²		

Potential energy efficiency rating: B 87
Potential environmental impact rating: A 98

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£61	£83	-£23
Community scheme	£501	£432	£69
Space heating	£250	£273	-£23
Water heating	£257	£188	£69
Lighting	£55	£55	£0
Generated (PV)	-£177	-£178	£1
Total cost of fuels	£385	£337	£47
Total cost of uses	£385	£338	£47
Delivered energy	72 kWh/m²	59 kWh/m²	13 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	2 kg/m²	2 kg/m²	0 kg/m²
Primary energy	26 kWh/m²	22 kWh/m²	4 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330 (1b)	- (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330 (1c)	- (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		4.9323 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3094	(42)
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												624.1873	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												624.1873	
Solar input	-0.0000	-16.2194	-58.0608	-80.0094	-105.2873	-97.2929	-96.7392	-84.2620	-57.6788	-28.6375	-0.0000	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.6481	212.6591	185.2328	133.9970	102.2831	89.8555	87.9356	107.6103	136.1704	187.4116	229.6316	255.8155	(64)
									Total per year (kWh/year) = Sum(64)m =			1987.2506	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757 (71)
Water heating gains (Table 5)												
	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599 (72)
Total internal gains												
	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	4.8400	36.7938	0.7300	0.7000	0.7700	63.0630	(77)
Southwest	1.2200	36.7938	0.7300	0.7000	0.7700	15.8960	(79)
Northwest	1.2200	11.2829	0.7300	0.7000	0.7700	4.8746	(81)

Solar gains	83.8336	144.4188	201.9008	257.3735	294.8595	295.6214	283.8062	255.3975	221.0422	160.7731	100.7082	71.5533 (83)
Total gains	662.5822	720.9121	761.3937	785.2547	791.5548	764.1773	735.8303	710.5486	692.4477	660.9233	635.4708	636.3976 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217
util living area												
	0.9567	0.9376	0.9025	0.8363	0.7223	0.5606	0.4143	0.4462	0.6438	0.8439	0.9337	0.9626 (86)
MIT	19.8456	20.0249	20.2887	20.5836	20.8224	20.9521	20.9890	20.9850	20.9143	20.6278	20.1789	19.7853 (87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090 (88)
util rest of house												
	0.9488	0.9264	0.8851	0.8070	0.6747	0.4921	0.3335	0.3640	0.5774	0.8101	0.9199	0.9556 (89)
MIT 2	18.7847	19.0072	19.3313	19.6832	19.9496	20.0760	20.1040	20.1016	20.0447	19.7419	19.2029	18.7095 (90)
Living area fraction									fLA = Living area / (4) =			0.3668 (91)
MIT	19.1738	19.3805	19.6825	20.0135	20.2698	20.3974	20.4286	20.4257	20.3637	20.0669	19.5609	19.1041 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1738	19.3805	19.6825	20.0135	20.2698	20.3974	20.4286	20.4257	20.3637	20.0669	19.5609	19.1041 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9385	0.9156	0.8756	0.8036	0.6837	0.5149	0.3628	0.3936	0.5972	0.8084	0.9099	0.9458	(94)
Useful gains	621.8568	660.0813	666.6509	631.0031	541.2148	393.4437	266.9805	279.7047	413.5256	534.2785	578.2078	601.9154	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1047.8607	1020.1504	928.7075	782.9429	603.7407	408.4245	269.7265	283.6076	441.2772	666.9396	877.8731	1049.9929	(97)
Space heating kWh													
	316.9469	241.9665	194.9701	109.3967	46.5193	0.0000	0.0000	0.0000	0.0000	98.6999	215.7590	333.3696	(98a)
Space heating requirement - total per year (kWh/year)												1557.6280	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	316.9469	241.9665	194.9701	109.3967	46.5193	0.0000	0.0000	0.0000	0.0000	98.6999	215.7590	333.3696	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1557.6280	
Space heating per m2											(98c) / (4) =	21.4313	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	316.9469	241.9665	194.9701	109.3967	46.5193	0.0000	0.0000	0.0000	0.0000	98.6999	215.7590	333.3696	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	475.4204	362.9497	292.4551	164.0950	69.7789	0.0000	0.0000	0.0000	0.0000	148.0499	323.6386	500.0545	
Space heating requirement													
	475.4204	362.9497	292.4551	164.0950	69.7789	0.0000	0.0000	0.0000	0.0000	148.0499	323.6386	500.0545	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	212.6591	185.2328	133.9970	102.2831	89.8555	87.9356	107.6103	136.1704	187.4116	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	318.9886	277.8492	200.9955	153.4247	134.7833	131.9034	161.4154	204.2556	281.1174	344.4473	383.7233	
Water heating fuel													
	387.9721	318.9886	277.8492	200.9955	153.4247	134.7833	131.9034	161.4154	204.2556	281.1174	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	8.4920	7.6702	8.4920	8.2180	8.4920	8.2180	8.4920	8.4920	8.2180	8.4920	8.2180	8.4920	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9541	-24.8708	-42.4882	-54.8798	-64.0812	-61.5030	-60.3713	-54.2093	-43.7560	-31.0030	-17.4758	-12.3621	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5447	-11.7075	-29.5072	-53.9842	-79.9096	-83.6490	-81.3696	-63.5332	-39.7064	-18.4938	-6.4743	-3.3869	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2336.4420	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2980.8759	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	23.3644	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4652.5232	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2336.4420	4.4400	103.7380	(340a)
Space heating total			103.7380	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2980.8759	4.4400	132.3509	(342a)
Water heating total			132.3509	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	16.4900	3.2957	(349)
Pump for solar water heating	80.0000	16.4900	13.1920	(349)
Energy for lighting	193.4401	16.4900	31.8983	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-481.9545	16.4900	-79.4743	
PV Unit electricity exported	-476.2665	5.5900	-26.6233	
Total			-106.0976	(352)
Total energy cost			270.3773	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.8271	(357)
SAP value	86.5923	
SAP rating (Section 12)	87	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1417.9514	0.1556	96.9335	(367)
Electrical energy for heat distribution (space & water)	23.3644	0.0000	7.9589	(372)
Overall CO2 factor for heat network			0.0414	(386)
Total CO2 associated with community systems			220.1954	(373)
Space and water heating			220.1954	(376)
Pumps, fans and electric keep-hot	99.9861	0.1387	13.8693	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-481.9545	0.1319	-63.5856	
PV Unit electricity exported	-476.2665	0.1213	-57.7895	
Total			-121.3751	(380)
Total CO2, kg/year			140.6090	(383)
CO2 emissions per m2			1.9300	(384)
EI value			98.3989	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330 (1b) - (3b)	
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		4.9323 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.3094	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day)	118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	

Distribution loss (46)m = 0.15 x (45)m

30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)

Water storage loss:

Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												698.3818	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												698.3818	
Solar input	-0.2882	-19.8943	-63.0504	-86.9122	-108.6771	-108.6071	-105.7317	-94.9883	-67.4759	-37.8323	-4.9243	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	258.3599	208.9842	180.2432	127.0942	98.8933	78.5413	78.9431	96.8840	126.3733	178.2168	224.7072	255.8155	(64)
											Total per year (kWh/year) = Sum(64)m =	1913.0561	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)													
	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)
Total internal gains													
	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	4.8400	42.9509	0.7300	0.7000	0.7700	73.6160	(77)
Southwest	1.2200	42.9509	0.7300	0.7000	0.7700	18.5561	(79)
Northwest	1.2200	13.7758	0.7300	0.7000	0.7700	5.9515	(81)

Solar gains	98.1236	150.3535	207.8445	269.8258	299.6156	323.0956	304.0148	277.5496	240.7883	176.7601	116.1266	84.2365	(83)
Total gains	676.8722	726.8468	767.3375	797.7070	796.3109	791.6515	756.0389	732.7008	712.1939	676.9103	650.8892	649.0809	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9511	0.9325	0.8910	0.8177	0.6935	0.4992	0.3598	0.3890	0.6088	0.8166	0.9228	0.9579	(86)
MIT	19.9116	20.0738	20.3562	20.6341	20.8559	20.9715	20.9942	20.9919	20.9333	20.6922	20.2545	19.8497	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9422	0.9204	0.8714	0.7856	0.6423	0.4286	0.2793	0.3069	0.5401	0.7780	0.9069	0.9500	(89)
MIT 2	18.8671	19.0679	19.4132	19.7410	19.9841	20.0912	20.1068	20.1056	20.0611	19.8140	19.2954	18.7903	(90)
Living area fraction											fLA = Living area / (4) =	0.3668	(91)
MIT	19.2502	19.4369	19.7591	20.0686	20.3039	20.4141	20.4323	20.4307	20.3810	20.1361	19.6472	19.1789	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2502	19.4369	19.7591	20.0686	20.3039	20.4141	20.4323	20.4307	20.3810	20.1361	19.6472	19.1789	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9316	0.9096	0.8627	0.7840	0.6540	0.4533	0.3088	0.3369	0.5618	0.7793	0.8972	0.9399	(94)
Useful gains	630.6024	661.1517	661.9971	625.4362	520.7993	358.8555	233.4524	246.8183	400.1402	527.5093	583.9733	610.0460	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	1032.1088	1002.9862	898.8776	758.6471	570.9193	367.3343	234.7608	248.7392	421.3612	636.5954	855.7685	1034.1274	(97)
Space heating kWh	298.7208	229.7128	176.2391	95.9119	37.2893	0.0000	0.0000	0.0000	0.0000	81.1601	195.6926	315.5166	(98a)
Space heating requirement - total per year (kWh/year)												1430.2430	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	298.7208	229.7128	176.2391	95.9119	37.2893	0.0000	0.0000	0.0000	0.0000	81.1601	195.6926	315.5166	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1430.2430	
Space heating per m2											(98c) / (4) =	19.6786	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement													
	298.7208	229.7128	176.2391	95.9119	37.2893	0.0000	0.0000	0.0000	0.0000	81.1601	195.6926	315.5166	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	448.0811	344.5692	264.3587	143.8678	55.9339	0.0000	0.0000	0.0000	0.0000	121.7401	293.5389	473.2748	
Space heating requirement													
	448.0811	344.5692	264.3587	143.8678	55.9339	0.0000	0.0000	0.0000	0.0000	121.7401	293.5389	473.2748	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement													
	258.3599	208.9842	180.2432	127.0942	98.8933	78.5413	78.9431	96.8840	126.3733	178.2168	224.7072	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.5399	313.4764	270.3648	190.6413	148.3399	117.8120	118.4147	145.3260	189.5599	267.3252	337.0608	383.7233	
Water heating fuel													
	387.5399	313.4764	270.3648	190.6413	148.3399	117.8120	118.4147	145.3260	189.5599	267.3252	337.0608	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	8.4920	7.6702	8.4920	8.2180	8.4920	8.2180	8.4920	8.4920	8.2180	8.4920	8.2180	8.4920	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.8663	-26.6927	-44.7143	-57.6640	-65.4319	-65.1316	-63.3225	-57.8097	-47.4406	-34.4735	-20.5043	-14.8840	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.1321	-13.2725	-32.5307	-59.9091	-83.8086	-95.9871	-91.1676	-73.4319	-46.9082	-22.5228	-8.5261	-4.6148	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2145.3645	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2869.5841	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	21.4536	(313)
Space cooling fuel	0.0000	(321)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4253.6279	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2145.3645	6.5500	140.5214	(340a)
Space heating total			140.5214	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2869.5841	6.5500	187.9578	(342a)
Water heating total			187.9578	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	28.4300	5.6821	(349)
Pump for solar water heating	80.0000	28.4300	22.7440	(349)
Energy for lighting	193.4401	28.4300	54.9950	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-515.9355	28.4300	-146.6805	
PV Unit electricity exported	-538.8116	5.8100	-31.3050	
Total			-177.9854	(352)
Total energy cost			337.9148	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1337.3196	0.1560	89.2257	(367)
Electrical energy for heat distribution (space & water)	21.4536	0.0000	7.5261	(372)
Overall CO2 factor for heat network			0.0415	(386)
Total CO2 associated with community systems			208.2231	(373)
Space and water heating			208.2231	(376)
Pumps, fans and electric keep-hot	99.9861	0.1387	13.8693	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-515.9355	0.1322	-68.2250	
PV Unit electricity exported	-538.8116	0.1214	-65.4032	
Total			-133.6282	(380)
Total CO2, kg/year			116.3836	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1337.3196	1.5774	902.4251	(467)
Electrical energy for heat distribution (space & water)	21.4536	0.0000	77.9994	(472)
Overall CO2 factor for heat network			0.4303	(486)
Total CO2 associated with community systems			2157.9820	(473)
Space and water heating			2157.9820	(476)
Pumps, fans and electric keep-hot	99.9861	1.5128	151.2590	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-515.9355	1.4886	-768.0122	
PV Unit electricity exported	-538.8116	0.4453	-239.9213	
Total			-1007.9335	(480)
Total Primary energy kWh/year			1598.0125	(483)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.37	**TER**	11.54
Environmental	98 A	**% DER < TER**			79.46
CO_2 Emissions (t/year)	0.14	**DFEE**	31.85	**TFEE**	34.41
Compliance Check	See BREL	**% DFEE < TFEE**			7.42
% DPER < TPER	50.71	**DPER**	29.80	**TPER**	60.46

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation		0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		11875.9502	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							163.4005	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 4.9323 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 118.0387 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)											Total = Sum(45)m =	1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =	2611.4378	(64)
12Total per year (kWh/year)											2611	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)

Heat gains from water heating, kWh/month

111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)

Water heating gains (Table 5)

150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)

Total internal gains

529.9009	542.3600	519.8296	502.5508	478.2395	462.4112	445.5913	446.6965	459.7372	474.1489	501.8869	519.6574	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.2200	11.2829	0.7300	0.7000	0.7700	4.8746	(75)
Southwest	4.8400	36.7938	0.7300	0.7000	0.7700	63.0630	(79)
Northwest	1.2200	11.2829	0.7300	0.7000	0.7700	4.8746	(81)

Solar gains 72.8121	127.2643	182.7299	240.8285	282.9075	286.6501	273.9524	241.6746	202.7106	142.9733	87.8019	61.9304	(83)
Total gains 602.7130	669.6243	702.5595	743.3794	761.1469	749.0612	719.5437	688.3712	662.4479	617.1222	589.6887	581.5878	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9680	0.9500	0.9217	0.8556	0.7403	0.5700	0.4231	0.4594	0.6652	0.8671	0.9469	0.9721	(86)
MIT	19.7382	19.9402	20.2044	20.5396	20.8048	20.9491	20.9882	20.9833	20.9033	20.5796	20.1045	19.6847	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9618	0.9406	0.9069	0.8283	0.6934	0.5009	0.3408	0.3752	0.5985	0.8363	0.9353	0.9666	(89)
MIT 2	18.6511	18.9034	19.2309	19.6341	19.9325	20.0738	20.1035	20.1008	20.0357	19.6891	19.1127	18.5840	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.0498	19.2837	19.5880	19.9662	20.2525	20.3949	20.4280	20.4245	20.3540	20.0157	19.4765	18.9877	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0498	19.2837	19.5880	19.9662	20.2525	20.3949	20.4280	20.4245	20.3540	20.0157	19.4765	18.9877	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9526	0.9301	0.8967	0.8234	0.7014	0.5237	0.3707	0.4056	0.6178	0.8327	0.9254	0.9579	(94)
Useful gains	574.1468	622.8388	629.9925	612.1103	533.8531	392.3151	266.7129	279.1708	409.2330	513.8604	545.6743	557.1079	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1039.1252	1013.3318	922.0508	779.6161	602.5203	408.2486	269.6849	283.5248	440.5913	663.3388	871.9249	1041.7963	(97)
Space heating kWh	345.9440	262.4113	217.2914	120.6042	51.0884	0.0000	0.0000	0.0000	0.0000	111.2119	234.9005	360.6082	(98a)
Space heating requirement - total per year (kWh/year)												1704.0598	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	345.9440	262.4113	217.2914	120.6042	51.0884	0.0000	0.0000	0.0000	0.0000	111.2119	234.9005	360.6082	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1704.0598	
Space heating per m2											(98c) / (4) =	23.4461	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	345.9440	262.4113	217.2914	120.6042	51.0884	0.0000	0.0000	0.0000	0.0000	111.2119	234.9005	360.6082	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	518.9159	393.6170	325.9371	180.9063	76.6327	0.0000	0.0000	0.0000	0.0000	166.8179	352.3507	540.9122	
Space heating requirement													
	518.9159	393.6170	325.9371	180.9063	76.6327	0.0000	0.0000	0.0000	0.0000	166.8179	352.3507	540.9122	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	
Water heating fuel													
	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9032	-24.7478	-42.1903	-54.3464	-63.2831	-60.6270	-59.4769	-53.4801	-43.2885	-30.7805	-17.3978	-12.3224	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5955	-11.8305	-29.8051	-54.5176	-80.7077	-84.5250	-82.2640	-64.2624	-40.1739	-18.7163	-6.5523	-3.4266	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												2556.0898	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3917.1568	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												25.5609	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.9861	(330a)
Total electricity for the above, kWh/year												19.9861	(331)
Electricity for lighting (calculated in Appendix L)												193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5728.4519	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1726.1991	0.1555	105.9937	(367)
Electrical energy for heat distribution (space & water)	25.5609	0.0000	9.4926	(372)
Overall CO2 factor for heat network			0.0406	(386)
Total CO2 associated with community systems			262.6292	(373)
Space and water heating			262.6292	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	0.1320	-62.9388	
PV Unit electricity exported	-481.3770	0.1213	-58.4056	
Total			-121.3444	(380)
Total CO2, kg/year			171.9766	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.3700	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1726.1991	1.5757	1074.0330	(467)
Electrical energy for heat distribution (space & water)	25.5609	0.0000	99.8508	(472)
Overall CO2 factor for heat network			0.4268	(486)
Total CO2 associated with community systems			2762.5383	(473)
Space and water heating			2762.5383	(476)
Pumps, fans and electric keep-hot	19.9861	1.5128	30.2350	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	1.4877	-709.3875	
PV Unit electricity exported	-481.3770	0.4451	-214.2796	
Total			-923.6671	(480)
Total Primary energy kWh/year			2165.8112	(483)
Dwelling Primary energy Rate (DPER)			29.8000	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b) x	2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c) x	2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4185	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3243	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4135	0.4054	0.3973	0.3568	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3649	0.3811	(22b)
Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			7.2800	1.1450	8.3359			(27)
Heatloss floor			36.3400	0.1300	4.7242			(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.1800	14.8338			(29a)
500mm mineral wool	36.3400		36.3400	0.1100	3.9974			(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.9313			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	3.6500	0.0500	0.1825
E3 Sill	2.7400	0.0500	0.1370
E4 Jamb	14.8400	0.0500	0.7420
E5 Ground floor (normal)	18.7200	0.1600	2.9952
E6 Intermediate floor within a dwelling	18.7200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.7200	0.0600	1.1232
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	5.5000	0.0800	0.4400
P2 Party wall - Intermediate floor within a dwelling	5.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	5.5000	0.1200	0.6600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8399 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.7712 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.4047	34.2096	34.0184	33.1202	32.9522	32.1700	32.1700	32.0251	32.4713	32.9522	33.2921	33.6475	(38)
Heat transfer coeff	76.1759	75.9808	75.7896	74.8914	74.7234	73.9411	73.9411	73.7963	74.2424	74.7234	75.0633	75.4187	(39)
Average = Sum(39)m / 12 =												74.8906	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0481	1.0454	1.0428	1.0304	1.0281	1.0174	1.0174	1.0154	1.0215	1.0281	1.0328	1.0377	(40)
HLP (average)												1.0304	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	249.9662	221.0368	234.6117	205.6045	198.8885	178.7466	175.9929	183.1904	185.4473	207.3672	221.2297	247.1336	(62)
WWHRS	-28.7738	-25.4478	-26.6475	-22.0651	-20.5639	-17.5967	-16.4941	-17.5398	-18.2062	-21.4631	-24.3151	-28.2410	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
										Total per year (kWh/year) = Sum(64)m =		2241.8614	(64)
12Total per year (kWh/year)												2242	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	104.8969	93.1698	99.7915	89.4439	87.9135	80.5137	80.3008	82.6939	82.7417	90.7327	94.6393	103.9551	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	140.9904	138.6456	134.1284	124.2277	118.1634	111.8245	107.9311	111.1477	114.9190	121.9526	131.4435	139.7245	(72)
Total internal gains	523.5655	536.0247	513.4942	496.2155	471.9041	453.0758	436.2560	437.3612	450.4018	467.8135	495.5515	513.3220	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.2200	11.2829	0.6300	0.7000	0.7700	4.2068	(75)
Southwest	4.8400	36.7938	0.6300	0.7000	0.7700	54.4242	(79)
Northwest	1.2200	11.2829	0.6300	0.7000	0.7700	4.2068	(81)

Solar gains	62.8379	109.8308	157.6984	207.8383	244.1530	247.3829	236.4246	208.5685	174.9420	123.3879	75.7742	53.4468	(83)
Total gains	586.4034	645.8555	671.1927	704.0538	716.0571	700.4587	672.6806	645.9297	625.3439	591.2014	571.3257	566.7688	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3060	43.4172	43.5268	44.0488	44.1478	44.6149	44.6149	44.7025	44.4338	44.1478	43.9479	43.7408	
alpha	3.8871	3.8945	3.9018	3.9366	3.9432	3.9743	3.9743	3.9802	3.9623	3.9432	3.9299	3.9161	
util living area	0.9728	0.9590	0.9376	0.8841	0.7856	0.6218	0.4693	0.5055	0.7122	0.8902	0.9553	0.9759	(86)
MIT	19.5374	19.7403	20.0197	20.4058	20.7226	20.9209	20.9798	20.9727	20.8596	20.4744	19.9587	19.5079	(87)
Th 2	20.0434	20.0457	20.0478	20.0581	20.0600	20.0689	20.0689	20.0706	20.0655	20.0600	20.0561	20.0521	(88)
util rest of house	0.9673	0.9508	0.9247	0.8595	0.7400	0.5479	0.3761	0.4116	0.6440	0.8621	0.9450	0.9710	(89)
MIT 2	18.3530	18.6092	18.9601	19.4386	19.8051	20.0134	20.0596	20.0570	19.9572	19.5298	18.8944	18.3217	(90)
Living area fraction									fLA = Living area / (4) =			0.3668	(91)
MIT	18.7875	19.0241	19.3488	19.7934	20.1416	20.3463	20.3971	20.3929	20.2882	19.8763	19.2848	18.7568	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7875	19.0241	19.3488	19.7934	20.1416	20.3463	20.3971	20.3929	20.2882	19.8763	19.2848	18.7568	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9580	0.9399	0.9133	0.8516	0.7443	0.5709	0.4097	0.4450	0.6613	0.8558	0.9345	0.9622	(94)
Useful gains	561.7533	607.0286	612.9749	599.5606	532.9467	399.8831	275.6187	287.4698	413.5700	505.9266	533.9027	545.3524	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1103.5953	1073.1603	973.8024	815.8239	630.7861	424.8849	280.7621	294.6627	459.4289	693.1572	914.6309	1097.8528	(97)
Space heating kWh	403.1304	313.2405	268.4556	155.7095	72.7925	0.0000	0.0000	0.0000	0.0000	139.2996	274.1243	411.0603	(98a)
Space heating requirement - total per year (kWh/year)												2037.8127	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	403.1304	313.2405	268.4556	155.7095	72.7925	0.0000	0.0000	0.0000	0.0000	139.2996	274.1243	411.0603	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2037.8127	
Space heating per m2											(98c) / (4) =	28.0381	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 92.3000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	403.1304	313.2405	268.4556	155.7095	72.7925	0.0000	0.0000	0.0000	0.0000	139.2996	274.1243	411.0603	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	436.7610	339.3721	290.8512	168.6994	78.8651	0.0000	0.0000	0.0000	0.0000	150.9205	296.9927	445.3524	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.3881	85.1103	84.6334	83.6933	82.2154	79.8000	79.8000	79.8000	79.8000	83.4216	84.8018	85.4513	(217)
Fuel for water heating, kWh/month	259.0436	229.8066	245.7236	219.3000	216.8992	201.9422	199.8732	207.5821	209.5753	222.8488	232.2057	256.1609	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.6146	19.7468	17.7798	13.0262	10.0618	8.2206	9.1787	11.9309	15.4970	20.3329	22.9660	25.2988	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-34.1427	-48.1921	-69.3402	-78.0353	-84.2042	-78.6248	-77.6860	-73.3488	-65.6465	-55.1924	-37.5712	-29.5143	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.0663	-40.1520	-79.8860	-120.0915	-158.8866	-159.6687	-157.7568	-133.4905	-97.7594	-57.4135	-25.4553	-15.0706	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2207.8144	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2700.9612	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	198.6542	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1796.1956	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3397.2343	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2207.8144	0.2100	463.6410	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2700.9612	0.2100	567.2019	(264)
Space and water heating			1030.8429	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	198.6542	0.1443	28.6719	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	0.1346	-98.4313	
PV Unit electricity exported	-1064.6971	0.1259	-134.0169	
Total			-232.4482	(269)
Total CO2, kg/year			838.9959	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.5400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2207.8144	1.1300	2494.8303	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2700.9612	1.1300	3052.0862	(278)
Space and water heating			5546.9165	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	198.6542	1.5338	304.7025	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	1.4973	-1095.2830	
PV Unit electricity exported	-1064.6971	0.4620	-491.9332	
Total			-1587.2162	(283)
Total Primary energy kWh/year			4394.5036	(286)
Target Primary Energy Rate (TPER)			60.4600	(287)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.37	**TER**	11.54
Environmental	98 A	**% DER < TER**			79.46
CO_2 Emissions (t/year)	0.14	**DFEE**	31.85	**TFEE**	34.41
Compliance Check	See BREL	**% DFEE < TFEE**			7.42
% DPER < TPER	50.71	**DPER**	29.80	**TPER**	60.46

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3185	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2468	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3147	0.3085	0.3024	0.2715	0.2653	0.2345	0.2345	0.2283	0.2468	0.2653	0.2777	0.2900	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5495	0.5476	0.5457	0.5369	0.5352	0.5275	0.5275	0.5261	0.5305	0.5352	0.5386	0.5421	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		4.9323 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.2906	32.1776	32.0668	31.5466	31.4493	30.9963	30.9963	30.9124	31.1708	31.4493	31.6462	31.8520	(38)
Heat transfer coeff	73.3597	73.2467	73.1359	72.6157	72.5184	72.0654	72.0654	71.9815	72.2399	72.5184	72.7153	72.9211	(39)
Average = Sum(39)m / 12 =												72.6153	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0094	1.0078	1.0063	0.9991	0.9978	0.9915	0.9915	0.9904	0.9939	0.9978	1.0005	1.0033	(40)
HLP (average)												0.9991	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 60.0096 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.4702	63.6744	61.7137	59.2732	57.0961	54.8336	54.3634	56.3200	58.3269	60.6504	63.1125	65.3783	(44)
Energy conte	103.6888	90.6715	94.8517	81.1421	76.8624	67.4243	65.7478	69.7360	71.9229	82.3020	89.9153	102.3666	(45)
Energy content (annual)										Total = Sum(45)m =		996.6312	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(64)
								Total per year (kWh/year) = Sum(64)m =			847.1365	(64)
12Total per year (kWh/year)											847	(64)

Electric shower(s)

50.4049	44.9112	49.0413	46.7995	47.6777	45.4799	46.9959	47.6777	46.7995	49.0413	48.1191	50.4049	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 573.3528 (64a)

Heat gains from water heating, kWh/month

34.6351	30.4955	32.4163	28.9426	28.2527	25.6976	25.7204	26.7383	26.9835	29.7495	31.1368	34.3541	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	46.5525	45.3802	43.5703	40.1980	37.9740	35.6912	34.5704	35.9386	37.4771	39.9859	43.2455	46.1749	(72)
Total internal gains	426.1276	439.7593	419.9362	409.1858	388.7147	376.9424	362.8952	362.1520	372.9599	382.8469	404.3535	416.7724	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.2200	11.2829	0.7300	0.7000	0.7700	4.8746	(75)
Southwest	4.8400	36.7938	0.7300	0.7000	0.7700	63.0630	(79)
Northwest	1.2200	11.2829	0.7300	0.7000	0.7700	4.8746	(81)

Solar gains	72.8121	127.2643	182.7299	240.8285	282.9075	286.6501	273.9524	241.6746	202.7106	142.9733	87.8019	61.9304	(83)
Total gains	498.9398	567.0236	602.6661	650.0143	671.6222	663.5925	636.8476	603.8267	575.6705	525.8201	492.1554	478.7028	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	44.9685	45.0379	45.1061	45.4292	45.4902	45.7762	45.7762	45.8295	45.6656	45.4902	45.3670	45.2389	
alpha	3.9979	4.0025	4.0071	4.0286	4.0327	4.0517	4.0517	4.0553	4.0444	4.0327	4.0245	4.0159	
util living area	0.9835	0.9716	0.9523	0.9010	0.8030	0.6373	0.4826	0.5256	0.7403	0.9155	0.9709	0.9859	(86)

MIT	19.4538	19.6765	19.9748	20.3815	20.7146	20.9190	20.9794	20.9709	20.8471	20.4240	19.8754	19.4119	(87)
Th 2	20.0755	20.0768	20.0781	20.0841	20.0852	20.0904	20.0904	20.0914	20.0884	20.0852	20.0829	20.0806	(88)
util rest of house													
	0.9800	0.9657	0.9421	0.8792	0.7596	0.5643	0.3894	0.4311	0.6744	0.8924	0.9638	0.9829	(89)
MIT 2	18.6685	18.8888	19.1820	19.5760	19.8784	20.0455	20.0829	20.0799	19.9946	19.6236	19.0917	18.6308	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.9565	19.1777	19.4728	19.8715	20.1852	20.3659	20.4117	20.4067	20.3073	19.9172	19.3792	18.9173	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9565	19.1777	19.4728	19.8715	20.1852	20.3659	20.4117	20.4067	20.3073	19.9172	19.3792	18.9173	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9746	0.9586	0.9340	0.8734	0.7648	0.5874	0.4231	0.4649	0.6914	0.8875	0.9570	0.9780	(94)
Useful gains	486.2464	543.5252	562.8897	567.7085	513.6386	389.7964	269.4417	280.6995	398.0388	466.6415	471.0012	468.1559	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1075.1979	1045.7953	948.7811	796.7010	615.3309	415.5223	274.6936	288.4107	448.4181	675.6658	892.8853	1073.2034	(97)
Space heating kWh													
	438.1800	337.5255	287.1031	164.8746	75.6591	0.0000	0.0000	0.0000	0.0000	155.5140	303.7565	450.1554	(98a)
Space heating requirement - total per year (kWh/year)												2212.7682	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	438.1800	337.5255	287.1031	164.8746	75.6591	0.0000	0.0000	0.0000	0.0000	155.5140	303.7565	450.1554	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2212.7682	
Space heating per m2											(98c) / (4) =	30.4454	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	677.4144	533.2836	547.0591	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8252	0.8903	0.8668	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	559.0123	474.8077	474.2134	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	719.0477	690.5208	654.3687	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	115.2254	160.4906	134.0355	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	28.8064	40.1226	33.5089	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												102.4379	(107)
Energy for space heating												30.4454	(99)
Energy for space cooling												1.4094	(108)
Total												31.8548	(109)
Fabric Energy Efficiency (DFEE)												31.9	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)		
Main dwelling							
Ground floor	36.3400	(1b)	x 2.4500	(2b)	= 89.0330	(1b) - (3b)	
First floor	36.3400	(1c)	x 2.4500	(2c)	= 89.0330	(1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)	
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		= 178.0660	(5)	

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4185	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3243	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4135	0.4054	0.3973	0.3568	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3649	0.3811	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			7.2800	1.1450	8.3359			(27)
Heatloss floor			36.3400	0.1300	4.7242			(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.1800	14.8338			(29a)
500mm mineral wool	36.3400		36.3400	0.1100	3.9974			(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.9313			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	3.6500	0.0500	0.1825
E3 Sill	2.7400	0.0500	0.1370
E4 Jamb	14.8400	0.0500	0.7420
E5 Ground floor (normal)	18.7200	0.1600	2.9952
E6 Intermediate floor within a dwelling	18.7200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.7200	0.0600	1.1232
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	5.5000	0.0800	0.4400
P2 Party wall - Intermediate floor within a dwelling	5.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	5.5000	0.1200	0.6600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8399 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.7712 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.4047	34.2096	34.0184	33.1202	32.9522	32.1700	32.1700	32.0251	32.4713	32.9522	33.2921	33.6475	(38)
Heat transfer coeff	76.1759	75.9808	75.7896	74.8914	74.7234	73.9411	73.9411	73.7963	74.2424	74.7234	75.0633	75.4187	(39)
Average = Sum(39)m / 12 =												74.8906	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0481	1.0454	1.0428	1.0304	1.0281	1.0174	1.0174	1.0154	1.0215	1.0281	1.0328	1.0377	(40)
HLP (average)												1.0304	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 60.0096 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.4702	63.6744	61.7137	59.2732	57.0961	54.8336	54.3634	56.3200	58.3269	60.6504	63.1125	65.3783	(44)
Energy conte	103.6888	90.6715	94.8517	81.1421	76.8624	67.4243	65.7478	69.7360	71.9229	82.3020	89.9153	102.3666	(45)
Energy content (annual)										Total = Sum(45)m =		996.6312	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(64)
								Total per year (kWh/year) = Sum(64)m =			847.1365	(64)
12Total per year (kWh/year)											847	(64)	

Electric shower(s)

50.4049	44.9112	49.0413	46.7995	47.6777	45.4799	46.9959	47.6777	46.7995	49.0413	48.1191	50.4049	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				573.3528	(64a)

Heat gains from water heating, kWh/month

34.6351	30.4955	32.4163	28.9426	28.2527	25.6976	25.7204	26.7383	26.9835	29.7495	31.1368	34.3541	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)													
	46.5525	45.3802	43.5703	40.1980	37.9740	35.6912	34.5704	35.9386	37.4771	39.9859	43.2455	46.1749	(72)
Total internal gains													
	426.1276	439.7593	419.9362	409.1858	388.7147	376.9424	362.8952	362.1520	372.9599	382.8469	404.3535	416.7724	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.2200	11.2829	0.6300	0.7000	0.7700	4.2068	(75)
Southwest	4.8400	36.7938	0.6300	0.7000	0.7700	54.4242	(79)
Northwest	1.2200	11.2829	0.6300	0.7000	0.7700	4.2068	(81)

Solar gains	62.8379	109.8308	157.6984	207.8383	244.1530	247.3829	236.4246	208.5685	174.9420	123.3879	75.7742	53.4468	(83)
Total gains	488.9655	549.5901	577.6346	617.0241	632.8678	624.3253	599.3198	570.7206	547.9020	506.2347	480.1277	470.2192	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3060	43.4172	43.5268	44.0488	44.1478	44.6149	44.6149	44.7025	44.4338	44.1478	43.9479	43.7408	
alpha	3.8871	3.8945	3.9018	3.9366	3.9432	3.9743	3.9743	3.9802	3.9623	3.9432	3.9299	3.9161	
util living area													
	0.9849	0.9751	0.9597	0.9173	0.8332	0.6764	0.5199	0.5618	0.7708	0.9269	0.9739	0.9869	(86)
MIT	19.3522	19.5662	19.8633	20.2877	20.6488	20.8931	20.9710	20.9605	20.8112	20.3549	19.7951	19.3218	(87)
Th 2	20.0434	20.0457	20.0478	20.0581	20.0600	20.0689	20.0689	20.0706	20.0655	20.0600	20.0561	20.0521	(88)
util rest of house													
	0.9817	0.9698	0.9507	0.8979	0.7925	0.6018	0.4195	0.4615	0.7061	0.9058	0.9674	0.9841	(89)
MIT 2	18.5442	18.7571	19.0509	19.4683	19.8019	20.0087	20.0582	20.0548	19.9479	19.5397	18.9929	18.5205	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.8406	19.0539	19.3489	19.7689	20.1126	20.3331	20.3930	20.3870	20.2646	19.8387	19.2872	18.8145	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8406	19.0539	19.3489	19.7689	20.1126	20.3331	20.3930	20.3870	20.2646	19.8387	19.2872	18.8145	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9763	0.9628	0.9425	0.8909	0.7950	0.6242	0.4555	0.4970	0.7211	0.8999	0.9606	0.9793	(94)
Useful gains	477.3771	529.1506	544.4455	549.7085	503.1327	389.7143	272.9930	283.6320	395.1105	455.5665	461.2294	460.4783	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1107.6400	1075.4221	973.8128	813.9863	628.6169	423.9110	280.4607	294.2246	457.6715	690.3488	914.8082	1102.2035	(97)
Space heating kWh													
	468.9156	367.0945	319.4492	190.2800	93.3602	0.0000	0.0000	0.0000	0.0000	174.6780	326.5767	477.4435	(98a)
Space heating requirement - total per year (kWh/year)												2417.7978	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	468.9156	367.0945	319.4492	190.2800	93.3602	0.0000	0.0000	0.0000	0.0000	174.6780	326.5767	477.4435	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2417.7978	
Space heating per m2											(98c) / (4) =	33.2663	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	695.0467	547.1644	560.8517	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7860	0.8597	0.8346	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	546.2942	470.3786	468.1126	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	673.1510	646.6572	615.6732	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	91.3369	131.1513	109.7851	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	22.8342	32.7878	27.4463	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												83.0683	(107)
Energy for space heating												33.2663	(99)
Energy for space cooling												1.1429	(108)
Total												34.4093	(109)
Fabric Energy Efficiency (TFEE)												34.4	(109)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.37	**TER**	11.54
Environmental	98 A	**% DER < TER**			79.46
CO_2 Emissions (t/year)	0.14	**DFEE**	31.85	**TFEE**	34.41
Compliance Check	See BREL	**% DFEE < TFEE**			7.42
% DPER < TPER	50.71	**DPER**	29.80	**TPER**	60.46

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation		0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		11875.9502	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							163.4005	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 4.9323 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 118.0387 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)											Total = Sum(45)m =	1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =	2611.4378	(64)
12Total per year (kWh/year)											2611	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)

Heat gains from water heating, kWh/month

111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)

Water heating gains (Table 5)

150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)

Total internal gains

529.9009	542.3600	519.8296	502.5508	478.2395	462.4112	445.5913	446.6965	459.7372	474.1489	501.8869	519.6574	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.2200	11.2829	0.7300	0.7000	0.7700	4.8746	(75)
Southwest	4.8400	36.7938	0.7300	0.7000	0.7700	63.0630	(79)
Northwest	1.2200	11.2829	0.7300	0.7000	0.7700	4.8746	(81)

Solar gains 72.8121	127.2643	182.7299	240.8285	282.9075	286.6501	273.9524	241.6746	202.7106	142.9733	87.8019	61.9304	(83)
Total gains 602.7130	669.6243	702.5595	743.3794	761.1469	749.0612	719.5437	688.3712	662.4479	617.1222	589.6887	581.5878	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9680	0.9500	0.9217	0.8556	0.7403	0.5700	0.4231	0.4594	0.6652	0.8671	0.9469	0.9721	(86)
MIT	19.7382	19.9402	20.2044	20.5396	20.8048	20.9491	20.9882	20.9833	20.9033	20.5796	20.1045	19.6847	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9618	0.9406	0.9069	0.8283	0.6934	0.5009	0.3408	0.3752	0.5985	0.8363	0.9353	0.9666	(89)
MIT 2	18.6511	18.9034	19.2309	19.6341	19.9325	20.0738	20.1035	20.1008	20.0357	19.6891	19.1127	18.5840	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.0498	19.2837	19.5880	19.9662	20.2525	20.3949	20.4280	20.4245	20.3540	20.0157	19.4765	18.9877	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0498	19.2837	19.5880	19.9662	20.2525	20.3949	20.4280	20.4245	20.3540	20.0157	19.4765	18.9877	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9526	0.9301	0.8967	0.8234	0.7014	0.5237	0.3707	0.4056	0.6178	0.8327	0.9254	0.9579	(94)
Useful gains	574.1468	622.8388	629.9925	612.1103	533.8531	392.3151	266.7129	279.1708	409.2330	513.8604	545.6743	557.1079	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1039.1252	1013.3318	922.0508	779.6161	602.5203	408.2486	269.6849	283.5248	440.5913	663.3388	871.9249	1041.7963	(97)
Space heating kWh	345.9440	262.4113	217.2914	120.6042	51.0884	0.0000	0.0000	0.0000	0.0000	111.2119	234.9005	360.6082	(98a)
Space heating requirement - total per year (kWh/year)												1704.0598	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	345.9440	262.4113	217.2914	120.6042	51.0884	0.0000	0.0000	0.0000	0.0000	111.2119	234.9005	360.6082	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1704.0598	
Space heating per m2											(98c) / (4) =	23.4461	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	345.9440	262.4113	217.2914	120.6042	51.0884	0.0000	0.0000	0.0000	0.0000	111.2119	234.9005	360.6082	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	518.9159	393.6170	325.9371	180.9063	76.6327	0.0000	0.0000	0.0000	0.0000	166.8179	352.3507	540.9122	
Space heating requirement													
	518.9159	393.6170	325.9371	180.9063	76.6327	0.0000	0.0000	0.0000	0.0000	166.8179	352.3507	540.9122	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	
Water heating fuel													
	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9032	-24.7478	-42.1903	-54.3464	-63.2831	-60.6270	-59.4769	-53.4801	-43.2885	-30.7805	-17.3978	-12.3224	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5955	-11.8305	-29.8051	-54.5176	-80.7077	-84.5250	-82.2640	-64.2624	-40.1739	-18.7163	-6.5523	-3.4266	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												2556.0898	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3917.1568	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												25.5609	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.9861	(330a)
Total electricity for the above, kWh/year												19.9861	(331)
Electricity for lighting (calculated in Appendix L)												193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5728.4519	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1726.1991	0.1555	105.9937	(367)
Electrical energy for heat distribution (space & water)	25.5609	0.0000	9.4926	(372)
Overall CO2 factor for heat network			0.0406	(386)
Total CO2 associated with community systems			262.6292	(373)
Space and water heating			262.6292	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	0.1320	-62.9388	
PV Unit electricity exported	-481.3770	0.1213	-58.4056	
Total			-121.3444	(380)
Total CO2, kg/year			171.9766	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.3700	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1726.1991	1.5757	1074.0330	(467)
Electrical energy for heat distribution (space & water)	25.5609	0.0000	99.8508	(472)
Overall CO2 factor for heat network			0.4268	(486)
Total CO2 associated with community systems			2762.5383	(473)
Space and water heating			2762.5383	(476)
Pumps, fans and electric keep-hot	19.9861	1.5128	30.2350	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	1.4877	-709.3875	
PV Unit electricity exported	-481.3770	0.4451	-214.2796	
Total			-923.6671	(480)
Total Primary energy kWh/year			2165.8112	(483)
Dwelling Primary energy Rate (DPER)			29.8000	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b) x	2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c) x	2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4185	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3243	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4135	0.4054	0.3973	0.3568	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3649	0.3811	(22b)
Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			7.2800	1.1450	8.3359			(27)
Heatloss floor			36.3400	0.1300	4.7242			(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.1800	14.8338			(29a)
500mm mineral wool	36.3400		36.3400	0.1100	3.9974			(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.9313			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	3.6500	0.0500	0.1825
E3 Sill	2.7400	0.0500	0.1370
E4 Jamb	14.8400	0.0500	0.7420
E5 Ground floor (normal)	18.7200	0.1600	2.9952
E6 Intermediate floor within a dwelling	18.7200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.7200	0.0600	1.1232
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	5.5000	0.0800	0.4400
P2 Party wall - Intermediate floor within a dwelling	5.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	5.5000	0.1200	0.6600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8399 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.7712 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.4047	34.2096	34.0184	33.1202	32.9522	32.1700	32.1700	32.0251	32.4713	32.9522	33.2921	33.6475	(38)
Heat transfer coeff	76.1759	75.9808	75.7896	74.8914	74.7234	73.9411	73.9411	73.7963	74.2424	74.7234	75.0633	75.4187	(39)
Average = Sum(39)m / 12 =												74.8906	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0481	1.0454	1.0428	1.0304	1.0281	1.0174	1.0174	1.0154	1.0215	1.0281	1.0328	1.0377	(40)
HLP (average)												1.0304	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	249.9662	221.0368	234.6117	205.6045	198.8885	178.7466	175.9929	183.1904	185.4473	207.3672	221.2297	247.1336	(62)
WWHRS	-28.7738	-25.4478	-26.6475	-22.0651	-20.5639	-17.5967	-16.4941	-17.5398	-18.2062	-21.4631	-24.3151	-28.2410	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
										Total per year (kWh/year) = Sum(64)m =		2241.8614	(64)
12Total per year (kWh/year)												2242	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	104.8969	93.1698	99.7915	89.4439	87.9135	80.5137	80.3008	82.6939	82.7417	90.7327	94.6393	103.9551	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	140.9904	138.6456	134.1284	124.2277	118.1634	111.8245	107.9311	111.1477	114.9190	121.9526	131.4435	139.7245	(72)
Total internal gains	523.5655	536.0247	513.4942	496.2155	471.9041	453.0758	436.2560	437.3612	450.4018	467.8135	495.5515	513.3220	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.2200	11.2829	0.6300	0.7000	0.7700	4.2068	(75)
Southwest	4.8400	36.7938	0.6300	0.7000	0.7700	54.4242	(79)
Northwest	1.2200	11.2829	0.6300	0.7000	0.7700	4.2068	(81)

Solar gains	62.8379	109.8308	157.6984	207.8383	244.1530	247.3829	236.4246	208.5685	174.9420	123.3879	75.7742	53.4468	(83)
Total gains	586.4034	645.8555	671.1927	704.0538	716.0571	700.4587	672.6806	645.9297	625.3439	591.2014	571.3257	566.7688	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3060	43.4172	43.5268	44.0488	44.1478	44.6149	44.6149	44.7025	44.4338	44.1478	43.9479	43.7408	
alpha	3.8871	3.8945	3.9018	3.9366	3.9432	3.9743	3.9743	3.9802	3.9623	3.9432	3.9299	3.9161	
util living area	0.9728	0.9590	0.9376	0.8841	0.7856	0.6218	0.4693	0.5055	0.7122	0.8902	0.9553	0.9759	(86)
MIT	19.5374	19.7403	20.0197	20.4058	20.7226	20.9209	20.9798	20.9727	20.8596	20.4744	19.9587	19.5079	(87)
Th 2	20.0434	20.0457	20.0478	20.0581	20.0600	20.0689	20.0689	20.0706	20.0655	20.0600	20.0561	20.0521	(88)
util rest of house	0.9673	0.9508	0.9247	0.8595	0.7400	0.5479	0.3761	0.4116	0.6440	0.8621	0.9450	0.9710	(89)
MIT 2	18.3530	18.6092	18.9601	19.4386	19.8051	20.0134	20.0596	20.0570	19.9572	19.5298	18.8944	18.3217	(90)
Living area fraction									fLA = Living area / (4) =			0.3668	(91)
MIT	18.7875	19.0241	19.3488	19.7934	20.1416	20.3463	20.3971	20.3929	20.2882	19.8763	19.2848	18.7568	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7875	19.0241	19.3488	19.7934	20.1416	20.3463	20.3971	20.3929	20.2882	19.8763	19.2848	18.7568	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9580	0.9399	0.9133	0.8516	0.7443	0.5709	0.4097	0.4450	0.6613	0.8558	0.9345	0.9622	(94)
Useful gains	561.7533	607.0286	612.9749	599.5606	532.9467	399.8831	275.6187	287.4698	413.5700	505.9266	533.9027	545.3524	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1103.5953	1073.1603	973.8024	815.8239	630.7861	424.8849	280.7621	294.6627	459.4289	693.1572	914.6309	1097.8528	(97)
Space heating kWh	403.1304	313.2405	268.4556	155.7095	72.7925	0.0000	0.0000	0.0000	0.0000	139.2996	274.1243	411.0603	(98a)
Space heating requirement - total per year (kWh/year)												2037.8127	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	403.1304	313.2405	268.4556	155.7095	72.7925	0.0000	0.0000	0.0000	0.0000	139.2996	274.1243	411.0603	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2037.8127	
Space heating per m2											(98c) / (4) =	28.0381	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 92.3000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	403.1304	313.2405	268.4556	155.7095	72.7925	0.0000	0.0000	0.0000	0.0000	139.2996	274.1243	411.0603	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	436.7610	339.3721	290.8512	168.6994	78.8651	0.0000	0.0000	0.0000	0.0000	150.9205	296.9927	445.3524	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.3881	85.1103	84.6334	83.6933	82.2154	79.8000	79.8000	79.8000	79.8000	83.4216	84.8018	85.4513	(217)
Fuel for water heating, kWh/month	259.0436	229.8066	245.7236	219.3000	216.8992	201.9422	199.8732	207.5821	209.5753	222.8488	232.2057	256.1609	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.6146	19.7468	17.7798	13.0262	10.0618	8.2206	9.1787	11.9309	15.4970	20.3329	22.9660	25.2988	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-34.1427	-48.1921	-69.3402	-78.0353	-84.2042	-78.6248	-77.6860	-73.3488	-65.6465	-55.1924	-37.5712	-29.5143	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.0663	-40.1520	-79.8860	-120.0915	-158.8866	-159.6687	-157.7568	-133.4905	-97.7594	-57.4135	-25.4553	-15.0706	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2207.8144	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2700.9612	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	198.6542	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1796.1956	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3397.2343	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2207.8144	0.2100	463.6410	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2700.9612	0.2100	567.2019	(264)
Space and water heating			1030.8429	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	198.6542	0.1443	28.6719	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	0.1346	-98.4313	
PV Unit electricity exported	-1064.6971	0.1259	-134.0169	
Total			-232.4482	(269)
Total CO2, kg/year			838.9959	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.5400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2207.8144	1.1300	2494.8303	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2700.9612	1.1300	3052.0862	(278)
Space and water heating			5546.9165	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	198.6542	1.5338	304.7025	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	1.4973	-1095.2830	
PV Unit electricity exported	-1064.6971	0.4620	-491.9332	
Total			-1587.2162	(283)
Total Primary energy kWh/year			4394.5036	(286)
Target Primary Energy Rate (TPER)			60.4600	(287)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.37	**TER**	11.54
Environmental	98 A	**% DER < TER**			79.46
CO_2 Emissions (t/year)	0.14	**DFEE**	31.85	**TFEE**	34.41
Compliance Check	See BREL	**% DFEE < TFEE**			7.42
% DPER < TPER	50.71	**DPER**	29.80	**TPER**	60.46

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 11875.9502	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	163.4005	(35)

Thermal bridges (User defined value 0.030 * total exposed area)												4.9323	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	41.0691	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3094	(42)
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)											Total = Sum(45)m =	1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =		2611.4378	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)
Total internal gains	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.2200	11.2829	0.7300	0.7000	0.7700	4.8746	(75)
Southwest	4.8400	36.7938	0.7300	0.7000	0.7700	63.0630	(79)
Northwest	1.2200	11.2829	0.7300	0.7000	0.7700	4.8746	(81)

Solar gains	72.8121	127.2643	182.7299	240.8285	282.9075	286.6501	273.9524	241.6746	202.7106	142.9733	87.8019	61.9304	(83)
Total gains	651.5607	703.7576	742.2229	768.7098	779.6028	755.2059	725.9765	696.8258	674.1162	643.1235	622.5645	626.7747	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area	0.9590	0.9419	0.9090	0.8440	0.7293	0.5661	0.4196	0.4542	0.6568	0.8534	0.9375	0.9644	(86)
MIT	19.8262	19.9971	20.2620	20.5667	20.8157	20.9503	20.9885	20.9840	20.9078	20.6089	20.1584	19.7679	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house	0.9513	0.9313	0.8924	0.8154	0.6820	0.4973	0.3379	0.3708	0.5902	0.8208	0.9244	0.9577	(89)
MIT 2	18.7607	18.9732	19.2997	19.6644	19.9431	20.0747	20.1037	20.1011	20.0394	19.7213	19.1781	18.6879	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.1515	19.3488	19.6527	19.9954	20.2632	20.3959	20.4283	20.4249	20.3579	20.0468	19.5377	19.0841	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1515	19.3488	19.6527	19.9954	20.2632	20.3959	20.4283	20.4249	20.3579	20.0468	19.5377	19.0841	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9412	0.9206	0.8826	0.8114	0.6906	0.5201	0.3675	0.4009	0.6096	0.8183	0.9144	0.9480	(94)
Useful gains	613.2804	647.8721	655.0668	623.7470	538.4092	392.7837	266.8216	279.3827	410.9733	526.2564	569.2467	594.2095	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1046.2895	1017.9162	926.6086	781.6689	603.2768	408.3217	269.7018	283.5577	440.8699	665.5297	876.2361	1048.5820	(97)
Space heating kWh	322.1588	248.6696	202.0271	113.7037	48.2615	0.0000	0.0000	0.0000	0.0000	103.6193	221.0323	338.0531	(98a)
Space heating requirement - total per year (kWh/year)												1597.5255	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	322.1588	248.6696	202.0271	113.7037	48.2615	0.0000	0.0000	0.0000	0.0000	103.6193	221.0323	338.0531	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1597.5255	
Space heating per m2											(98c) / (4) =	21.9803	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	322.1588	248.6696	202.0271	113.7037	48.2615	0.0000	0.0000	0.0000	0.0000	103.6193	221.0323	338.0531 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	483.2382	373.0044	303.0407	170.5556	72.3922	0.0000	0.0000	0.0000	0.0000	155.4290	331.5485	507.0797
Space heating requirement												
	483.2382	373.0044	303.0407	170.5556	72.3922	0.0000	0.0000	0.0000	0.0000	155.4290	331.5485	507.0797 (307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement												
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233
Water heating fuel												
	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233 (310)

Cooling System Energy Efficiency Ratio	0.0000	(314)

Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9032	-24.7478	-42.1903	-54.3464	-63.2831	-60.6270	-59.4769	-53.4801	-43.2885	-30.7805	-17.3978	-12.3224	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5955	-11.8305	-29.8051	-54.5176	-80.7077	-84.5250	-82.2640	-64.2624	-40.1739	-18.7163	-6.5523	-3.4266	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2396.2883	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3917.1568	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	23.9629	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
Total electricity for the above, kWh/year	19.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5568.6504	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2396.2883	4.4400	106.3952	(340a)
Space heating total			106.3952	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3917.1568	4.4400	173.9218	(342a)
Water heating total			173.9218	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	16.4900	3.2957	(349)
Energy for lighting	193.4401	16.4900	31.8983	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	16.4900	-78.6316	
PV Unit electricity exported	-481.3770	5.5900	-26.9090	
Total			-105.5405	(352)
Total energy cost			301.9704	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.9238	(357)
SAP value	85.0257	
SAP rating (Section 12)	85	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1683.5854	0.1555	99.3640	(367)
Electrical energy for heat distribution (space & water)	23.9629	0.0000	9.2440	(372)
Overall CO2 factor for heat network			0.0405	(386)
Total CO2 associated with community systems			255.7510	(373)
Space and water heating			255.7510	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	0.1320	-62.9388	
PV Unit electricity exported	-481.3770	0.1213	-58.4056	
Total			-121.3444	(380)
Total CO2, kg/year			165.0983	(383)
CO2 emissions per m2			2.2700	(384)
EI value			98.1201	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b) x	2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c) x	2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 72.6800						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor (20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =		0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11875.9502 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

Thermal bridges (User defined value 0.030 * total exposed area) 4.9323 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)

Average = Sum(39)m / 12 = 70.4500

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 118.0387 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =		2611.4378	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
303.6858 306.8371 298.8959 281.9900 260.6494 240.5922 227.1928 224.0415 231.9827 248.8885 270.2292 290.2863 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 (71)
Water heating gains (Table 5)
150.3258 147.9809 143.4637 133.5631 127.4987 121.1599 117.2665 120.4831 124.2544 131.2879 140.7789 149.0599 (72)
Total internal gains
578.7486 576.4933 559.4929 527.8812 496.6954 468.5559 452.0241 455.1511 471.4055 500.1502 534.7626 564.8443 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.2200	13.7758	0.7300	0.7000	0.7700	5.9515	(75)
Southwest	4.8400	42.9509	0.7300	0.7000	0.7700	73.6160	(79)
Northwest	1.2200	13.7758	0.7300	0.7000	0.7700	5.9515	(81)

Solar gains 85.5191 133.0963 189.2038 254.0211 289.0002 314.7662 294.9247 264.1763 222.1675 157.9895 101.6268 73.1390 (83)
Total gains 664.2676 709.5896 748.6968 781.9023 785.6955 783.3221 746.9489 719.3274 693.5730 658.1397 636.3894 637.9833 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area	0.9539	0.9370	0.8977	0.8254	0.6999	0.5039	0.3640	0.3959	0.6216	0.8274	0.9276	0.9601	(86)
MIT	19.8899	20.0465	20.3316	20.6194	20.8509	20.9705	20.9940	20.9914	20.9280	20.6746	20.2325	19.8301	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house	0.9453	0.9256	0.8790	0.7940	0.6487	0.4329	0.2827	0.3125	0.5524	0.7899	0.9124	0.9526	(89)
MIT 2	18.8404	19.0346	19.3843	19.7249	19.9794	20.0906	20.1067	20.1054	20.0570	19.7955	19.2690	18.7660	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.2254	19.4057	19.7318	20.0530	20.2991	20.4133	20.4321	20.4304	20.3765	20.1180	19.6224	19.1563	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2254	19.4057	19.7318	20.0530	20.2991	20.4133	20.4321	20.4304	20.3765	20.1180	19.6224	19.1563	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9349	0.9148	0.8700	0.7918	0.6602	0.4577	0.3124	0.3429	0.5740	0.7903	0.9026	0.9426	(94)
Useful gains	621.0547	649.1640	651.3345	619.1230	518.7135	358.5004	233.3819	246.6622	398.1192	520.1256	574.4054	601.3632	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	1030.3595	1000.7946	896.9548	757.5493	570.5790	367.2795	234.7496	248.7148	421.0423	635.3160	854.0255	1032.5369	(97)
Space heating kWh	304.5228	236.2958	182.7415	99.6670	38.5879	0.0000	0.0000	0.0000	0.0000	85.7016	201.3264	320.7933	(98a)
Space heating requirement - total per year (kWh/year)												1469.6362	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	304.5228	236.2958	182.7415	99.6670	38.5879	0.0000	0.0000	0.0000	0.0000	85.7016	201.3264	320.7933	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1469.6362	
Space heating per m2										(98c) / (4) =		20.2206	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement
304.5228 236.2958 182.7415 99.6670 38.5879 0.0000 0.0000 0.0000 0.0000 85.7016 201.3264 320.7933 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50
307a 456.7841 354.4437 274.1123 149.5005 57.8818 0.0000 0.0000 0.0000 0.0000 128.5524 301.9897 481.1899
Space heating requirement
456.7841 354.4437 274.1123 149.5005 57.8818 0.0000 0.0000 0.0000 0.0000 128.5524 301.9897 481.1899 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)

Water heating
Annual water heating requirement
258.6481 228.8785 243.2936 214.0064 207.5704 187.1484 184.6748 191.8723 193.8492 216.0491 229.6316 255.8155 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50
310a 387.9721 343.3178 364.9404 321.0096 311.3556 280.7226 277.0123 287.8084 290.7737 324.0737 344.4473 383.7233
Water heating fuel
387.9721 343.3178 364.9404 321.0096 311.3556 280.7226 277.0123 287.8084 290.7737 324.0737 344.4473 383.7233 (310)
Cooling System Energy Efficiency Ratio 0.0000 (314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (315)
Pumps and Fa 1.6975 1.5332 1.6975 1.6427 1.6975 1.6427 1.6975 1.6975 1.6427 1.6975 1.6427 1.6975 (331)
Lighting 23.9686 19.2285 17.3131 12.6843 9.7977 8.0048 8.9378 11.6177 15.0903 19.7993 22.3632 24.6347 (332)
Electricity generated by PVs (Appendix M) (negative quantity)
(333a)m -17.7988 -26.5546 -44.3894 -57.0811 -64.6020 -64.1536 -62.3425 -56.9881 -46.9012 -34.2077 -20.4034 -14.8306 (333a)

Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.1997	-13.4106	-32.8557	-60.4920	-84.6385	-96.9652	-92.1477	-74.2535	-47.4476	-22.7886	-8.6270	-4.6681	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2204.4544	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3917.1568	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	22.0445	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
Total electricity for the above, kWh/year	19.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5280.2904	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2204.4544	6.5500	144.3918	(340a)
Space heating total			144.3918	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3917.1568	6.5500	256.5738	(342a)
Water heating total			256.5738	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	28.4300	5.6821	(349)
Energy for lighting	193.4401	28.4300	54.9950	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.2528	28.4300	-145.0649	
PV Unit electricity exported	-544.4942	5.8100	-31.6351	
Total			-176.7000	(352)
Total energy cost			388.9426	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1632.4296	0.1559	91.6380	(367)
Electrical energy for heat distribution (space & water)	22.0445	0.0000	8.9543	(372)
Overall CO2 factor for heat network			0.0405	(386)
Total CO2 associated with community systems			247.7352	(373)
Space and water heating			247.7352	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.2528	0.1323	-67.5052	
PV Unit electricity exported	-544.4942	0.1214	-66.0897	
Total			-133.5948	(380)
Total CO2, kg/year			144.8321	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1632.4296	1.5771	927.1153	(467)
Electrical energy for heat distribution (space & water)	22.0445	0.0000	94.3414	(472)
Overall CO2 factor for heat network			0.4264	(486)
Total CO2 associated with community systems			2610.1112	(473)
Space and water heating			2610.1112	(476)
Pumps, fans and electric keep-hot	19.9861	1.5128	30.2350	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.2528	1.4888	-759.6722	
PV Unit electricity exported	-544.4942	0.4453	-242.4386	
Total			-1002.1108	(480)
Total Primary energy kWh/year			1934.9403	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Southwest

Current energy efficiency rating: B 85
Current environmental impact rating: A 98

N Solar water heating — Recommended
U Solar photovoltaic panels — Already installed
V2 Wind turbine — Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.4	-£ 47	-26 kg (17.9%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£47	0.36 kg/m²	B 86	A 98
Total Savings	£47	0.36 kg/m²		

Potential energy efficiency rating: B 86
Potential environmental impact rating: A 98

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£61	£83	-£23
Community scheme	£505	£436	£69
Space heating	£254	£277	-£23
Water heating	£257	£188	£69
Lighting	£55	£55	£0
Generated (PV)	-£177	-£178	£1
Total cost of fuels	£389	£341	£47
Total cost of uses	£389	£342	£47
Delivered energy	73 kWh/m²	59 kWh/m²	13 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	2 kg/m²	2 kg/m²	0 kg/m²
Primary energy	27 kWh/m²	22 kWh/m²	4 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330 (1b) - (3b)	
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation — 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) — 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		4.9323 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3094	(42)
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												624.1873	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												624.1873	
Solar input	-0.0000	-16.2194	-58.0608	-80.0094	-105.2873	-97.2929	-96.7392	-84.2620	-57.6788	-28.6375	-0.0000	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.6481	212.6591	185.2328	133.9970	102.2831	89.8555	87.9356	107.6103	136.1704	187.4116	229.6316	255.8155	(64)
									Total per year (kWh/year) = Sum(64)m =			1987.2506	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757 (71)
Water heating gains (Table 5)												
	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599 (72)
Total internal gains												
	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.2200	11.2829	0.7300	0.7000	0.7700	4.8746	(75)
Southwest	4.8400	36.7938	0.7300	0.7000	0.7700	63.0630	(79)
Northwest	1.2200	11.2829	0.7300	0.7000	0.7700	4.8746	(81)

Solar gains	72.8121	127.2643	182.7299	240.8285	282.9075	286.6501	273.9524	241.6746	202.7106	142.9733	87.8019	61.9304	(83)
Total gains	651.5607	703.7576	742.2229	768.7098	779.6028	755.2059	725.9765	696.8258	674.1162	643.1235	622.5645	626.7747	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9590	0.9419	0.9090	0.8440	0.7293	0.5661	0.4196	0.4542	0.6568	0.8534	0.9375	0.9644	(86)
MIT	19.8262	19.9971	20.2620	20.5667	20.8157	20.9503	20.9885	20.9840	20.9078	20.6089	20.1584	19.7679	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9513	0.9313	0.8924	0.8154	0.6820	0.4973	0.3379	0.3708	0.5902	0.8208	0.9244	0.9577	(89)
MIT 2	18.7607	18.9732	19.2997	19.6644	19.9431	20.0747	20.1037	20.1011	20.0394	19.7213	19.1781	18.6879	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.1515	19.3488	19.6527	19.9954	20.2632	20.3959	20.4283	20.4249	20.3579	20.0468	19.5377	19.0841	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1515	19.3488	19.6527	19.9954	20.2632	20.3959	20.4283	20.4249	20.3579	20.0468	19.5377	19.0841	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9412	0.9206	0.8826	0.8114	0.6906	0.5201	0.3675	0.4009	0.6096	0.8183	0.9144	0.9480	(94)
Useful gains	613.2804	647.8721	655.0668	623.7470	538.4092	392.7837	266.8216	279.3827	410.9733	526.2564	569.2467	594.2095	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1046.2895	1017.9162	926.6086	781.6689	603.2768	408.3217	269.7018	283.5577	440.8699	665.5297	876.2361	1048.5820	(97)
Space heating kWh													
	322.1588	248.6696	202.0271	113.7037	48.2615	0.0000	0.0000	0.0000	0.0000	103.6193	221.0323	338.0531	(98a)
Space heating requirement - total per year (kWh/year)												1597.5255	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	322.1588	248.6696	202.0271	113.7037	48.2615	0.0000	0.0000	0.0000	0.0000	103.6193	221.0323	338.0531	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1597.5255	
Space heating per m2											(98c) / (4) =	21.9803	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	322.1588	248.6696	202.0271	113.7037	48.2615	0.0000	0.0000	0.0000	0.0000	103.6193	221.0323	338.0531	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	483.2382	373.0044	303.0407	170.5556	72.3922	0.0000	0.0000	0.0000	0.0000	155.4290	331.5485	507.0797	
Space heating requirement													
	483.2382	373.0044	303.0407	170.5556	72.3922	0.0000	0.0000	0.0000	0.0000	155.4290	331.5485	507.0797	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	212.6591	185.2328	133.9970	102.2831	89.8555	87.9356	107.6103	136.1704	187.4116	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	318.9886	277.8492	200.9955	153.4247	134.7833	131.9034	161.4154	204.2556	281.1174	344.4473	383.7233	
Water heating fuel													
	387.9721	318.9886	277.8492	200.9955	153.4247	134.7833	131.9034	161.4154	204.2556	281.1174	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	8.4920	7.6702	8.4920	8.2180	8.4920	8.2180	8.4920	8.4920	8.2180	8.4920	8.2180	8.4920	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9541	-24.8708	-42.4882	-54.8798	-64.0812	-61.5030	-60.3713	-54.2093	-43.7560	-31.0030	-17.4758	-12.3621	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5447	-11.7075	-29.5072	-53.9842	-79.9096	-83.6490	-81.3696	-63.5332	-39.7064	-18.4938	-6.4743	-3.3869	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2396.2883	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2980.8759	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	23.9629	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4712.3695	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2396.2883	4.4400	106.3952	(340a)
Space heating total			106.3952	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2980.8759	4.4400	132.3509	(342a)
Water heating total			132.3509	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	16.4900	3.2957	(349)
Pump for solar water heating	80.0000	16.4900	13.1920	(349)
Energy for lighting	193.4401	16.4900	31.8983	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-481.9545	16.4900	-79.4743	
PV Unit electricity exported	-476.2665	5.5900	-26.6233	
Total			-106.0976	(352)
Total energy cost			273.0345	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.8353	(357)
SAP value	86.4606	
SAP rating (Section 12)	86	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1433.9104	0.1555	99.3640	(367)
Electrical energy for heat distribution (space & water)	23.9629	0.0000	8.0500	(372)
Overall CO2 factor for heat network			0.0414	(386)
Total CO2 associated with community systems			222.7171	(373)
Space and water heating			222.7171	(376)
Pumps, fans and electric keep-hot	99.9861	0.1387	13.8693	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-481.9545	0.1319	-63.5856	
PV Unit electricity exported	-476.2665	0.1213	-57.7895	
Total			-121.3751	(380)
Total CO2, kg/year			143.1307	(383)
CO2 emissions per m2			1.9700	(384)
EI value			98.3702	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330 (1b) - (3b)	
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		4.9323 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.3094	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day)	118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	

Distribution loss (46)m = 0.15 x (45)m

30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)

Water storage loss:

Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												698.3818	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												698.3818	
Solar input	-0.2882	-19.8943	-63.0504	-86.9122	-108.6771	-108.6071	-105.7317	-94.9883	-67.4759	-37.8323	-4.9243	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	258.3599	208.9842	180.2432	127.0942	98.8933	78.5413	78.9431	96.8840	126.3733	178.2168	224.7072	255.8155	(64)
									Total per year (kWh/year) = Sum(64)m =			1913.0561	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month													
	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)													
	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)
Total internal gains													
	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.2200	13.7758	0.7300	0.7000	0.7700	5.9515	(75)
Southwest	4.8400	42.9509	0.7300	0.7000	0.7700	73.6160	(79)
Northwest	1.2200	13.7758	0.7300	0.7000	0.7700	5.9515	(81)

Solar gains	85.5191	133.0963	189.2038	254.0211	289.0002	314.7662	294.9247	264.1763	222.1675	157.9895	101.6268	73.1390	(83)
Total gains	664.2676	709.5896	748.6968	781.9023	785.6955	783.3221	746.9489	719.3274	693.5730	658.1397	636.3894	637.9833	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9539	0.9370	0.8977	0.8254	0.6999	0.5039	0.3640	0.3959	0.6216	0.8274	0.9276	0.9601	(86)
MIT	19.8899	20.0465	20.3316	20.6194	20.8509	20.9705	20.9940	20.9914	20.9280	20.6746	20.2325	19.8301	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9453	0.9256	0.8790	0.7940	0.6487	0.4329	0.2827	0.3125	0.5524	0.7899	0.9124	0.9526	(89)
MIT 2	18.8404	19.0346	19.3843	19.7249	19.9794	20.0906	20.1067	20.1054	20.0570	19.7955	19.2690	18.7660	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.2254	19.4057	19.7318	20.0530	20.2991	20.4133	20.4321	20.4304	20.3765	20.1180	19.6224	19.1563	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2254	19.4057	19.7318	20.0530	20.2991	20.4133	20.4321	20.4304	20.3765	20.1180	19.6224	19.1563	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9349	0.9148	0.8700	0.7918	0.6602	0.4577	0.3124	0.3429	0.5740	0.7903	0.9026	0.9426	(94)
Useful gains	621.0547	649.1640	651.3345	619.1230	518.7135	358.5004	233.3819	246.6622	398.1192	520.1256	574.4054	601.3632	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	1030.3595	1000.7946	896.9548	757.5493	570.5790	367.2795	234.7496	248.7148	421.0423	635.3160	854.0255	1032.5369	(97)
Space heating kWh													
	304.5228	236.2958	182.7415	99.6670	38.5879	0.0000	0.0000	0.0000	0.0000	85.7016	201.3264	320.7933	(98a)
Space heating requirement - total per year (kWh/year)												1469.6362	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	304.5228	236.2958	182.7415	99.6670	38.5879	0.0000	0.0000	0.0000	0.0000	85.7016	201.3264	320.7933	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1469.6362	
Space heating per m2											(98c) / (4) =	20.2206	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement													
	304.5228	236.2958	182.7415	99.6670	38.5879	0.0000	0.0000	0.0000	0.0000	85.7016	201.3264	320.7933	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	456.7841	354.4437	274.1123	149.5005	57.8818	0.0000	0.0000	0.0000	0.0000	128.5524	301.9897	481.1899	
Space heating requirement													
	456.7841	354.4437	274.1123	149.5005	57.8818	0.0000	0.0000	0.0000	0.0000	128.5524	301.9897	481.1899	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement													
	258.3599	208.9842	180.2432	127.0942	98.8933	78.5413	78.9431	96.8840	126.3733	178.2168	224.7072	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.5399	313.4764	270.3648	190.6413	148.3399	117.8120	118.4147	145.3260	189.5599	267.3252	337.0608	383.7233	
Water heating fuel													
	387.5399	313.4764	270.3648	190.6413	148.3399	117.8120	118.4147	145.3260	189.5599	267.3252	337.0608	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	8.4920	7.6702	8.4920	8.2180	8.4920	8.2180	8.4920	8.4920	8.2180	8.4920	8.2180	8.4920	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.8663	-26.6927	-44.7143	-57.6640	-65.4319	-65.1316	-63.3225	-57.8097	-47.4406	-34.4735	-20.5043	-14.8840	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.1321	-13.2725	-32.5307	-59.9091	-83.8086	-95.9871	-91.1676	-73.4319	-46.9082	-22.5228	-8.5261	-4.6148	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2204.4544	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2869.5841	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	22.0445	(313)
Space cooling fuel	0.0000	(321)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4312.7177	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2204.4544	6.5500	144.3918	(340a)
Space heating total			144.3918	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2869.5841	6.5500	187.9578	(342a)
Water heating total			187.9578	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	28.4300	5.6821	(349)
Pump for solar water heating	80.0000	28.4300	22.7440	(349)
Energy for lighting	193.4401	28.4300	54.9950	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-515.9355	28.4300	-146.6805	
PV Unit electricity exported	-538.8116	5.8100	-31.3050	
Total			-177.9854	(352)
Total energy cost			341.7852	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1353.0769	0.1559	91.6380	(367)
Electrical energy for heat distribution (space & water)	22.0445	0.0000	7.6166	(372)
Overall CO2 factor for heat network			0.0415	(386)
Total CO2 associated with community systems			210.7258	(373)
Space and water heating			210.7258	(376)
Pumps, fans and electric keep-hot	99.9861	0.1387	13.8693	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-515.9355	0.1322	-68.2250	
PV Unit electricity exported	-538.8116	0.1214	-65.4032	
Total			-133.6282	(380)
Total CO2, kg/year			118.8863	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1353.0769	1.5771	927.1153	(467)
Electrical energy for heat distribution (space & water)	22.0445	0.0000	78.9252	(472)
Overall CO2 factor for heat network			0.4303	(486)
Total CO2 associated with community systems			2183.5981	(473)
Space and water heating			2183.5981	(476)
Pumps, fans and electric keep-hot	99.9861	1.5128	151.2590	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-515.9355	1.4886	-768.0122	
PV Unit electricity exported	-538.8116	0.4453	-239.9213	
Total			-1007.9335	(480)
Total Primary energy kWh/year			1623.6286	(483)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.44	**TER**	11.78
Environmental	98 A	**% DER < TER**			79.29
CO_2 Emissions (t/year)	0.15	**DFEE**	33.17	**TFEE**	35.58
Compliance Check	See BREL	**% DFEE < TFEE**			6.76
% DPER < TPER	50.49	**DPER**	30.55	**TPER**	61.71

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		11875.9502	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							163.4005	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 4.9323 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)											Total = Sum(45)m =	1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =		2611.4378	(64)
12Total per year (kWh/year)												2611	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)
Total internal gains	529.9009	542.3600	519.8296	502.5508	478.2395	462.4112	445.5913	446.6965	459.7372	474.1489	501.8869	519.6574	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.2200	10.6334	0.7300	0.7000	0.7700	4.5939	(74)
East	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(76)
West	4.8400	19.6403	0.7300	0.7000	0.7700	33.6625	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	46.7417	91.2291	150.7013	221.9940	274.9747	282.9979	268.7893	228.7692	175.8579	108.2843	58.2205	38.4900	(83)
Total gains	576.6425	633.5892	670.5309	724.5449	753.2142	745.4091	714.3806	675.4657	635.5951	582.4332	560.1073	558.1474	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9723	0.9578	0.9315	0.8641	0.7450	0.5723	0.4259	0.4674	0.6850	0.8848	0.9546	0.9756	(86)
MIT	19.6898	19.8780	20.1555	20.5185	20.7999	20.9483	20.9879	20.9822	20.8921	20.5376	20.0541	19.6405	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9669	0.9497	0.9180	0.8378	0.6983	0.5031	0.3432	0.3821	0.6184	0.8566	0.9444	0.9708	(89)
MIT 2	18.5905	18.8266	19.1720	19.6103	19.9277	20.0732	20.1034	20.1002	20.0264	19.6422	19.0511	18.5285	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.9937	19.2122	19.5328	19.9434	20.2476	20.3942	20.4278	20.4237	20.3440	19.9707	19.4190	18.9364	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9937	19.2122	19.5328	19.9434	20.2476	20.3942	20.4278	20.4237	20.3440	19.9707	19.4190	18.9364	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9582	0.9397	0.9077	0.8323	0.7061	0.5259	0.3732	0.4128	0.6370	0.8516	0.9347	0.9626	(94)
Useful gains	552.5346	595.3576	608.6487	603.0327	531.8080	392.0299	266.6225	278.8259	404.8542	496.0220	523.5582	537.2869	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1035.1744	1008.2974	918.1584	778.0072	602.1796	408.2042	269.6709	283.4713	439.8866	660.1624	867.8766	1038.1775	(97)
Space heating kWh													
	359.0840	277.4955	230.2752	125.9817	52.3565	0.0000	0.0000	0.0000	0.0000	122.1205	247.9092	372.6626	(98a)
Space heating requirement - total per year (kWh/year)												1787.8852	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	359.0840	277.4955	230.2752	125.9817	52.3565	0.0000	0.0000	0.0000	0.0000	122.1205	247.9092	372.6626	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1787.8852	
Space heating per m2											(98c) / (4) =	24.5994	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	359.0840	277.4955	230.2752	125.9817	52.3565	0.0000	0.0000	0.0000	0.0000	122.1205	247.9092	372.6626	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	538.6260	416.2433	345.4128	188.9725	78.5347	0.0000	0.0000	0.0000	0.0000	183.1808	371.8639	558.9939	
Space heating requirement													
	538.6260	416.2433	345.4128	188.9725	78.5347	0.0000	0.0000	0.0000	0.0000	183.1808	371.8639	558.9939	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	
Water heating fuel													
	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9032	-24.7478	-42.1903	-54.3464	-63.2831	-60.6270	-59.4769	-53.4801	-43.2885	-30.7805	-17.3978	-12.3224	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5955	-11.8305	-29.8051	-54.5176	-80.7077	-84.5250	-82.2640	-64.2624	-40.1739	-18.7163	-6.5523	-3.4266	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												2681.8278	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3917.1568	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												26.8183	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.9861	(330a)
Total electricity for the above, kWh/year												19.9861	(331)
Electricity for lighting (calculated in Appendix L)												193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5854.1899	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1759.7292	0.1554	111.1501	(367)
Electrical energy for heat distribution (space & water)	26.8183	0.0000	9.6860	(372)
Overall CO2 factor for heat network			0.0406	(386)
Total CO2 associated with community systems			267.9790	(373)
Space and water heating			267.9790	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	0.1320	-62.9388	
PV Unit electricity exported	-481.3770	0.1213	-58.4056	
Total			-121.3444	(380)
Total CO2, kg/year			177.3263	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.4400	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1759.7292	1.5754	1126.6573	(467)
Electrical energy for heat distribution (space & water)	26.8183	0.0000	101.8242	(472)
Overall CO2 factor for heat network			0.4269	(486)
Total CO2 associated with community systems			2817.1359	(473)
Space and water heating			2817.1359	(476)
Pumps, fans and electric keep-hot	19.9861	1.5128	30.2350	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	1.4877	-709.3875	
PV Unit electricity exported	-481.3770	0.4451	-214.2796	
Total			-923.6671	(480)
Total Primary energy kWh/year			2220.4088	(483)
Dwelling Primary energy Rate (DPER)			30.5500	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b) x	2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c) x	2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4185	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3243	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4135	0.4054	0.3973	0.3568	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3649	0.3811	(22b)
Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			7.2800	1.1450	8.3359			(27)
Heatloss floor			36.3400	0.1300	4.7242			(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.1800	14.8338			(29a)
500mm mineral wool	36.3400		36.3400	0.1100	3.9974			(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.9313			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	3.6500	0.0500	0.1825
E3 Sill	2.7400	0.0500	0.1370
E4 Jamb	14.8400	0.0500	0.7420
E5 Ground floor (normal)	18.7200	0.1600	2.9952
E6 Intermediate floor within a dwelling	18.7200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.7200	0.0600	1.1232
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	5.5000	0.0800	0.4400
P2 Party wall - Intermediate floor within a dwelling	5.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	5.5000	0.1200	0.6600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8399 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.7712 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.4047	34.2096	34.0184	33.1202	32.9522	32.1700	32.1700	32.0251	32.4713	32.9522	33.2921	33.6475	(38)
Heat transfer coeff	76.1759	75.9808	75.7896	74.8914	74.7234	73.9411	73.9411	73.7963	74.2424	74.7234	75.0633	75.4187	(39)
Average = Sum(39)m / 12 =												74.8906	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0481	1.0454	1.0428	1.0304	1.0281	1.0174	1.0174	1.0154	1.0215	1.0281	1.0328	1.0377	(40)
HLP (average)												1.0304	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	249.9662	221.0368	234.6117	205.6045	198.8885	178.7466	175.9929	183.1904	185.4473	207.3672	221.2297	247.1336	(62)
WWHRS	-28.7738	-25.4478	-26.6475	-22.0651	-20.5639	-17.5967	-16.4941	-17.5398	-18.2062	-21.4631	-24.3151	-28.2410	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
										Total per year (kWh/year) = Sum(64)m =		2241.8614	(64)
12Total per year (kWh/year)												2242	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	104.8969	93.1698	99.7915	89.4439	87.9135	80.5137	80.3008	82.6939	82.7417	90.7327	94.6393	103.9551	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	140.9904	138.6456	134.1284	124.2277	118.1634	111.8245	107.9311	111.1477	114.9190	121.9526	131.4435	139.7245	(72)
Total internal gains	523.5655	536.0247	513.4942	496.2155	471.9041	453.0758	436.2560	437.3612	450.4018	467.8135	495.5515	513.3220	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.2200	10.6334	0.6300	0.7000	0.7700	3.9646	(74)
East	1.2200	19.6403	0.6300	0.7000	0.7700	7.3228	(76)
West	4.8400	19.6403	0.6300	0.7000	0.7700	29.0512	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	40.3387	78.7320	130.0573	191.5839	237.3070	244.2311	231.9688	197.4309	151.7678	93.4508	50.2451	33.2174	(83)
Total gains	563.9042	614.7567	643.5515	687.7994	709.2110	697.3069	668.2248	634.7921	602.1696	561.2644	545.7966	546.5394	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3060	43.4172	43.5268	44.0488	44.1478	44.6149	44.6149	44.7025	44.4338	44.1478	43.9479	43.7408	
alpha	3.8871	3.8945	3.9018	3.9366	3.9432	3.9743	3.9743	3.9802	3.9623	3.9432	3.9299	3.9161	
util living area	0.9760	0.9647	0.9446	0.8906	0.7895	0.6240	0.4722	0.5132	0.7294	0.9037	0.9610	0.9785	(86)
MIT	19.4955	19.6854	19.9751	20.3851	20.7171	20.9199	20.9793	20.9712	20.8467	20.4345	19.9142	19.4696	(87)
Th 2	20.0434	20.0457	20.0478	20.0581	20.0600	20.0689	20.0689	20.0706	20.0655	20.0600	20.0561	20.0521	(88)
util rest of house	0.9711	0.9575	0.9329	0.8669	0.7442	0.5500	0.3785	0.4183	0.6619	0.8781	0.9519	0.9741	(89)
MIT 2	18.3004	18.5410	18.9058	19.4148	19.7995	20.0126	20.0593	20.0562	19.9461	19.4845	18.8397	18.2736	(90)
Living area fraction									fLA = Living area / (4) =			0.3668	(91)
MIT	18.7388	18.9608	19.2980	19.7707	20.1361	20.3454	20.3968	20.3919	20.2764	19.8330	19.2338	18.7123	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7388	18.9608	19.2980	19.7707	20.1361	20.3454	20.3968	20.3919	20.2764	19.8330	19.2338	18.7123	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9623	0.9471	0.9216	0.8586	0.7482	0.5729	0.4123	0.4521	0.6783	0.8708	0.9418	0.9659	(94)
Useful gains	542.6171	582.2479	593.1057	590.5363	530.6467	399.5091	275.4840	286.9840	408.4298	488.7301	514.0143	527.8915	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1099.8884	1068.3510	969.9546	814.1238	630.3762	424.8237	280.7404	294.5846	458.5530	689.9188	910.8070	1094.5006	(97)
Space heating kWh	414.6098	326.6612	280.3756	160.9830	74.1988	0.0000	0.0000	0.0000	0.0000	149.6843	285.6907	421.5571	(98a)
Space heating requirement - total per year (kWh/year)												2113.7607	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	414.6098	326.6612	280.3756	160.9830	74.1988	0.0000	0.0000	0.0000	0.0000	149.6843	285.6907	421.5571	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2113.7607	
Space heating per m2											(98c) / (4) =	29.0831	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	414.6098	326.6612	280.3756	160.9830	74.1988	0.0000	0.0000	0.0000	0.0000	149.6843	285.6907	421.5571	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	449.1981	353.9125	303.7656	174.4128	80.3887	0.0000	0.0000	0.0000	0.0000	162.1716	309.5241	456.7250	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4474	85.2013	84.7305	83.7670	82.2494	79.8000	79.8000	79.8000	79.8000	83.5783	84.8934	85.5041	(217)
Fuel for water heating, kWh/month	258.8639	229.5612	245.4421	219.1070	216.8096	201.9422	199.8732	207.5821	209.5753	222.4311	231.9551	256.0025	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.6146	19.7468	17.7798	13.0262	10.0618	8.2206	9.1787	11.9309	15.4970	20.3329	22.9660	25.2988	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-34.1427	-48.1921	-69.3402	-78.0353	-84.2042	-78.6248	-77.6860	-73.3488	-65.6465	-55.1924	-37.5712	-29.5143	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.0663	-40.1520	-79.8860	-120.0915	-158.8866	-159.6687	-157.7568	-133.4905	-97.7594	-57.4135	-25.4553	-15.0706	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2290.0983	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2699.1455	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	198.6542	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1796.1956	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3477.7025	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2290.0983	0.2100	480.9206	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2699.1455	0.2100	566.8206	(264)
Space and water heating			1047.7412	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	198.6542	0.1443	28.6719	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	0.1346	-98.4313	
PV Unit electricity exported	-1064.6971	0.1259	-134.0169	
Total			-232.4482	(269)
Total CO2, kg/year			855.8942	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.7800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2290.0983	1.1300	2587.8110	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2699.1455	1.1300	3050.0344	(278)
Space and water heating			5637.8455	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	198.6542	1.5338	304.7025	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	1.4973	-1095.2830	
PV Unit electricity exported	-1064.6971	0.4620	-491.9332	
Total			-1587.2162	(283)
Total Primary energy kWh/year			4485.4326	(286)
Target Primary Energy Rate (TPER)			61.7100	(287)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.44	**TER**	11.78
Environmental	98 A	**% DER < TER**			79.29
CO_2 Emissions (t/year)	0.15	**DFEE**	33.17	**TFEE**	35.58
Compliance Check	See BREL	**% DFEE < TFEE**			6.76
% DPER < TPER	50.49	**DPER**	30.55	**TPER**	61.71

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3185	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2468	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3147	0.3085	0.3024	0.2715	0.2653	0.2345	0.2345	0.2283	0.2468	0.2653	0.2777	0.2900	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5495	0.5476	0.5457	0.5369	0.5352	0.5275	0.5275	0.5261	0.5305	0.5352	0.5386	0.5421	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		4.9323 (36)
Point Thermal bridges	(36a) =	0.0000

Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.2906	32.1776	32.0668	31.5466	31.4493	30.9963	30.9963	30.9124	31.1708	31.4493	31.6462	31.8520	(38)
Heat transfer coeff	73.3597	73.2467	73.1359	72.6157	72.5184	72.0654	72.0654	71.9815	72.2399	72.5184	72.7153	72.9211	(39)
Average = Sum(39)m / 12 =												72.6153	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0094	1.0078	1.0063	0.9991	0.9978	0.9915	0.9915	0.9904	0.9939	0.9978	1.0005	1.0033	(40)
HLP (average)												0.9991	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 60.0096 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.4702	63.6744	61.7137	59.2732	57.0961	54.8336	54.3634	56.3200	58.3269	60.6504	63.1125	65.3783	(44)
Energy conte	103.6888	90.6715	94.8517	81.1421	76.8624	67.4243	65.7478	69.7360	71.9229	82.3020	89.9153	102.3666	(45)
Energy content (annual)										Total = Sum(45)m =		996.6312	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(64)
								Total per year (kWh/year) = Sum(64)m =			847.1365	(64)
12Total per year (kWh/year)											847	(64)

Electric shower(s)

50.4049	44.9112	49.0413	46.7995	47.6777	45.4799	46.9959	47.6777	46.7995	49.0413	48.1191	50.4049	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 573.3528 (64a)

Heat gains from water heating, kWh/month

34.6351	30.4955	32.4163	28.9426	28.2527	25.6976	25.7204	26.7383	26.9835	29.7495	31.1368	34.3541	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	46.5525	45.3802	43.5703	40.1980	37.9740	35.6912	34.5704	35.9386	37.4771	39.9859	43.2455	46.1749	(72)
Total internal gains	426.1276	439.7593	419.9362	409.1858	388.7147	376.9424	362.8952	362.1520	372.9599	382.8469	404.3535	416.7724	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.2200	10.6334	0.7300	0.7000	0.7700	4.5939	(74)
East	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(76)
West	4.8400	19.6403	0.7300	0.7000	0.7700	33.6625	(80)

Solar gains	46.7417	91.2291	150.7013	221.9940	274.9747	282.9979	268.7893	228.7692	175.8579	108.2843	58.2205	38.4900	(83)
Total gains	472.8693	530.9884	570.6375	631.1798	663.6895	659.9403	631.6845	590.9212	548.8178	491.1311	462.5740	455.2624	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	44.9685	45.0379	45.1061	45.4292	45.4902	45.7762	45.7762	45.8295	45.6656	45.4902	45.3670	45.2389	
alpha	3.9979	4.0025	4.0071	4.0286	4.0327	4.0517	4.0517	4.0553	4.0444	4.0327	4.0245	4.0159	
util living area	0.9862	0.9770	0.9596	0.9083	0.8077	0.6400	0.4862	0.5355	0.7614	0.9301	0.9762	0.9881	(86)

MIT	19.4025	19.6089	19.9193	20.3555	20.7078	20.9177	20.9789	20.9689	20.8297	20.3720	19.8200	19.3653	(87)
Th 2	20.0755	20.0768	20.0781	20.0841	20.0852	20.0904	20.0904	20.0914	20.0884	20.0852	20.0829	20.0806	(88)
util rest of house													
	0.9833	0.9722	0.9507	0.8877	0.7648	0.5669	0.3924	0.4398	0.6970	0.9100	0.9703	0.9856	(89)
MIT 2	18.6179	18.8227	19.1288	19.5524	19.8730	20.0448	20.0826	20.0790	19.9825	19.5764	19.0379	18.5848	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.9057	19.1111	19.4188	19.8470	20.1792	20.3650	20.4114	20.4055	20.2933	19.8682	19.3248	18.8711	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9057	19.1111	19.4188	19.8470	20.1792	20.3650	20.4114	20.4055	20.2933	19.8682	19.3248	18.8711	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9784	0.9657	0.9429	0.8815	0.7696	0.5899	0.4263	0.4739	0.7127	0.9043	0.9640	0.9812	(94)
Useful gains	462.6592	512.7763	538.0666	556.3948	510.7676	389.3318	269.2739	280.0574	391.1467	444.1144	445.9388	446.6839	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1071.4720	1040.9135	944.8275	794.9222	614.8967	415.4560	274.6694	288.3188	447.4021	672.1156	888.9268	1069.8329	(97)
Space heating kWh													
	452.9567	354.9082	302.6301	171.7397	77.4720	0.0000	0.0000	0.0000	0.0000	169.6329	318.9514	463.6229	(98a)
Space heating requirement - total per year (kWh/year)												2311.9139	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	452.9567	354.9082	302.6301	171.7397	77.4720	0.0000	0.0000	0.0000	0.0000	169.6329	318.9514	463.6229	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2311.9139	
Space heating per m2											(98c) / (4) =	31.8095	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	677.4144	533.2836	547.0591	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8230	0.8879	0.8593	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	557.4929	473.4942	470.0807	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	714.7789	684.4860	639.2843	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	113.2459	156.9779	125.8875	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	28.3115	39.2445	31.4719	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												99.0279	(107)
Energy for space heating												31.8095	(99)
Energy for space cooling												1.3625	(108)
Total												33.1720	(109)
Fabric Energy Efficiency (DFEE)												33.2	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor		36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		3 * 10 =	30.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1685 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.4185 (18)
Number of sides sheltered			3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3243 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4135	0.4054	0.3973	0.3568	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3649	0.3811	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			7.2800	1.1450	8.3359			(27)
Heatloss floor			36.3400	0.1300	4.7242			(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.1800	14.8338			(29a)
500mm mineral wool	36.3400		36.3400	0.1100	3.9974			(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.9313			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	3.6500	0.0500	0.1825
E3 Sill	2.7400	0.0500	0.1370
E4 Jamb	14.8400	0.0500	0.7420
E5 Ground floor (normal)	18.7200	0.1600	2.9952
E6 Intermediate floor within a dwelling	18.7200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.7200	0.0600	1.1232
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	5.5000	0.0800	0.4400
P2 Party wall - Intermediate floor within a dwelling	5.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	5.5000	0.1200	0.6600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8399 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.7712 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.4047	34.2096	34.0184	33.1202	32.9522	32.1700	32.1700	32.0251	32.4713	32.9522	33.2921	33.6475	(38)
Heat transfer coeff	76.1759	75.9808	75.7896	74.8914	74.7234	73.9411	73.9411	73.7963	74.2424	74.7234	75.0633	75.4187	(39)
Average = Sum(39)m / 12 =												74.8906	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0481	1.0454	1.0428	1.0304	1.0281	1.0174	1.0174	1.0154	1.0215	1.0281	1.0328	1.0377	(40)
HLP (average)												1.0304	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 60.0096 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.4702	63.6744	61.7137	59.2732	57.0961	54.8336	54.3634	56.3200	58.3269	60.6504	63.1125	65.3783	(44)
Energy conte	103.6888	90.6715	94.8517	81.1421	76.8624	67.4243	65.7478	69.7360	71.9229	82.3020	89.9153	102.3666	(45)
Energy content (annual)										Total = Sum(45)m =		996.6312	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
88.1355	77.0708	80.6239	68.9708	65.3330	57.3106	55.8856	59.2756	61.1344	69.9567	76.4280	87.0116	(64)
								Total per year (kWh/year) = Sum(64)m =			847.1365	(64)
12Total per year (kWh/year)											847	(64)	

Electric shower(s)

50.4049	44.9112	49.0413	46.7995	47.6777	45.4799	46.9959	47.6777	46.7995	49.0413	48.1191	50.4049	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				573.3528	(64a)

Heat gains from water heating, kWh/month

34.6351	30.4955	32.4163	28.9426	28.2527	25.6976	25.7204	26.7383	26.9835	29.7495	31.1368	34.3541	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)													
	46.5525	45.3802	43.5703	40.1980	37.9740	35.6912	34.5704	35.9386	37.4771	39.9859	43.2455	46.1749	(72)
Total internal gains													
	426.1276	439.7593	419.9362	409.1858	388.7147	376.9424	362.8952	362.1520	372.9599	382.8469	404.3535	416.7724	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.2200	10.6334	0.6300	0.7000	0.7700	3.9646	(74)
East	1.2200	19.6403	0.6300	0.7000	0.7700	7.3228	(76)
West	4.8400	19.6403	0.6300	0.7000	0.7700	29.0512	(80)

Solar gains	40.3387	78.7320	130.0573	191.5839	237.3070	244.2311	231.9688	197.4309	151.7678	93.4508	50.2451	33.2174	(83)
Total gains	466.4663	518.4913	549.9935	600.7697	626.0217	621.1735	594.8640	559.5830	524.7277	476.2977	454.5986	449.9898	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3060	43.4172	43.5268	44.0488	44.1478	44.6149	44.6149	44.7025	44.4338	44.1478	43.9479	43.7408	
alpha	3.8871	3.8945	3.9018	3.9366	3.9432	3.9743	3.9743	3.9802	3.9623	3.9432	3.9299	3.9161	
util living area													
	0.9871	0.9793	0.9653	0.9231	0.8371	0.6788	0.5232	0.5710	0.7888	0.9384	0.9781	0.9887	(86)
MIT	19.3081	19.5076	19.8143	20.2637	20.6419	20.8917	20.9704	20.9581	20.7935	20.3082	19.7470	19.2818	(87)
Th 2	20.0434	20.0457	20.0478	20.0581	20.0600	20.0689	20.0689	20.0706	20.0655	20.0600	20.0561	20.0521	(88)
util rest of house													
	0.9843	0.9749	0.9574	0.9046	0.7968	0.6042	0.4224	0.4698	0.7258	0.9199	0.9725	0.9863	(89)
MIT 2	18.5007	18.6996	19.0037	19.4463	19.7963	20.0078	20.0579	20.0537	19.9353	19.4969	18.9461	18.4810	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.7969	18.9960	19.3011	19.7461	20.1065	20.3320	20.3926	20.3855	20.2501	19.7945	19.2399	18.7747	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7969	18.9960	19.3011	19.7461	20.1065	20.3320	20.3926	20.3855	20.2501	19.7945	19.2399	18.7747	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9794	0.9685	0.9496	0.8974	0.7991	0.6265	0.4586	0.5055	0.7395	0.9135	0.9663	0.9819	(94)
Useful gains	456.8699	502.1622	522.2652	539.1558	500.2292	389.1894	272.7851	282.8723	388.0559	435.1066	439.2868	441.8430	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1104.3115	1071.0237	970.1862	812.2803	628.1622	423.8339	280.4302	294.1137	456.5989	687.0427	911.2621	1099.2063	(97)
Space heating kWh													
	481.6966	382.2749	333.2532	196.6496	95.1821	0.0000	0.0000	0.0000	0.0000	187.4405	339.8222	489.0783	(98a)
Space heating requirement - total per year (kWh/year)												2505.3974	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	481.6966	382.2749	333.2532	196.6496	95.1821	0.0000	0.0000	0.0000	0.0000	187.4405	339.8222	489.0783	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2505.3974	
Space heating per m2											(98c) / (4) =	34.4716	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	695.0467	547.1644	560.8517	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7837	0.8570	0.8269	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	544.7199	468.9332	463.7451	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	669.4670	641.4491	602.6552	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	89.8179	128.3518	103.3492	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	22.4545	32.0880	25.8373	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												80.3797	(107)
Energy for space heating												34.4716	(99)
Energy for space cooling												1.1059	(108)
Total												35.5776	(109)
Fabric Energy Efficiency (TFEE)												35.6	(109)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.44	**TER**	11.78
Environmental	98 A	**% DER < TER**			79.29
CO_2 Emissions (t/year)	0.15	**DFEE**	33.17	**TFEE**	35.58
Compliance Check	See BREL	**% DFEE < TFEE**			6.76
% DPER < TPER	50.49	**DPER**	30.55	**TPER**	61.71

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		11875.9502	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							163.4005	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 4.9323 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)											Total = Sum(45)m =	1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =		2611.4378	(64)
12Total per year (kWh/year)												2611	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)
Total internal gains	529.9009	542.3600	519.8296	502.5508	478.2395	462.4112	445.5913	446.6965	459.7372	474.1489	501.8869	519.6574	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.2200	10.6334	0.7300	0.7000	0.7700	4.5939	(74)
East	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(76)
West	4.8400	19.6403	0.7300	0.7000	0.7700	33.6625	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	46.7417	91.2291	150.7013	221.9940	274.9747	282.9979	268.7893	228.7692	175.8579	108.2843	58.2205	38.4900	(83)
Total gains	576.6425	633.5892	670.5309	724.5449	753.2142	745.4091	714.3806	675.4657	635.5951	582.4332	560.1073	558.1474	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9723	0.9578	0.9315	0.8641	0.7450	0.5723	0.4259	0.4674	0.6850	0.8848	0.9546	0.9756	(86)
MIT	19.6898	19.8780	20.1555	20.5185	20.7999	20.9483	20.9879	20.9822	20.8921	20.5376	20.0541	19.6405	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9669	0.9497	0.9180	0.8378	0.6983	0.5031	0.3432	0.3821	0.6184	0.8566	0.9444	0.9708	(89)
MIT 2	18.5905	18.8266	19.1720	19.6103	19.9277	20.0732	20.1034	20.1002	20.0264	19.6422	19.0511	18.5285	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	18.9937	19.2122	19.5328	19.9434	20.2476	20.3942	20.4278	20.4237	20.3440	19.9707	19.4190	18.9364	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9937	19.2122	19.5328	19.9434	20.2476	20.3942	20.4278	20.4237	20.3440	19.9707	19.4190	18.9364	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9582	0.9397	0.9077	0.8323	0.7061	0.5259	0.3732	0.4128	0.6370	0.8516	0.9347	0.9626	(94)
Useful gains	552.5346	595.3576	608.6487	603.0327	531.8080	392.0299	266.6225	278.8259	404.8542	496.0220	523.5582	537.2869	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1035.1744	1008.2974	918.1584	778.0072	602.1796	408.2042	269.6709	283.4713	439.8866	660.1624	867.8766	1038.1775	(97)
Space heating kWh													
	359.0840	277.4955	230.2752	125.9817	52.3565	0.0000	0.0000	0.0000	0.0000	122.1205	247.9092	372.6626	(98a)
Space heating requirement - total per year (kWh/year)												1787.8852	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	359.0840	277.4955	230.2752	125.9817	52.3565	0.0000	0.0000	0.0000	0.0000	122.1205	247.9092	372.6626	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1787.8852	
Space heating per m2											(98c) / (4) =	24.5994	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	359.0840	277.4955	230.2752	125.9817	52.3565	0.0000	0.0000	0.0000	0.0000	122.1205	247.9092	372.6626	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	538.6260	416.2433	345.4128	188.9725	78.5347	0.0000	0.0000	0.0000	0.0000	183.1808	371.8639	558.9939	
Space heating requirement													
	538.6260	416.2433	345.4128	188.9725	78.5347	0.0000	0.0000	0.0000	0.0000	183.1808	371.8639	558.9939	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	
Water heating fuel													
	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9032	-24.7478	-42.1903	-54.3464	-63.2831	-60.6270	-59.4769	-53.4801	-43.2885	-30.7805	-17.3978	-12.3224	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5955	-11.8305	-29.8051	-54.5176	-80.7077	-84.5250	-82.2640	-64.2624	-40.1739	-18.7163	-6.5523	-3.4266	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												2681.8278	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3917.1568	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												26.8183	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.9861	(330a)
Total electricity for the above, kWh/year												19.9861	(331)
Electricity for lighting (calculated in Appendix L)												193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5854.1899	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1759.7292	0.1554	111.1501	(367)
Electrical energy for heat distribution (space & water)	26.8183	0.0000	9.6860	(372)
Overall CO2 factor for heat network			0.0406	(386)
Total CO2 associated with community systems			267.9790	(373)
Space and water heating			267.9790	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	0.1320	-62.9388	
PV Unit electricity exported	-481.3770	0.1213	-58.4056	
Total			-121.3444	(380)
Total CO2, kg/year			177.3263	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.4400	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1759.7292	1.5754	1126.6573	(467)
Electrical energy for heat distribution (space & water)	26.8183	0.0000	101.8242	(472)
Overall CO2 factor for heat network			0.4269	(486)
Total CO2 associated with community systems			2817.1359	(473)
Space and water heating			2817.1359	(476)
Pumps, fans and electric keep-hot	19.9861	1.5128	30.2350	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	1.4877	-709.3875	
PV Unit electricity exported	-481.3770	0.4451	-214.2796	
Total			-923.6671	(480)
Total Primary energy kWh/year			2220.4088	(483)
Dwelling Primary energy Rate (DPER)			30.5500	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b) x	2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c) x	2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1685	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4185	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3243	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4135	0.4054	0.3973	0.3568	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3649	0.3811	(22b)
Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			7.2800	1.1450	8.3359			(27)
Heatloss floor			36.3400	0.1300	4.7242			(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.1800	14.8338			(29a)
500mm mineral wool	36.3400		36.3400	0.1100	3.9974			(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.9313			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	3.6500	0.0500	0.1825
E3 Sill	2.7400	0.0500	0.1370
E4 Jamb	14.8400	0.0500	0.7420
E5 Ground floor (normal)	18.7200	0.1600	2.9952
E6 Intermediate floor within a dwelling	18.7200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.7200	0.0600	1.1232
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	5.5000	0.0800	0.4400
P2 Party wall - Intermediate floor within a dwelling	5.5000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	5.5000	0.1200	0.6600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8399 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.7712 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.4047	34.2096	34.0184	33.1202	32.9522	32.1700	32.1700	32.0251	32.4713	32.9522	33.2921	33.6475	(38)
Heat transfer coeff	76.1759	75.9808	75.7896	74.8914	74.7234	73.9411	73.9411	73.7963	74.2424	74.7234	75.0633	75.4187	(39)
Average = Sum(39)m / 12 =												74.8906	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0481	1.0454	1.0428	1.0304	1.0281	1.0174	1.0174	1.0154	1.0215	1.0281	1.0328	1.0377	(40)
HLP (average)												1.0304	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	249.9662	221.0368	234.6117	205.6045	198.8885	178.7466	175.9929	183.1904	185.4473	207.3672	221.2297	247.1336	(62)
WWHRS	-28.7738	-25.4478	-26.6475	-22.0651	-20.5639	-17.5967	-16.4941	-17.5398	-18.2062	-21.4631	-24.3151	-28.2410	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
										Total per year (kWh/year) = Sum(64)m =		2241.8614	(64)
12Total per year (kWh/year)												2242	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	104.8969	93.1698	99.7915	89.4439	87.9135	80.5137	80.3008	82.6939	82.7417	90.7327	94.6393	103.9551	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	115.4696	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.4648	131.1574	118.4648	122.4136	118.4648	122.4136	118.4648	118.4648	122.4136	118.4648	122.4136	118.4648	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.4695	205.5808	200.2602	188.9333	174.6351	161.1968	152.2192	150.1078	155.4284	166.7553	181.0535	194.4918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	34.5470	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	140.9904	138.6456	134.1284	124.2277	118.1634	111.8245	107.9311	111.1477	114.9190	121.9526	131.4435	139.7245	(72)
Total internal gains	523.5655	536.0247	513.4942	496.2155	471.9041	453.0758	436.2560	437.3612	450.4018	467.8135	495.5515	513.3220	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.2200	10.6334	0.6300	0.7000	0.7700	3.9646	(74)
East	1.2200	19.6403	0.6300	0.7000	0.7700	7.3228	(76)
West	4.8400	19.6403	0.6300	0.7000	0.7700	29.0512	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	40.3387	78.7320	130.0573	191.5839	237.3070	244.2311	231.9688	197.4309	151.7678	93.4508	50.2451	33.2174	(83)
Total gains	563.9042	614.7567	643.5515	687.7994	709.2110	697.3069	668.2248	634.7921	602.1696	561.2644	545.7966	546.5394	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3060	43.4172	43.5268	44.0488	44.1478	44.6149	44.6149	44.7025	44.4338	44.1478	43.9479	43.7408	
alpha	3.8871	3.8945	3.9018	3.9366	3.9432	3.9743	3.9743	3.9802	3.9623	3.9432	3.9299	3.9161	
util living area	0.9760	0.9647	0.9446	0.8906	0.7895	0.6240	0.4722	0.5132	0.7294	0.9037	0.9610	0.9785	(86)
MIT	19.4955	19.6854	19.9751	20.3851	20.7171	20.9199	20.9793	20.9712	20.8467	20.4345	19.9142	19.4696	(87)
Th 2	20.0434	20.0457	20.0478	20.0581	20.0600	20.0689	20.0689	20.0706	20.0655	20.0600	20.0561	20.0521	(88)
util rest of house	0.9711	0.9575	0.9329	0.8669	0.7442	0.5500	0.3785	0.4183	0.6619	0.8781	0.9519	0.9741	(89)
MIT 2	18.3004	18.5410	18.9058	19.4148	19.7995	20.0126	20.0593	20.0562	19.9461	19.4845	18.8397	18.2736	(90)
Living area fraction									fLA = Living area / (4) =			0.3668	(91)
MIT	18.7388	18.9608	19.2980	19.7707	20.1361	20.3454	20.3968	20.3919	20.2764	19.8330	19.2338	18.7123	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7388	18.9608	19.2980	19.7707	20.1361	20.3454	20.3968	20.3919	20.2764	19.8330	19.2338	18.7123	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9623	0.9471	0.9216	0.8586	0.7482	0.5729	0.4123	0.4521	0.6783	0.8708	0.9418	0.9659	(94)
Useful gains	542.6171	582.2479	593.1057	590.5363	530.6467	399.5091	275.4840	286.9840	408.4298	488.7301	514.0143	527.8915	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1099.8884	1068.3510	969.9546	814.1238	630.3762	424.8237	280.7404	294.5846	458.5530	689.9188	910.8070	1094.5006	(97)
Space heating kWh	414.6098	326.6612	280.3756	160.9830	74.1988	0.0000	0.0000	0.0000	0.0000	149.6843	285.6907	421.5571	(98a)
Space heating requirement - total per year (kWh/year)												2113.7607	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	414.6098	326.6612	280.3756	160.9830	74.1988	0.0000	0.0000	0.0000	0.0000	149.6843	285.6907	421.5571	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2113.7607	
Space heating per m2											(98c) / (4) =	29.0831	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	414.6098	326.6612	280.3756	160.9830	74.1988	0.0000	0.0000	0.0000	0.0000	149.6843	285.6907	421.5571	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	449.1981	353.9125	303.7656	174.4128	80.3887	0.0000	0.0000	0.0000	0.0000	162.1716	309.5241	456.7250	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	221.1924	195.5890	207.9642	183.5394	178.3246	161.1499	159.4988	165.6505	167.2411	185.9041	196.9146	218.8927	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4474	85.2013	84.7305	83.7670	82.2494	79.8000	79.8000	79.8000	79.8000	83.5783	84.8934	85.5041	(217)
Fuel for water heating, kWh/month	258.8639	229.5612	245.4421	219.1070	216.8096	201.9422	199.8732	207.5821	209.5753	222.4311	231.9551	256.0025	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.6146	19.7468	17.7798	13.0262	10.0618	8.2206	9.1787	11.9309	15.4970	20.3329	22.9660	25.2988	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-34.1427	-48.1921	-69.3402	-78.0353	-84.2042	-78.6248	-77.6860	-73.3488	-65.6465	-55.1924	-37.5712	-29.5143	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-19.0663	-40.1520	-79.8860	-120.0915	-158.8866	-159.6687	-157.7568	-133.4905	-97.7594	-57.4135	-25.4553	-15.0706	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2290.0983	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2699.1455	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	198.6542	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1796.1956	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3477.7025	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2290.0983	0.2100	480.9206	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2699.1455	0.2100	566.8206	(264)
Space and water heating			1047.7412	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	198.6542	0.1443	28.6719	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	0.1346	-98.4313	
PV Unit electricity exported	-1064.6971	0.1259	-134.0169	
Total			-232.4482	(269)
Total CO2, kg/year			855.8942	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.7800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2290.0983	1.1300	2587.8110	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2699.1455	1.1300	3050.0344	(278)
Space and water heating			5637.8455	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	198.6542	1.5338	304.7025	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-731.4984	1.4973	-1095.2830	
PV Unit electricity exported	-1064.6971	0.4620	-491.9332	
Total			-1587.2162	(283)
Total Primary energy kWh/year			4485.4326	(286)
Target Primary Energy Rate (TPER)			61.7100	(287)

Full SAP Calculation Printout

Property Reference	House End Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	85 B	**DER**	2.44	**TER**	11.78
Environmental	98 A	**% DER < TER**			79.29
CO_2 Emissions (t/year)	0.15	**DFEE**	33.17	**TFEE**	35.58
Compliance Check	See BREL	**% DFEE < TFEE**			6.76
% DPER < TPER	50.49	**DPER**	30.55	**TPER**	61.71

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330	(1b) - (3b)
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 11875.9502	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	163.4005	(35)

Thermal bridges (User defined value 0.030 * total exposed area)												4.9323	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	41.0691	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3094	(42)
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)											Total = Sum(45)m =	1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =		2611.4378	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)
Total internal gains	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.2200	10.6334	0.7300	0.7000	0.7700	4.5939	(74)
East	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(76)
West	4.8400	19.6403	0.7300	0.7000	0.7700	33.6625	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	46.7417	91.2291	150.7013	221.9940	274.9747	282.9979	268.7893	228.7692	175.8579	108.2843	58.2205	38.4900	(83)
Total gains	625.4902	667.7224	710.1943	749.8752	771.6701	751.5538	720.8134	683.9203	647.2634	608.4345	592.9831	603.3343	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area	0.9639	0.9504	0.9193	0.8526	0.7340	0.5684	0.4224	0.4621	0.6763	0.8716	0.9460	0.9685	(86)
MIT	19.7797	19.9370	20.2158	20.5467	20.8111	20.9496	20.9882	20.9829	20.8972	20.5694	20.1100	19.7251	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house	0.9571	0.9411	0.9041	0.8250	0.6868	0.4994	0.3402	0.3776	0.6097	0.8414	0.9343	0.9625	(89)
MIT 2	18.7028	18.8994	19.2445	19.6420	19.9386	20.0742	20.1036	20.1006	20.0306	19.6778	19.1194	18.6345	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.0978	19.2800	19.6008	19.9739	20.2587	20.3953	20.4281	20.4242	20.3485	20.0048	19.4828	19.0346	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0978	19.2800	19.6008	19.9739	20.2587	20.3953	20.4281	20.4242	20.3485	20.0048	19.4828	19.0346	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9474	0.9306	0.8940	0.8203	0.6952	0.5223	0.3700	0.4080	0.6285	0.8375	0.9243	0.9533	(94)
Useful gains	592.6195	621.4152	634.9355	615.1563	536.4848	392.5069	266.7347	279.0549	406.8237	509.5345	548.0844	575.1493	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1042.5058	1013.0710	922.9507	780.1545	602.9577	408.2785	269.6883	283.5068	440.2041	662.5709	872.3660	1045.0943	(97)
Space heating kWh	334.7153	263.1927	214.2833	118.7987	49.4558	0.0000	0.0000	0.0000	0.0000	113.8591	233.4827	349.6390	(98a)
Space heating requirement - total per year (kWh/year)												1677.4267	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	334.7153	263.1927	214.2833	118.7987	49.4558	0.0000	0.0000	0.0000	0.0000	113.8591	233.4827	349.6390	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1677.4267	
Space heating per m2											(98c) / (4) =	23.0796	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	334.7153	263.1927	214.2833	118.7987	49.4558	0.0000	0.0000	0.0000	0.0000	113.8591	233.4827	349.6390	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	502.0730	394.7890	321.4249	178.1981	74.1838	0.0000	0.0000	0.0000	0.0000	170.7886	350.2240	524.4586	
Space heating requirement													
	502.0730	394.7890	321.4249	178.1981	74.1838	0.0000	0.0000	0.0000	0.0000	170.7886	350.2240	524.4586	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	
Water heating fuel													
	387.9721	343.3178	364.9404	321.0096	311.3556	280.7226	277.0123	287.8084	290.7737	324.0737	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6975	1.5332	1.6975	1.6427	1.6975	1.6427	1.6975	1.6975	1.6427	1.6975	1.6427	1.6975	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9032	-24.7478	-42.1903	-54.3464	-63.2831	-60.6270	-59.4769	-53.4801	-43.2885	-30.7805	-17.3978	-12.3224	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5955	-11.8305	-29.8051	-54.5176	-80.7077	-84.5250	-82.2640	-64.2624	-40.1739	-18.7163	-6.5523	-3.4266	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2516.1401	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3917.1568	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	25.1614	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
Total electricity for the above, kWh/year	19.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5688.5022	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2516.1401	4.4400	111.7166	(340a)
Space heating total			111.7166	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3917.1568	4.4400	173.9218	(342a)
Water heating total			173.9218	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	16.4900	3.2957	(349)
Energy for lighting	193.4401	16.4900	31.8983	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	16.4900	-78.6316	
PV Unit electricity exported	-481.3770	5.5900	-26.9090	
Total			-105.5405	(352)
Total energy cost			307.2918	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.9400	(357)
SAP value	84.7618	
SAP rating (Section 12)	85	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1715.5458	0.1554	104.2812	(367)
Electrical energy for heat distribution (space & water)	25.1614	0.0000	9.4284	(372)
Overall CO2 factor for heat network			0.0405	(386)
Total CO2 associated with community systems			260.8526	(373)
Space and water heating			260.8526	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-476.8439	0.1320	-62.9388	
PV Unit electricity exported	-481.3770	0.1213	-58.4056	
Total			-121.3444	(380)
Total CO2, kg/year			170.1999	(383)
CO2 emissions per m2			2.3400	(384)
EI value			98.0620	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400	(1b) x	2.4500	(2b) =	89.0330	(1b) - (3b)
First floor	36.3400	(1c) x	2.4500	(2c) =	89.0330	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 72.6800						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		178.0660	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	0 * 10 = 0.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	3	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11875.9502 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.4005 (35)

Thermal bridges (User defined value 0.030 * total exposed area) 4.9323 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)

Average = Sum(39)m / 12 = 70.4500

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3094 (42)

Hot water usage for mixer showers

62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day) 118.0387 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(64)
										Total per year (kWh/year) = Sum(64)m =		2611.4378	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
303.6858 306.8371 298.8959 281.9900 260.6494 240.5922 227.1928 224.0415 231.9827 248.8885 270.2292 290.2863 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 51.1657 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 -92.3757 (71)
Water heating gains (Table 5)
150.3258 147.9809 143.4637 133.5631 127.4987 121.1599 117.2665 120.4831 124.2544 131.2879 140.7789 149.0599 (72)
Total internal gains
578.7486 576.4933 559.4929 527.8812 496.6954 468.5559 452.0241 455.1511 471.4055 500.1502 534.7626 564.8443 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.2200	12.7500	0.7300	0.7000	0.7700	5.5084	(74)
East	1.2200	23.7835	0.7300	0.7000	0.7700	10.2752	(76)
West	4.8400	23.7835	0.7300	0.7000	0.7700	40.7638	(80)

Solar gains 56.5474 98.1656 159.7449 237.6934 283.2480 312.5259 291.3398 253.0861 196.6839 122.9406 69.4031 46.8194 (83)
Total gains 635.2960 674.6589 719.2378 765.5746 779.9434 781.0818 743.3639 708.2372 668.0894 623.0908 604.1657 611.6637 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area	0.9599	0.9458	0.9081	0.8333	0.7033	0.5052	0.3657	0.4018	0.6397	0.8473	0.9377	0.9651	(86)
MIT	19.8393	19.9894	20.2912	20.6036	20.8481	20.9702	20.9939	20.9909	20.9200	20.6393	20.1819	19.7828	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house	0.9522	0.9356	0.8907	0.8026	0.6523	0.4340	0.2840	0.3172	0.5701	0.8121	0.9242	0.9584	(89)
MIT 2	18.7777	18.9648	19.3366	19.7075	19.9767	20.0904	20.1066	20.1052	20.0507	19.7577	19.2082	18.7073	(90)
Living area fraction									fLA = Living area / (4) =			0.3668	(91)
MIT	19.1671	19.3407	19.6868	20.0362	20.2964	20.4131	20.4321	20.4301	20.3696	20.0811	19.5653	19.1018	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1671	19.3407	19.6868	20.0362	20.2964	20.4131	20.4321	20.4301	20.3696	20.0811	19.5653	19.1018	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9423	0.9251	0.8812	0.7999	0.6636	0.4589	0.3139	0.3481	0.5913	0.8109	0.9143	0.9489	(94)
Useful gains	598.6246	624.1083	633.7963	612.3477	517.5501	358.4024	233.3531	246.5228	395.0453	505.2475	552.3673	580.3867	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	1026.2504	996.2089	893.7817	756.3667	570.3888	367.2644	234.7450	248.6929	420.5551	632.7182	850.0030	1028.6961	(97)
Space heating kWh	318.1536	250.0517	193.4292	103.6937	39.3119	0.0000	0.0000	0.0000	0.0000	94.8383	214.2978	333.5422	(98a)
Space heating requirement - total per year (kWh/year)												1547.3182	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	318.1536	250.0517	193.4292	103.6937	39.3119	0.0000	0.0000	0.0000	0.0000	94.8383	214.2978	333.5422	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1547.3182	
Space heating per m2										(98c) / (4) =		21.2895	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement
318.1536 250.0517 193.4292 103.6937 39.3119 0.0000 0.0000 0.0000 0.0000 94.8383 214.2978 333.5422 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50
307a 477.2304 375.0775 290.1438 155.5405 58.9679 0.0000 0.0000 0.0000 0.0000 142.2574 321.4467 500.3133
Space heating requirement
477.2304 375.0775 290.1438 155.5405 58.9679 0.0000 0.0000 0.0000 0.0000 142.2574 321.4467 500.3133 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)

Water heating
Annual water heating requirement
258.6481 228.8785 243.2936 214.0064 207.5704 187.1484 184.6748 191.8723 193.8492 216.0491 229.6316 255.8155 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50
310a 387.9721 343.3178 364.9404 321.0096 311.3556 280.7226 277.0123 287.8084 290.7737 324.0737 344.4473 383.7233
Water heating fuel
387.9721 343.3178 364.9404 321.0096 311.3556 280.7226 277.0123 287.8084 290.7737 324.0737 344.4473 383.7233 (310)
Cooling System Energy Efficiency Ratio 0.0000 (314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (315)
Pumps and Fa 1.6975 1.5332 1.6975 1.6427 1.6975 1.6427 1.6975 1.6975 1.6427 1.6975 1.6427 1.6975 (331)
Lighting 23.9686 19.2285 17.3131 12.6843 9.7977 8.0048 8.9378 11.6177 15.0903 19.7993 22.3632 24.6347 (332)
Electricity generated by PVs (Appendix M) (negative quantity)
(333a)m -17.7988 -26.5546 -44.3894 -57.0811 -64.6020 -64.1536 -62.3425 -56.9881 -46.9012 -34.2077 -20.4034 -14.8306 (333a)

Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.1997	-13.4106	-32.8557	-60.4920	-84.6385	-96.9652	-92.1477	-74.2535	-47.4476	-22.7886	-8.6270	-4.6681	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2320.9774	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3917.1568	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	23.2098	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
Total electricity for the above, kWh/year	19.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5396.8134	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2320.9774	6.5500	152.0240	(340a)
Space heating total			152.0240	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3917.1568	6.5500	256.5738	(342a)
Water heating total			256.5738	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	28.4300	5.6821	(349)
Energy for lighting	193.4401	28.4300	54.9950	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.2528	28.4300	-145.0649	
PV Unit electricity exported	-544.4942	5.8100	-31.6351	
Total			-176.7000	(352)
Total energy cost			396.5749	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1663.5024	0.1558	96.4415	(367)
Electrical energy for heat distribution (space & water)	23.2098	0.0000	9.1344	(372)
Overall CO2 factor for heat network			0.0405	(386)
Total CO2 associated with community systems			252.7188	(373)
Space and water heating			252.7188	(376)
Pumps, fans and electric keep-hot	19.9861	0.1387	2.7723	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.2528	0.1323	-67.5052	
PV Unit electricity exported	-544.4942	0.1214	-66.0897	
Total			-133.5948	(380)
Total CO2, kg/year			149.8157	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1663.5024	1.5769	975.9735	(467)
Electrical energy for heat distribution (space & water)	23.2098	0.0000	96.1736	(472)
Overall CO2 factor for heat network			0.4265	(486)
Total CO2 associated with community systems			2660.8016	(473)
Space and water heating			2660.8016	(476)
Pumps, fans and electric keep-hot	19.9861	1.5128	30.2350	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.2528	1.4888	-759.6722	
PV Unit electricity exported	-544.4942	0.4453	-242.4386	
Total			-1002.1108	(480)
Total Primary energy kWh/year			1985.6307	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - West

Current energy efficiency rating: B 85
Current environmental impact rating: A 98

N Solar water heating — Recommended
U Solar photovoltaic panels — Already installed
V2 Wind turbine — Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.4	-£ 47	-26 kg (17.3%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£47	0.36 kg/m²	B 86	A 98
Total Savings	£47	0.36 kg/m²		

Potential energy efficiency rating: B 86
Potential environmental impact rating: A 98

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£61	£83	-£23
Community scheme	£513	£444	£69
Space heating	£262	£284	-£23
Water heating	£257	£188	£69
Lighting	£55	£55	£0
Generated (PV)	-£177	-£178	£1
Total cost of fuels	£397	£349	£47
Total cost of uses	£397	£349	£47
Delivered energy	74 kWh/m²	61 kWh/m²	13 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	2 kg/m²	2 kg/m²	0 kg/m²
Primary energy	27 kWh/m²	23 kWh/m²	4 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330 (1b) - (3b)	
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		4.9323 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3094	(42)
Hot water usage for mixer showers	62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)
Hot water usage for baths	27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)
Hot water usage for other uses	38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)
Average daily hot water use (litres/day)												118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	
Distribution loss (46)m = 0.15 x (45)m	30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												624.1873	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												624.1873	
Solar input	-0.0000	-16.2194	-58.0608	-80.0094	-105.2873	-97.2929	-96.7392	-84.2620	-57.6788	-28.6375	-0.0000	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.6481	212.6591	185.2328	133.9970	102.2831	89.8555	87.9356	107.6103	136.1704	187.4116	229.6316	255.8155	(64)
									Total per year (kWh/year) = Sum(64)m =			1987.2506	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757 (71)
Water heating gains (Table 5)												
	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599 (72)
Total internal gains												
	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.2200	10.6334	0.7300	0.7000	0.7700	4.5939	(74)
East	1.2200	19.6403	0.7300	0.7000	0.7700	8.4852	(76)
West	4.8400	19.6403	0.7300	0.7000	0.7700	33.6625	(80)

Solar gains	46.7417	91.2291	150.7013	221.9940	274.9747	282.9979	268.7893	228.7692	175.8579	108.2843	58.2205	38.4900	(83)
Total gains	625.4902	667.7224	710.1943	749.8752	771.6701	751.5538	720.8134	683.9203	647.2634	608.4345	592.9831	603.3343	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9639	0.9504	0.9193	0.8526	0.7340	0.5684	0.4224	0.4621	0.6763	0.8716	0.9460	0.9685	(86)
MIT	19.7797	19.9370	20.2158	20.5467	20.8111	20.9496	20.9882	20.9829	20.8972	20.5694	20.1100	19.7251	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9571	0.9411	0.9041	0.8250	0.6868	0.4994	0.3402	0.3776	0.6097	0.8414	0.9343	0.9625	(89)
MIT 2	18.7028	18.8994	19.2445	19.6420	19.9386	20.0742	20.1036	20.1006	20.0306	19.6778	19.1194	18.6345	(90)
Living area fraction										fLA = Living area / (4) =		0.3668	(91)
MIT	19.0978	19.2800	19.6008	19.9739	20.2587	20.3953	20.4281	20.4242	20.3485	20.0048	19.4828	19.0346	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0978	19.2800	19.6008	19.9739	20.2587	20.3953	20.4281	20.4242	20.3485	20.0048	19.4828	19.0346	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9474	0.9306	0.8940	0.8203	0.6952	0.5223	0.3700	0.4080	0.6285	0.8375	0.9243	0.9533	(94)
Useful gains	592.6195	621.4152	634.9355	615.1563	536.4848	392.5069	266.7347	279.0549	406.8237	509.5345	548.0844	575.1493	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1042.5058	1013.0710	922.9507	780.1545	602.9577	408.2785	269.6883	283.5068	440.2041	662.5709	872.3660	1045.0943	(97)
Space heating kWh													
	334.7153	263.1927	214.2833	118.7987	49.4558	0.0000	0.0000	0.0000	0.0000	113.8591	233.4827	349.6390	(98a)
Space heating requirement - total per year (kWh/year)												1677.4267	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	334.7153	263.1927	214.2833	118.7987	49.4558	0.0000	0.0000	0.0000	0.0000	113.8591	233.4827	349.6390	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1677.4267	
Space heating per m2											(98c) / (4) =	23.0796	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	334.7153	263.1927	214.2833	118.7987	49.4558	0.0000	0.0000	0.0000	0.0000	113.8591	233.4827	349.6390	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	502.0730	394.7890	321.4249	178.1981	74.1838	0.0000	0.0000	0.0000	0.0000	170.7886	350.2240	524.4586	
Space heating requirement													
	502.0730	394.7890	321.4249	178.1981	74.1838	0.0000	0.0000	0.0000	0.0000	170.7886	350.2240	524.4586	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	258.6481	212.6591	185.2328	133.9970	102.2831	89.8555	87.9356	107.6103	136.1704	187.4116	229.6316	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.9721	318.9886	277.8492	200.9955	153.4247	134.7833	131.9034	161.4154	204.2556	281.1174	344.4473	383.7233	
Water heating fuel													
	387.9721	318.9886	277.8492	200.9955	153.4247	134.7833	131.9034	161.4154	204.2556	281.1174	344.4473	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	8.4920	7.6702	8.4920	8.2180	8.4920	8.2180	8.4920	8.4920	8.2180	8.4920	8.2180	8.4920	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.9541	-24.8708	-42.4882	-54.8798	-64.0812	-61.5030	-60.3713	-54.2093	-43.7560	-31.0030	-17.4758	-12.3621	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5447	-11.7075	-29.5072	-53.9842	-79.9096	-83.6490	-81.3696	-63.5332	-39.7064	-18.4938	-6.4743	-3.3869	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2516.1401	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2980.8759	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	25.1614	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4832.2213	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2516.1401	4.4400	111.7166	(340a)
Space heating total			111.7166	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2980.8759	4.4400	132.3509	(342a)
Water heating total			132.3509	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	16.4900	3.2957	(349)
Pump for solar water heating	80.0000	16.4900	13.1920	(349)
Energy for lighting	193.4401	16.4900	31.8983	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-481.9545	16.4900	-79.4743	
PV Unit electricity exported	-476.2665	5.5900	-26.6233	
Total			-106.0976	(352)
Total energy cost			278.3559	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8515 (357)
SAP value		86.1967
SAP rating (Section 12)		86 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1465.8709	0.1554	104.2812	(367)
Electrical energy for heat distribution (space & water)	25.1614	0.0000	8.2344	(372)
Overall CO2 factor for heat network			0.0414	(386)
Total CO2 associated with community systems			227.8187	(373)
Space and water heating			227.8187	(376)
Pumps, fans and electric keep-hot	99.9861	0.1387	13.8693	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-481.9545	0.1319	-63.5856	
PV Unit electricity exported	-476.2665	0.1213	-57.7895	
Total			-121.3751	(380)
Total CO2, kg/year			148.2323	(383)
CO2 emissions per m2			2.0400	(384)
EI value			98.3121	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.3400 (1b)	x	2.4500 (2b)	=	89.0330 (1b) - (3b)	
First floor	36.3400 (1c)	x	2.4500 (2c)	=	89.0330 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	178.0660	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.2800	1.0536	7.6705			(27)
FD			2.0400	1.1000	2.2440			(26)
Heatloss floor			36.3400	0.1100	3.9974	100.0000	3634.0000	(28a)
100mm Full Fill Cavity	91.7300	9.3200	82.4100	0.2300	18.9543	50.0000	4120.5002	(29a)
500mm mineral wool	36.3400		36.3400	0.0900	3.2706	10.0000	363.4000	(30)
Total net area of external elements Aum(A, m2)			164.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1368			(33)
Main dwelling								
Party Wall			26.9500	0.0000	0.0000	70.0000	1886.5001	(32)
Timber partitions			98.9300			9.0000	890.3700	(32c)
Internal Floor 1			36.3400			18.0000	654.1200	(32d)
Internal Ceiling 1			36.3400			9.0000	327.0600	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11875.9502 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		163.4005 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		4.9323 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	41.0691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	29.3809	(38)
Heat transfer coeff	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	70.4500	(39)
Average = Sum(39)m / 12 =												70.4500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	0.9693	(40)
HLP (average)												0.9693	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.3094	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
62.9406	61.9947	60.6164	57.9792	56.0330	53.8627	52.6290	53.9969	55.4964	57.8267	60.5205	62.6994	(42a)

Hot water usage for baths

27.1897	26.7859	26.2173	25.1688	24.3837	23.5132	23.0430	23.6076	24.2224	25.1539	26.2240	27.0978	(42b)

Hot water usage for other uses

38.2805	36.8885	35.4964	34.1044	32.7124	31.3204	31.3204	32.7124	34.1044	35.4964	36.8885	38.2805	(42c)

Average daily hot water use (litres/day)	118.0387	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.4108	125.6691	122.3301	117.2524	113.1292	108.6962	106.9924	110.3170	113.8233	118.4771	123.6330	128.0777	(44)
Energy conte	203.3713	178.9511	188.0168	160.5127	152.2936	133.6547	129.3980	136.5955	140.3555	160.7723	176.1379	200.5387	(45)
Energy content (annual)										Total = Sum(45)m =		1960.5981	

Distribution loss (46)m = 0.15 x (45)m

30.5057	26.8427	28.2025	24.0769	22.8440	20.0482	19.4097	20.4893	21.0533	24.1158	26.4207	30.0808	(46)

Water storage loss:

Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.6481	228.8785	243.2936	214.0064	207.5704	187.1484	184.6748	191.8723	193.8492	216.0491	229.6316	255.8155	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												698.3818	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												698.3818	
Solar input	-0.2882	-19.8943	-63.0504	-86.9122	-108.6771	-108.6071	-105.7317	-94.9883	-67.4759	-37.8323	-4.9243	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	258.3599	208.9842	180.2432	127.0942	98.8933	78.5413	78.9431	96.8840	126.3733	178.2168	224.7072	255.8155	(64)
									Total per year (kWh/year) = Sum(64)m =			1913.0561	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month													
	111.8424	99.4432	106.7370	96.1654	94.8591	87.2351	87.2463	89.6394	89.4631	97.6782	101.3608	110.9006	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	138.5635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.3835	24.3217	19.7798	14.9746	11.1937	9.4502	10.2112	13.2729	17.8149	22.6201	26.4010	28.1445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	303.6858	306.8371	298.8959	281.9900	260.6494	240.5922	227.1928	224.0415	231.9827	248.8885	270.2292	290.2863	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	51.1657	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	-92.3757	(71)
Water heating gains (Table 5)													
	150.3258	147.9809	143.4637	133.5631	127.4987	121.1599	117.2665	120.4831	124.2544	131.2879	140.7789	149.0599	(72)
Total internal gains													
	578.7486	576.4933	559.4929	527.8812	496.6954	468.5559	452.0241	455.1511	471.4055	500.1502	534.7626	564.8443	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.2200	12.7500	0.7300	0.7000	0.7700	5.5084	(74)
East	1.2200	23.7835	0.7300	0.7000	0.7700	10.2752	(76)
West	4.8400	23.7835	0.7300	0.7000	0.7700	40.7638	(80)

Solar gains	56.5474	98.1656	159.7449	237.6934	283.2480	312.5259	291.3398	253.0861	196.6839	122.9406	69.4031	46.8194	(83)
Total gains	635.2960	674.6589	719.2378	765.5746	779.9434	781.0818	743.3639	708.2372	668.0894	623.0908	604.1657	611.6637	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	46.8258	
alpha	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	4.1217	
util living area													
	0.9599	0.9458	0.9081	0.8333	0.7033	0.5052	0.3657	0.4018	0.6397	0.8473	0.9377	0.9651	(86)
MIT	19.8393	19.9894	20.2912	20.6036	20.8481	20.9702	20.9939	20.9909	20.9200	20.6393	20.1819	19.7828	(87)
Th 2	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	20.1090	(88)
util rest of house													
	0.9522	0.9356	0.8907	0.8026	0.6523	0.4340	0.2840	0.3172	0.5701	0.8121	0.9242	0.9584	(89)
MIT 2	18.7777	18.9648	19.3366	19.7075	19.9767	20.0904	20.1066	20.1052	20.0507	19.7577	19.2082	18.7073	(90)
Living area fraction									fLA = Living area / (4) =			0.3668	(91)
MIT	19.1671	19.3407	19.6868	20.0362	20.2964	20.4131	20.4321	20.4301	20.3696	20.0811	19.5653	19.1018	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1671	19.3407	19.6868	20.0362	20.2964	20.4131	20.4321	20.4301	20.3696	20.0811	19.5653	19.1018	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9423	0.9251	0.8812	0.7999	0.6636	0.4589	0.3139	0.3481	0.5913	0.8109	0.9143	0.9489	(94)
Useful gains	598.6246	624.1083	633.7963	612.3477	517.5501	358.4024	233.3531	246.5228	395.0453	505.2475	552.3673	580.3867	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	1026.2504	996.2089	893.7817	756.3667	570.3888	367.2644	234.7450	248.6929	420.5551	632.7182	850.0030	1028.6961	(97)
Space heating kWh													
	318.1536	250.0517	193.4292	103.6937	39.3119	0.0000	0.0000	0.0000	0.0000	94.8383	214.2978	333.5422	(98a)
Space heating requirement - total per year (kWh/year)												1547.3182	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	318.1536	250.0517	193.4292	103.6937	39.3119	0.0000	0.0000	0.0000	0.0000	94.8383	214.2978	333.5422	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1547.3182	
Space heating per m2											(98c) / (4) =	21.2895	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement													
	318.1536	250.0517	193.4292	103.6937	39.3119	0.0000	0.0000	0.0000	0.0000	94.8383	214.2978	333.5422	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	477.2304	375.0775	290.1438	155.5405	58.9679	0.0000	0.0000	0.0000	0.0000	142.2574	321.4467	500.3133	
Space heating requirement													
	477.2304	375.0775	290.1438	155.5405	58.9679	0.0000	0.0000	0.0000	0.0000	142.2574	321.4467	500.3133	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement													
	258.3599	208.9842	180.2432	127.0942	98.8933	78.5413	78.9431	96.8840	126.3733	178.2168	224.7072	255.8155	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	387.5399	313.4764	270.3648	190.6413	148.3399	117.8120	118.4147	145.3260	189.5599	267.3252	337.0608	383.7233	
Water heating fuel													
	387.5399	313.4764	270.3648	190.6413	148.3399	117.8120	118.4147	145.3260	189.5599	267.3252	337.0608	383.7233	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	8.4920	7.6702	8.4920	8.2180	8.4920	8.2180	8.4920	8.4920	8.2180	8.4920	8.2180	8.4920	(331)
Lighting	23.9686	19.2285	17.3131	12.6843	9.7977	8.0048	8.9378	11.6177	15.0903	19.7993	22.3632	24.6347	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.8663	-26.6927	-44.7143	-57.6640	-65.4319	-65.1316	-63.3225	-57.8097	-47.4406	-34.4735	-20.5043	-14.8840	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.1321	-13.2725	-32.5307	-59.9091	-83.8086	-95.9871	-91.1676	-73.4319	-46.9082	-22.5228	-8.5261	-4.6148	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2320.9774	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2869.5841	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	23.2098	(313)
Space cooling fuel	0.0000	(321)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.9861	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.9861	(331)
Electricity for lighting (calculated in Appendix L)	193.4401	(332)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4429.2407	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2320.9774	6.5500	152.0240	(340a)
Space heating total			152.0240	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2869.5841	6.5500	187.9578	(342a)
Water heating total			187.9578	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.9861	28.4300	5.6821	(349)
Pump for solar water heating	80.0000	28.4300	22.7440	(349)
Energy for lighting	193.4401	28.4300	54.9950	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-515.9355	28.4300	-146.6805	
PV Unit electricity exported	-538.8116	5.8100	-31.3050	
Total			-177.9854	(352)
Total energy cost			349.4175	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1384.1497	0.1558	96.4415	(367)
Electrical energy for heat distribution (space & water)	23.2098	0.0000	7.7967	(372)
Overall CO2 factor for heat network			0.0416	(386)
Total CO2 associated with community systems			215.7095	(373)
Space and water heating			215.7095	(376)
Pumps, fans and electric keep-hot	99.9861	0.1387	13.8693	(378)
Energy for lighting	193.4401	0.1443	27.9194	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-515.9355	0.1322	-68.2250	
PV Unit electricity exported	-538.8116	0.1214	-65.4032	
Total			-133.6282	(380)
Total CO2, kg/year			123.8699	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1384.1497	1.5769	975.9735	(467)
Electrical energy for heat distribution (space & water)	23.2098	0.0000	80.7574	(472)
Overall CO2 factor for heat network			0.4305	(486)
Total CO2 associated with community systems			2234.2885	(473)
Space and water heating			2234.2885	(476)
Pumps, fans and electric keep-hot	99.9861	1.5128	151.2590	(478)
Energy for lighting	193.4401	1.5338	296.7049	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-515.9355	1.4886	-768.0122	
PV Unit electricity exported	-538.8116	0.4453	-239.9213	
Total			-1007.9335	(480)
Total Primary energy kWh/year			1674.3190	(483)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	82 B	**DER**	3.49	**TER**	10.88
Environmental	97 A	**% DER < TER**			67.92
CO_2 Emissions (t/year)	0.24	**DFEE**	24.15	**TFEE**	32.03
Compliance Check	See BREL	**% DFEE < TFEE**			24.60
% DPER < TPER	34.88	**DPER**	36.93	**TPER**	56.71

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												175.9097	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6151	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	30.3121	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
										Total per year (kWh/year) = Sum(64)m =		2597.3645	(64)
12Total per year (kWh/year)												2597	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.6996	119.2388	107.6996	111.2896	107.6996	111.2896	107.6996	107.6996	111.2896	107.6996	111.2896	107.6996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains	515.4281	526.7231	505.4479	488.0289	464.3062	448.3397	432.0236	433.1332	445.7187	460.2911	487.4158	505.3106	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8900	19.6403	0.6800	0.7000	0.7700	64.0743	(76)
East	2.0370	19.6403	0.6800	0.7000	0.7700	13.1971	(76)

Solar gains	77.2714	151.1592	248.9377	363.0608	444.9447	455.4800	433.6356	372.4865	289.5249	179.3632	96.3483	63.5442	(83)
Total gains	592.6994	677.8824	754.3856	851.0898	909.2509	903.8197	865.6592	805.6198	735.2435	639.6543	583.7641	568.8548	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9664	0.9381	0.8805	0.7530	0.5845	0.4160	0.3005	0.3371	0.5418	0.8154	0.9387	0.9718	(86)
MIT	20.1176	20.3268	20.5876	20.8394	20.9591	20.9936	20.9990	20.9982	20.9781	20.8000	20.4165	20.0628	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9599	0.9272	0.8610	0.7201	0.5415	0.3672	0.2481	0.2811	0.4859	0.7804	0.9259	0.9664	(89)
MIT 2	19.2106	19.4693	19.7842	20.0710	20.1944	20.2249	20.2286	20.2282	20.2135	20.0358	19.5843	19.1422	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.5188	19.7607	20.0572	20.3321	20.4542	20.4860	20.4904	20.4898	20.4733	20.2954	19.8670	19.4550	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5188	19.7607	20.0572	20.3321	20.4542	20.4860	20.4904	20.4898	20.4733	20.2954	19.8670	19.4550	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9528	0.9195	0.8563	0.7247	0.5543	0.3835	0.2659	0.3001	0.5039	0.7837	0.9189	0.9596	(94)
Useful gains	564.7170	623.3387	645.9790	616.7599	504.0057	346.6426	230.1559	241.7651	370.4730	501.2766	536.4375	545.8828	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	901.3170	880.1092	802.9129	677.0558	518.4613	348.5959	230.4025	242.2160	377.4510	574.2031	756.1163	903.4611	(97)
Space heating kWh	250.4305	172.5498	116.7588	43.4131	10.7550	0.0000	0.0000	0.0000	0.0000	54.2573	158.1687	266.0383	(98a)
Space heating requirement - total per year (kWh/year)												1072.3714	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	250.4305	172.5498	116.7588	43.4131	10.7550	0.0000	0.0000	0.0000	0.0000	54.2573	158.1687	266.0383	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1072.3714	
Space heating per m2											(98c) / (4) =	14.9940	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	250.4305	172.5498	116.7588	43.4131	10.7550	0.0000	0.0000	0.0000	0.0000	54.2573	158.1687	266.0383	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	375.6457	258.8247	175.1383	65.1196	16.1324	0.0000	0.0000	0.0000	0.0000	81.3860	237.2531	399.0574	
Space heating requirement													
	375.6457	258.8247	175.1383	65.1196	16.1324	0.0000	0.0000	0.0000	0.0000	81.3860	237.2531	399.0574	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1608.5572	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3896.0468	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												16.0856	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.6671	(330a)
Total electricity for the above, kWh/year												19.6671	(331)
Electricity for lighting (calculated in Appendix L)												174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5698.9853	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1467.8944	0.1572	67.4187	(367)
Electrical energy for heat distribution (space & water)	16.0856	0.0000	8.0162	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			221.7808	(373)
Space and water heating			221.7808	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Total CO2, kg/year			249.7255	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.4900	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1467.8944	1.5818	678.5237	(467)
Electrical energy for heat distribution (space & water)	16.0856	0.0000	84.6976	(472)
Overall CO2 factor for heat network			0.4257	(486)
Total CO2 associated with community systems			2343.2993	(473)
Space and water heating			2343.2993	(476)
Pumps, fans and electric keep-hot	19.6671	1.5128	29.7525	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Total Primary energy kWh/year			2641.0341	(483)
Dwelling Primary energy Rate (DPER)			36.9300	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b) x	2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c) x	2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4212 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3264 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3020	0.3264	0.3509	0.3672	0.3836	(22b)
Effective ac	0.5866	0.5833	0.5800	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			11.9270	1.1450	13.6603			(27)
Heatloss floor			35.7600	0.1300	4.6488			(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.1800	6.3023			(29a)
500mm mineral wool	35.7600		35.7600	0.1100	3.9336			(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.5850			(33)
Main dwelling								

Party Wall	69.6500	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.9097 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	7.0600	0.0500	0.3530
E3 Sill	3.7400	0.0500	0.1870
E4 Jamb	23.3600	0.0500	1.1680
E5 Ground floor (normal)	11.1200	0.1600	1.7792
E6 Intermediate floor within a dwelling	4.0300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.3800	0.0600	0.3828
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	12.9900	0.0800	1.0392
P2 Party wall - Intermediate floor within a dwelling	15.4400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	15.4400	0.1200	1.8528
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.3500	0.0200	0.0470

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.3690 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 38.9540 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.9203	33.7259	33.5352	32.6398	32.4723	31.6925	31.6925	31.5481	31.9929	32.4723	32.8112	33.1655	(38)
Heat transfer coeff	72.8744	72.6799	72.4893	71.5939	71.4264	70.6465	70.6465	70.5021	70.9469	71.4264	71.7653	72.1196	(39)

Average = Sum(39)m / 12 = 71.5931

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0189	1.0162	1.0136	1.0010	0.9987	0.9878	0.9878	0.9858	0.9920	0.9987	1.0034	1.0084	(40)
HLP (average)												1.0010	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

Hot water usage for mixer showers

62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day) 117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)

Energy content (annual) Total = Sum(45)m = 1946.5248

Distribution loss (46)m = 0.15 x (45)m

30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss

Combi loss

Total heat required for water heating calculated for each month

248.5063	219.7523	233.2621	204.4524	197.7953	177.7872	175.0641	182.2099	184.4398	206.2131	219.9654	245.6941	(62)
-28.5673	-25.2652	-26.4562	-21.9068	-20.4164	-17.4704	-16.3757	-17.4139	-18.0756	-21.3091	-24.1406	-28.0383	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS

PV diverter

Solar input

FGHRS

Output from w/h

219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)

Total per year (kWh/year) = Sum(64)m = 2229.7066 (64)

12Total per year (kWh/year) 2230 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

104.4115	92.7427	99.3428	89.0609	87.5501	80.1947	79.9919	82.3679	82.4067	90.3490	94.2189	103.4764	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.8362	116.0686	104.8362	108.3307	104.8362	108.3307	104.8362	104.8362	108.3307	104.8362	108.3307	104.8362	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	140.3380	138.0100	133.5252	123.6956	117.6748	111.3815	107.5160	110.7095	114.4537	121.4368	130.8596	139.0812	(72)
Total internal gains	506.2293	517.2176	496.2491	478.7347	455.1075	436.0455	419.8249	420.9345	433.4245	451.0924	478.1216	496.1119	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
East					11.9270	19.6403		0.6300	0.7000	0.7700		71.5897	(76)
Solar gains	71.5897	140.0446	230.6335	336.3652	412.2282	421.9889	401.7506	345.0978	268.2363	166.1747	89.2639	58.8719	(83)
Total gains	577.8190	657.2622	726.8826	815.0999	867.3356	858.0344	821.5755	766.0323	701.6608	617.2671	567.3855	554.9837	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.9557	48.0840	48.2104	48.8134	48.9279	49.4680	49.4680	49.5693	49.2585	48.9279	48.6968	48.4576	
alpha	4.1970	4.2056	4.2140	4.2542	4.2619	4.2979	4.2979	4.3046	4.2839	4.2619	4.2465	4.2305	
util living area	0.9765	0.9592	0.9236	0.8335	0.6896	0.5105	0.3747	0.4173	0.6446	0.8767	0.9586	0.9797	(86)
MIT	19.6811	19.9089	20.2318	20.6207	20.8657	20.9713	20.9939	20.9905	20.9243	20.5905	20.0799	19.6471	(87)
Th 2	20.0676	20.0698	20.0721	20.0825	20.0844	20.0935	20.0935	20.0952	20.0900	20.0844	20.0805	20.0764	(88)
util rest of house	0.9714	0.9508	0.9081	0.8023	0.6391	0.4440	0.2992	0.3379	0.5757	0.8456	0.9486	0.9754	(89)
MIT 2	18.5438	18.8308	19.2316	19.7007	19.9682	20.0749	20.0910	20.0909	20.0351	19.6793	19.0568	18.5072	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	18.9302	19.1971	19.5714	20.0133	20.2732	20.3795	20.3978	20.3965	20.3372	19.9889	19.4044	18.8945	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9302	19.1971	19.5714	20.0133	20.2732	20.3795	20.3978	20.3965	20.3372	19.9889	19.4044	18.8945	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9635	0.9410	0.8983	0.7998	0.6500	0.4654	0.3248	0.3647	0.5952	0.8419	0.9394	0.9681	(94)
Useful gains	556.7074	618.5041	652.9330	651.8923	563.7341	399.3278	266.8216	279.3473	417.6525	519.6993	533.0088	537.2541	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1066.1689	1039.1099	947.5387	795.6428	612.3498	408.2987	268.2979	281.7634	442.5112	670.6156	883.0306	1059.7608	(97)
Space heating kWh	379.0393	282.6471	219.1867	103.5004	36.1701	0.0000	0.0000	0.0000	0.0000	112.2818	252.0157	388.7449	(98a)
Space heating requirement - total per year (kWh/year)												1773.5859	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	379.0393	282.6471	219.1867	103.5004	36.1701	0.0000	0.0000	0.0000	0.0000	112.2818	252.0157	388.7449	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1773.5859	
Space heating per m2											(98c) / (4) =	24.7985	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	379.0393	282.6471	219.1867	103.5004	36.1701	0.0000	0.0000	0.0000	0.0000	112.2818	252.0157	388.7449	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	410.6601	306.2266	237.4720	112.1347	39.1875	0.0000	0.0000	0.0000	0.0000	121.6487	273.0398	421.1754	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.2688	84.8971	84.1904	82.8378	81.1938	79.8000	79.8000	79.8000	79.8000	82.9774	84.6266	85.3452	(217)
Fuel for water heating, kWh/month	257.9361	229.0856	245.6407	220.3650	218.4637	200.8982	198.8576	206.5112	208.4765	222.8366	231.3986	255.0301	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.7829	17.4750	15.7343	11.5277	8.9043	7.2749	8.1228	10.5583	13.7142	17.9938	20.3239	22.3883	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.5568	-47.3592	-68.1531	-76.7310	-82.8400	-77.3720	-76.4273	-72.1080	-64.4904	-54.2111	-36.9141	-29.0069	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-18.8029	-39.5749	-78.6914	-118.2335	-156.3709	-157.1182	-155.2578	-131.4301	-96.3075	-56.5975	-25.1064	-14.8664	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1921.5449	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2695.5000	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	175.8004	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1767.5275	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3111.3177	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1921.5449	0.2100	403.5244	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2695.5000	0.2100	566.0550	(264)
Space and water heating			969.5794	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	175.8004	0.1443	25.3734	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	0.1346	-96.7689	
PV Unit electricity exported	-1048.3576	0.1259	-131.9744	
Total			-228.7433	(269)
Total CO2, kg/year			778.1388	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.8800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1921.5449	1.1300	2171.3457	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2695.5000	1.1300	3045.9150	(278)
Space and water heating			5217.2607	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	175.8004	1.5338	269.6485	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	1.4973	-1076.8103	
PV Unit electricity exported	-1048.3576	0.4621	-484.4365	
Total			-1561.2467	(283)
Total Primary energy kWh/year			4055.7633	(286)
Target Primary Energy Rate (TPER)			56.7100	(287)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	82 B	**DER**	3.49	**TER**	10.88
Environmental	97 A	**% DER < TER**			67.92
CO_2 Emissions (t/year)	0.24	**DFEE**	24.15	**TFEE**	32.03
Compliance Check	See BREL	**% DFEE < TFEE**			24.60
% DPER < TPER	34.88	**DPER**	36.93	**TPER**	56.71

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2489	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3174	0.3112	0.3049	0.2738	0.2676	0.2365	0.2365	0.2303	0.2489	0.2676	0.2801	0.2925	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5504	0.5484	0.5465	0.5375	0.5358	0.5280	0.5280	0.5265	0.5310	0.5358	0.5392	0.5428	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.8245	31.7114	31.6006	31.0799	30.9825	30.5289	30.5289	30.4450	30.7036	30.9825	31.1795	31.3856	(38)
Heat transfer coeff	62.1367	62.0236	61.9127	61.3920	61.2946	60.8411	60.8411	60.7571	61.0158	61.2946	61.4917	61.6977	(39)

Average = Sum(39)m / 12 = 61.3916

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8688	0.8672	0.8657	0.8584	0.8570	0.8507	0.8507	0.8495	0.8531	0.8570	0.8598	0.8627	(40)
HLP (average)												0.8584	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day) 59.5787 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.0001	63.2172	61.2706	58.8477	56.6862	54.4399	53.9730	55.9157	57.9081	60.2149	62.6593	64.9088	(44)
Energy conte	102.9443	90.0205	94.1707	80.5595	76.3105	66.9402	65.2757	69.2353	71.4064	81.7111	89.2697	101.6316	(45)

Energy content (annual) Total = Sum(45)m = 989.4754

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(64)

Total per year (kWh/year) = Sum(64)m = 841.0541 (64)

12Total per year (kWh/year) 841 (64)

Electric shower(s)

50.0432	44.5889	48.6894	46.4637	47.3355	45.1535	46.6586	47.3355	46.4637	48.6894	47.7738	50.0432	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 569.2384 (64a)

Heat gains from water heating, kWh/month

34.3865	30.2766	32.1836	28.7348	28.0499	25.5132	25.5357	26.5464	26.7898	29.5359	30.9133	34.1075	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.6996	119.2388	107.6996	111.2896	107.6996	111.2896	107.6996	107.6996	111.2896	107.6996	111.2896	107.6996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	46.2184	45.0544	43.2575	39.9095	37.7014	35.4350	34.3222	35.6806	37.2080	39.6988	42.9351	45.8434	(72)
Total internal gains	411.9730	424.4322	405.8448	394.9074	374.9975	363.0578	349.4944	348.7689	359.1376	369.2178	390.1559	402.7375	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8900	19.6403	0.6800	0.7000	0.7700	64.0743	(76)
East	2.0370	19.6403	0.6800	0.7000	0.7700	13.1971	(76)

Solar gains	77.2714	151.1592	248.9377	363.0608	444.9447	455.4800	433.6356	372.4865	289.5249	179.3632	96.3483	63.5442	(83)
Total gains	489.2444	575.5914	654.7825	757.9682	819.9421	818.5378	783.1300	721.2555	648.6625	548.5809	486.5042	466.2817	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.2428	56.3453	56.4462	56.9250	57.0154	57.4404	57.4404	57.5198	57.2760	57.0154	56.8327	56.6429	
alpha	4.7495	4.7564	4.7631	4.7950	4.8010	4.8294	4.8294	4.8347	4.8184	4.8010	4.7888	4.7762	
util living area	0.9849	0.9678	0.9281	0.8190	0.6531	0.4687	0.3406	0.3851	0.6182	0.8834	0.9699	0.9878	(86)

MIT	19.8341	20.0735	20.3912	20.7432	20.9274	20.9879	20.9979	20.9963	20.9578	20.6784	20.1949	19.7899 (87)
Th 2	20.1941	20.1955	20.1968	20.2030	20.2042	20.2096	20.2096	20.2106	20.2075	20.2042	20.2018	20.1994 (88)
util rest of house												
	0.9817	0.9613	0.9142	0.7890	0.6074	0.4134	0.2800	0.3201	0.5569	0.8555	0.9626	0.9851 (89)
MIT 2	19.1299	19.3657	19.6731	20.0013	20.1552	20.2034	20.2089	20.2093	20.1835	19.9530	19.4925	19.0905 (90)
Living area fraction										fLA = Living area / (4) =		0.3398 (91)
MIT	19.3691	19.6062	19.9171	20.2534	20.4176	20.4700	20.4770	20.4767	20.4466	20.1994	19.7312	19.3281 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3691	19.6062	19.9171	20.2534	20.4176	20.4700	20.4770	20.4767	20.4466	20.1994	19.7312	19.3281 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9776	0.9556	0.9086	0.7910	0.6200	0.4318	0.3006	0.3421	0.5759	0.8553	0.9574	0.9815	(94)
Useful gains	478.2776	550.0109	594.9630	599.5662	508.3514	353.4402	235.3777	246.7579	373.5646	469.1850	465.7776	457.6444	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	936.3469	912.1310	830.6888	697.0090	534.3408	357.1366	235.8797	247.6866	387.2400	588.3936	776.7123	933.3703	(97)
Space heating kWh													
	340.8035	243.3448	175.3800	70.1588	19.3361	0.0000	0.0000	0.0000	0.0000	88.6912	223.8729	353.9401	(98a)
Space heating requirement - total per year (kWh/year)												1515.5275	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	340.8035	243.3448	175.3800	70.1588	19.3361	0.0000	0.0000	0.0000	0.0000	88.6912	223.8729	353.9401	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1515.5275	
Space heating per m2											(98c) / (4) =	21.1903	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	571.9062	450.2240	461.7539	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9580	0.9797	0.9694	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	547.8683	441.0946	447.6135	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	911.3212	872.2100	802.0383	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	261.6861	320.7499	263.6921	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	65.4215	80.1875	65.9230	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												211.5320	(107)
Energy for space heating												21.1903	(99)
Energy for space cooling												2.9577	(108)
Total												24.1479	(109)
Fabric Energy Efficiency (DFEE)												24.1	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor		35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3264	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3020	0.3264	0.3509	0.3672	0.3836	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5866	0.5833	0.5800	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			11.9270	1.1450	13.6603			(27)
Heatloss floor			35.7600	0.1300	4.6488			(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.1800	6.3023			(29a)
500mm mineral wool	35.7600		35.7600	0.1100	3.9336			(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5850			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	175.9097	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.0600	0.0500	0.3530
E3 Sill	3.7400	0.0500	0.1870
E4 Jamb	23.3600	0.0500	1.1680
E5 Ground floor (normal)	11.1200	0.1600	1.7792
E6 Intermediate floor within a dwelling	4.0300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.3800	0.0600	0.3828
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	12.9900	0.0800	1.0392
P2 Party wall - Intermediate floor within a dwelling	15.4400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	15.4400	0.1200	1.8528
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.3500	0.0200	0.0470

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.3690	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	38.9540	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.9203	33.7259	33.5352	32.6398	32.4723	31.6925	31.6925	31.5481	31.9929	32.4723	32.8112	33.1655	(38)
Heat transfer coeff													
	72.8744	72.6799	72.4893	71.5939	71.4264	70.6465	70.6465	70.5021	70.9469	71.4264	71.7653	72.1196	(39)
Average = Sum(39)m / 12 =												71.5931	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0189	1.0162	1.0136	1.0010	0.9987	0.9878	0.9878	0.9858	0.9920	0.9987	1.0034	1.0084	(40)
HLP (average)												1.0010	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2825	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses													
	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												59.5787	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	65.0001	63.2172	61.2706	58.8477	56.6862	54.4399	53.9730	55.9157	57.9081	60.2149	62.6593	64.9088	(44)
Energy conte	102.9443	90.0205	94.1707	80.5595	76.3105	66.9402	65.2757	69.2353	71.4064	81.7111	89.2697	101.6316	(45)
Energy content (annual)										Total = Sum(45)m =		989.4754	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(64)
										Total per year (kWh/year) = Sum(64)m =		841.0541	(64)
12Total per year (kWh/year)												841	(64)
Electric shower(s)													
	50.0432	44.5889	48.6894	46.4637	47.3355	45.1535	46.6586	47.3355	46.4637	48.6894	47.7738	50.0432	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		569.2384	(64a)
Heat gains from water heating, kWh/month													
	34.3865	30.2766	32.1836	28.7348	28.0499	25.5132	25.5357	26.5464	26.7898	29.5359	30.9133	34.1075	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	104.8362	116.0686	104.8362	108.3307	104.8362	108.3307	104.8362	104.8362	108.3307	104.8362	108.3307	104.8362 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982 (71)

Water heating gains (Table 5)

	46.2184	45.0544	43.2575	39.9095	37.7014	35.4350	34.3222	35.6806	37.2080	39.6988	42.9351	45.8434 (72)

Total internal gains

	409.1097	421.2621	402.9814	391.9486	372.1341	360.0989	346.6311	345.9056	356.1788	366.3544	387.1971	399.8741 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	11.9270	19.6403	0.6300	0.7000	0.7700	71.5897	(76)

Solar gains	71.5897	140.0446	230.6335	336.3652	412.2282	421.9889	401.7506	345.0978	268.2363	166.1747	89.2639	58.8719 (83)
Total gains	480.6993	561.3066	633.6149	728.3137	784.3622	782.0878	748.3817	691.0034	624.4151	532.5291	476.4610	458.7460 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.9557	48.0840	48.2104	48.8134	48.9279	49.4680	49.4680	49.5693	49.2585	48.9279	48.6968	48.4576	
alpha	4.1970	4.2056	4.2140	4.2542	4.2619	4.2979	4.2979	4.3046	4.2839	4.2619	4.2465	4.2305	
util living area	0.9876	0.9758	0.9493	0.8727	0.7373	0.5536	0.4097	0.4596	0.7015	0.9171	0.9769	0.9897	(86)
MIT	19.5003	19.7416	20.0904	20.5319	20.8255	20.9610	20.9914	20.9862	20.8952	20.4833	19.9208	19.4654	(87)
Th 2	20.0676	20.0698	20.0721	20.0825	20.0844	20.0935	20.0935	20.0952	20.0900	20.0844	20.0805	20.0764	(88)
util rest of house	0.9848	0.9704	0.9380	0.8459	0.6881	0.4836	0.3279	0.3735	0.6325	0.8932	0.9708	0.9874	(89)
MIT 2	18.7025	18.9420	19.2841	19.7080	19.9643	20.0734	20.0907	20.0902	20.0289	19.6747	19.1293	18.6745	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	18.9736	19.2137	19.5580	19.9879	20.2569	20.3750	20.3967	20.3947	20.3232	19.9494	19.3982	18.9432	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9736	19.2137	19.5580	19.9879	20.2569	20.3750	20.3967	20.3947	20.3232	19.9494	19.3982	18.9432	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9805	0.9642	0.9305	0.8428	0.6979	0.5059	0.3556	0.4025	0.6512	0.8891	0.9650	0.9836	(94)
Useful gains	471.3216	541.2028	589.5901	613.8489	547.4295	395.6872	266.1233	278.0989	406.6322	473.4699	459.8083	451.2075	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1069.3277	1040.3166	946.5684	793.8289	611.1905	407.9842	268.2243	281.6317	441.5202	667.7967	882.5843	1063.2751	(97)
Space heating kWh	444.9165	335.4045	265.5919	129.5856	47.4382	0.0000	0.0000	0.0000	0.0000	144.5791	304.3987	455.3783	(98a)
Space heating requirement - total per year (kWh/year)												2127.2927	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	444.9165	335.4045	265.5919	129.5856	47.4382	0.0000	0.0000	0.0000	0.0000	144.5791	304.3987	455.3783	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2127.2927	
Space heating per m2											(98c) / (4) =	29.7440	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	664.0772	522.7842	535.8159	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9032	0.9454	0.9251	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	599.7645	494.2384	495.6975	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	871.9251	834.6712	769.6736	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	195.9556	253.2820	203.8382	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	48.9889	63.3205	50.9596	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												163.2690	(107)
Energy for space heating												29.7440	(99)
Energy for space cooling												2.2828	(108)
Total												32.0269	(109)
Fabric Energy Efficiency (TFEE)												32.0	(109)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	82 B	**DER**	3.49	**TER**	10.88
Environmental	97 A	**% DER < TER**			67.92
CO_2 Emissions (t/year)	0.24	**DFEE**	24.15	**TFEE**	32.03
Compliance Check	See BREL	**% DFEE < TFEE**			24.60
% DPER < TPER	34.88	**DPER**	36.93	**TPER**	56.71

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												175.9097	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6151	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	30.3121	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
										Total per year (kWh/year) = Sum(64)m =		2597.3645	(64)
12Total per year (kWh/year)												2597	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.6996	119.2388	107.6996	111.2896	107.6996	111.2896	107.6996	107.6996	111.2896	107.6996	111.2896	107.6996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains	515.4281	526.7231	505.4479	488.0289	464.3062	448.3397	432.0236	433.1332	445.7187	460.2911	487.4158	505.3106	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8900	19.6403	0.6800	0.7000	0.7700	64.0743	(76)
East	2.0370	19.6403	0.6800	0.7000	0.7700	13.1971	(76)

Solar gains	77.2714	151.1592	248.9377	363.0608	444.9447	455.4800	433.6356	372.4865	289.5249	179.3632	96.3483	63.5442	(83)
Total gains	592.6994	677.8824	754.3856	851.0898	909.2509	903.8197	865.6592	805.6198	735.2435	639.6543	583.7641	568.8548	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9664	0.9381	0.8805	0.7530	0.5845	0.4160	0.3005	0.3371	0.5418	0.8154	0.9387	0.9718	(86)
MIT	20.1176	20.3268	20.5876	20.8394	20.9591	20.9936	20.9990	20.9982	20.9781	20.8000	20.4165	20.0628	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9599	0.9272	0.8610	0.7201	0.5415	0.3672	0.2481	0.2811	0.4859	0.7804	0.9259	0.9664	(89)
MIT 2	19.2106	19.4693	19.7842	20.0710	20.1944	20.2249	20.2286	20.2282	20.2135	20.0358	19.5843	19.1422	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.5188	19.7607	20.0572	20.3321	20.4542	20.4860	20.4904	20.4898	20.4733	20.2954	19.8670	19.4550	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5188	19.7607	20.0572	20.3321	20.4542	20.4860	20.4904	20.4898	20.4733	20.2954	19.8670	19.4550	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9528	0.9195	0.8563	0.7247	0.5543	0.3835	0.2659	0.3001	0.5039	0.7837	0.9189	0.9596	(94)
Useful gains	564.7170	623.3387	645.9790	616.7599	504.0057	346.6426	230.1559	241.7651	370.4730	501.2766	536.4375	545.8828	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	901.3170	880.1092	802.9129	677.0558	518.4613	348.5959	230.4025	242.2160	377.4510	574.2031	756.1163	903.4611	(97)
Space heating kWh	250.4305	172.5498	116.7588	43.4131	10.7550	0.0000	0.0000	0.0000	0.0000	54.2573	158.1687	266.0383	(98a)
Space heating requirement - total per year (kWh/year)												1072.3714	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	250.4305	172.5498	116.7588	43.4131	10.7550	0.0000	0.0000	0.0000	0.0000	54.2573	158.1687	266.0383	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1072.3714	
Space heating per m2											(98c) / (4) =	14.9940	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	250.4305	172.5498	116.7588	43.4131	10.7550	0.0000	0.0000	0.0000	0.0000	54.2573	158.1687	266.0383	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	375.6457	258.8247	175.1383	65.1196	16.1324	0.0000	0.0000	0.0000	0.0000	81.3860	237.2531	399.0574	
Space heating requirement													
	375.6457	258.8247	175.1383	65.1196	16.1324	0.0000	0.0000	0.0000	0.0000	81.3860	237.2531	399.0574	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1608.5572	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3896.0468	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												16.0856	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.6671	(330a)
Total electricity for the above, kWh/year												19.6671	(331)
Electricity for lighting (calculated in Appendix L)												174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5698.9853	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1467.8944	0.1572	67.4187	(367)
Electrical energy for heat distribution (space & water)	16.0856	0.0000	8.0162	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			221.7808	(373)
Space and water heating			221.7808	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Total CO2, kg/year			249.7255	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.4900	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1467.8944	1.5818	678.5237	(467)
Electrical energy for heat distribution (space & water)	16.0856	0.0000	84.6976	(472)
Overall CO2 factor for heat network			0.4257	(486)
Total CO2 associated with community systems			2343.2993	(473)
Space and water heating			2343.2993	(476)
Pumps, fans and electric keep-hot	19.6671	1.5128	29.7525	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Total Primary energy kWh/year			2641.0341	(483)
Dwelling Primary energy Rate (DPER)			36.9300	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b) x	2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c) x	2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4212 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3264 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3020	0.3264	0.3509	0.3672	0.3836	(22b)
Effective ac	0.5866	0.5833	0.5800	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			11.9270	1.1450	13.6603			(27)
Heatloss floor			35.7600	0.1300	4.6488			(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.1800	6.3023			(29a)
500mm mineral wool	35.7600		35.7600	0.1100	3.9336			(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.5850			(33)
Main dwelling								

Party Wall	69.6500	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.9097 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	7.0600	0.0500	0.3530
E3 Sill	3.7400	0.0500	0.1870
E4 Jamb	23.3600	0.0500	1.1680
E5 Ground floor (normal)	11.1200	0.1600	1.7792
E6 Intermediate floor within a dwelling	4.0300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.3800	0.0600	0.3828
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	12.9900	0.0800	1.0392
P2 Party wall - Intermediate floor within a dwelling	15.4400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	15.4400	0.1200	1.8528
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.3500	0.0200	0.0470

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.3690 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 38.9540 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.9203	33.7259	33.5352	32.6398	32.4723	31.6925	31.6925	31.5481	31.9929	32.4723	32.8112	33.1655	(38)
Heat transfer coeff	72.8744	72.6799	72.4893	71.5939	71.4264	70.6465	70.6465	70.5021	70.9469	71.4264	71.7653	72.1196	(39)

Average = Sum(39)m / 12 = 71.5931

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0189	1.0162	1.0136	1.0010	0.9987	0.9878	0.9878	0.9858	0.9920	0.9987	1.0034	1.0084	(40)
HLP (average)												1.0010	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

Hot water usage for mixer showers

62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day) 117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)

Energy content (annual) Total = Sum(45)m = 1946.5248

Distribution loss (46)m = 0.15 x (45)m

30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss

Combi loss

Total heat required for water heating calculated for each month

248.5063	219.7523	233.2621	204.4524	197.7953	177.7872	175.0641	182.2099	184.4398	206.2131	219.9654	245.6941	(62)
-28.5673	-25.2652	-26.4562	-21.9068	-20.4164	-17.4704	-16.3757	-17.4139	-18.0756	-21.3091	-24.1406	-28.0383	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS

PV diverter

Solar input

FGHRS

Output from w/h

219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)

Total per year (kWh/year) = Sum(64)m = 2229.7066 (64)

12Total per year (kWh/year) 2230 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

104.4115	92.7427	99.3428	89.0609	87.5501	80.1947	79.9919	82.3679	82.4067	90.3490	94.2189	103.4764	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.8362	116.0686	104.8362	108.3307	104.8362	108.3307	104.8362	104.8362	108.3307	104.8362	108.3307	104.8362	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	140.3380	138.0100	133.5252	123.6956	117.6748	111.3815	107.5160	110.7095	114.4537	121.4368	130.8596	139.0812	(72)
Total internal gains	506.2293	517.2176	496.2491	478.7347	455.1075	436.0455	419.8249	420.9345	433.4245	451.0924	478.1216	496.1119	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
East					11.9270	19.6403		0.6300	0.7000	0.7700		71.5897	(76)
Solar gains	71.5897	140.0446	230.6335	336.3652	412.2282	421.9889	401.7506	345.0978	268.2363	166.1747	89.2639	58.8719	(83)
Total gains	577.8190	657.2622	726.8826	815.0999	867.3356	858.0344	821.5755	766.0323	701.6608	617.2671	567.3855	554.9837	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.9557	48.0840	48.2104	48.8134	48.9279	49.4680	49.4680	49.5693	49.2585	48.9279	48.6968	48.4576	
alpha	4.1970	4.2056	4.2140	4.2542	4.2619	4.2979	4.2979	4.3046	4.2839	4.2619	4.2465	4.2305	
util living area	0.9765	0.9592	0.9236	0.8335	0.6896	0.5105	0.3747	0.4173	0.6446	0.8767	0.9586	0.9797	(86)
MIT	19.6811	19.9089	20.2318	20.6207	20.8657	20.9713	20.9939	20.9905	20.9243	20.5905	20.0799	19.6471	(87)
Th 2	20.0676	20.0698	20.0721	20.0825	20.0844	20.0935	20.0935	20.0952	20.0900	20.0844	20.0805	20.0764	(88)
util rest of house	0.9714	0.9508	0.9081	0.8023	0.6391	0.4440	0.2992	0.3379	0.5757	0.8456	0.9486	0.9754	(89)
MIT 2	18.5438	18.8308	19.2316	19.7007	19.9682	20.0749	20.0910	20.0909	20.0351	19.6793	19.0568	18.5072	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	18.9302	19.1971	19.5714	20.0133	20.2732	20.3795	20.3978	20.3965	20.3372	19.9889	19.4044	18.8945	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9302	19.1971	19.5714	20.0133	20.2732	20.3795	20.3978	20.3965	20.3372	19.9889	19.4044	18.8945	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9635	0.9410	0.8983	0.7998	0.6500	0.4654	0.3248	0.3647	0.5952	0.8419	0.9394	0.9681	(94)
Useful gains	556.7074	618.5041	652.9330	651.8923	563.7341	399.3278	266.8216	279.3473	417.6525	519.6993	533.0088	537.2541	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1066.1689	1039.1099	947.5387	795.6428	612.3498	408.2987	268.2979	281.7634	442.5112	670.6156	883.0306	1059.7608	(97)
Space heating kWh	379.0393	282.6471	219.1867	103.5004	36.1701	0.0000	0.0000	0.0000	0.0000	112.2818	252.0157	388.7449	(98a)
Space heating requirement - total per year (kWh/year)												1773.5859	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	379.0393	282.6471	219.1867	103.5004	36.1701	0.0000	0.0000	0.0000	0.0000	112.2818	252.0157	388.7449	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1773.5859	
Space heating per m2											(98c) / (4) =	24.7985	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	379.0393	282.6471	219.1867	103.5004	36.1701	0.0000	0.0000	0.0000	0.0000	112.2818	252.0157	388.7449	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	410.6601	306.2266	237.4720	112.1347	39.1875	0.0000	0.0000	0.0000	0.0000	121.6487	273.0398	421.1754	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.2688	84.8971	84.1904	82.8378	81.1938	79.8000	79.8000	79.8000	79.8000	82.9774	84.6266	85.3452	(217)
Fuel for water heating, kWh/month	257.9361	229.0856	245.6407	220.3650	218.4637	200.8982	198.8576	206.5112	208.4765	222.8366	231.3986	255.0301	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.7829	17.4750	15.7343	11.5277	8.9043	7.2749	8.1228	10.5583	13.7142	17.9938	20.3239	22.3883	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.5568	-47.3592	-68.1531	-76.7310	-82.8400	-77.3720	-76.4273	-72.1080	-64.4904	-54.2111	-36.9141	-29.0069	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-18.8029	-39.5749	-78.6914	-118.2335	-156.3709	-157.1182	-155.2578	-131.4301	-96.3075	-56.5975	-25.1064	-14.8664	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1921.5449	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2695.5000	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	175.8004	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1767.5275	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3111.3177	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1921.5449	0.2100	403.5244	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2695.5000	0.2100	566.0550	(264)
Space and water heating			969.5794	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	175.8004	0.1443	25.3734	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	0.1346	-96.7689	
PV Unit electricity exported	-1048.3576	0.1259	-131.9744	
Total			-228.7433	(269)
Total CO2, kg/year			778.1388	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.8800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1921.5449	1.1300	2171.3457	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2695.5000	1.1300	3045.9150	(278)
Space and water heating			5217.2607	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	175.8004	1.5338	269.6485	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	1.4973	-1076.8103	
PV Unit electricity exported	-1048.3576	0.4621	-484.4365	
Total			-1561.2467	(283)
Total Primary energy kWh/year			4055.7633	(286)
Target Primary Energy Rate (TPER)			56.7100	(287)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	82 B	**DER**	3.49	**TER**	10.88
Environmental	97 A	**% DER < TER**			67.92
CO_2 Emissions (t/year)	0.24	**DFEE**	24.15	**TFEE**	32.03
Compliance Check	See BREL	**% DFEE < TFEE**			24.60
% DPER < TPER	34.88	**DPER**	36.93	**TPER**	56.71

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												175.9097	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6151	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	30.3121	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
										Total per year (kWh/year) = Sum(64)m =		2597.3645	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains	570.7610	568.7779	552.3532	521.4980	490.9997	463.3358	446.9330	449.7815	465.4657	493.4744	527.3747	556.9668	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8900	19.6403	0.6800	0.7000	0.7700	64.0743	(76)
East	2.0370	19.6403	0.6800	0.7000	0.7700	13.1971	(76)

Solar gains	77.2714	151.1592	248.9377	363.0608	444.9447	455.4800	433.6356	372.4865	289.5249	179.3632	96.3483	63.5442	(83)
Total gains	648.0324	719.9372	801.2909	884.5588	935.9444	918.8159	880.5685	822.2681	754.9906	672.8376	623.7230	620.5110	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area	0.9534	0.9245	0.8589	0.7338	0.5700	0.4094	0.2954	0.3304	0.5289	0.7927	0.9237	0.9610	(86)
MIT	20.2131	20.3897	20.6386	20.8569	20.9633	20.9940	20.9990	20.9983	20.9803	20.8250	20.4762	20.1550	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house	0.9450	0.9118	0.8375	0.7004	0.5275	0.3613	0.2439	0.2754	0.4740	0.7562	0.9086	0.9538	(89)
MIT 2	19.3287	19.5452	19.8428	20.0892	20.1981	20.2252	20.2286	20.2283	20.2151	20.0618	19.6556	19.2567	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.6292	19.8322	20.1132	20.3501	20.4581	20.4864	20.4904	20.4899	20.4750	20.3211	19.9344	19.5619	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6292	19.8322	20.1132	20.3501	20.4581	20.4864	20.4904	20.4899	20.4750	20.3211	19.9344	19.5619	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9373	0.9044	0.8340	0.7059	0.5403	0.3774	0.2614	0.2941	0.4918	0.7608	0.9021	0.9463	(94)
Useful gains	607.3936	651.1154	668.2927	624.3678	505.7312	346.7966	230.1773	241.8109	371.2739	511.9078	562.6498	587.2096	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	907.8587	884.3433	806.2270	678.1206	518.6902	348.6161	230.4054	242.2221	377.5565	575.7256	760.1069	909.7955	(97)
Space heating kWh	223.5460	156.7291	102.6231	38.7020	9.6415	0.0000	0.0000	0.0000	0.0000	47.4804	142.1691	240.0039	(98a)
Space heating requirement - total per year (kWh/year)												960.8953	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	223.5460	156.7291	102.6231	38.7020	9.6415	0.0000	0.0000	0.0000	0.0000	47.4804	142.1691	240.0039	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												960.8953	
Space heating per m2											(98c) / (4) =	13.4353	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	223.5460	156.7291	102.6231	38.7020	9.6415	0.0000	0.0000	0.0000	0.0000	47.4804	142.1691	240.0039	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	335.3190	235.0937	153.9347	58.0530	14.4623	0.0000	0.0000	0.0000	0.0000	71.2207	213.2537	360.0058	
Space heating requirement													
	335.3190	235.0937	153.9347	58.0530	14.4623	0.0000	0.0000	0.0000	0.0000	71.2207	213.2537	360.0058	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1441.3429	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3896.0468	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												14.4134	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.6671	(330a)
Total electricity for the above, kWh/year												19.6671	(331)
Electricity for lighting (calculated in Appendix L)												174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5531.7710	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1441.3429	4.4400	63.9956	(340a)
Space heating total			63.9956	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3896.0468	4.4400	172.9845	(342a)
Water heating total			172.9845	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	16.4900	3.2431	(349)
Energy for lighting	174.7141	16.4900	28.8104	(350)
Additional standing charges			92.0000	(351)
Total energy cost			361.0336	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1154	(357)
SAP value		81.9186	
SAP rating (Section 12)		82	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1423.3039	0.1572	60.4274	(367)
Electrical energy for heat distribution (space & water)	14.4134	0.0000	7.7540	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			214.5274	(373)
Space and water heating			214.5274	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Total CO2, kg/year			242.4721	(383)
CO2 emissions per m2			3.3900	(384)
EI value			97.2115	(384a)
EI rating			97	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b) x	2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c) x	2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.2825 (42)
Hot water usage for mixer showers	62.4889 61.5498 60.1814 57.5631 55.6309 53.4762 52.2514 53.6095 55.0982 57.4117 60.0862	62.2495 (42a)
Hot water usage for baths	26.9955 26.5946 26.0300 24.9890 24.2095 23.3452 22.8784 23.4390 24.0494 24.9743 26.0367	26.9042 (42b)
Hot water usage for other uses	38.0046 36.6226 35.2406 33.8587 32.4767 31.0947 31.0947 32.4767 33.8587 35.2406 36.6226	38.0046 (42c)
Average daily hot water use (litres/day)		117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
									Total per year (kWh/year) = Sum(64)m =			2597.3645	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)

Total internal gains

	570.7610	568.7779	552.3532	521.4980	490.9997	463.3358	446.9330	449.7815	465.4657	493.4744	527.3747	556.9668 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8900	23.7835	0.6800	0.7000	0.7700	77.5911	(76)
East	2.0370	23.7835	0.6800	0.7000	0.7700	15.9811	(76)

Solar gains	93.5722	162.6475	263.5188	387.8277	457.1329	501.7079	468.7900	411.0428	323.2212	203.5286	114.9325	77.3917 (83)
Total gains	664.3333	731.4254	815.8720	909.3257	948.1326	965.0438	915.7229	860.8244	788.6869	697.0030	642.3072	634.3585 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area	0.9458	0.9157	0.8381	0.7028	0.5364	0.3545	0.2520	0.2817	0.4877	0.7525	0.9082	0.9549	(86)
MIT	20.2730	20.4362	20.6919	20.8858	20.9733	20.9971	20.9996	20.9993	20.9867	20.8689	20.5418	20.2126	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house	0.9361	0.9017	0.8142	0.6676	0.4931	0.3080	0.2023	0.2289	0.4335	0.7119	0.8905	0.9466	(89)
MIT 2	19.4029	19.6019	19.9048	20.1197	20.2073	20.2274	20.2289	20.2288	20.2200	20.1080	19.7343	19.3286	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.6986	19.8853	20.1723	20.3800	20.4675	20.4889	20.4908	20.4906	20.4805	20.3666	20.0087	19.6290	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6986	19.8853	20.1723	20.3800	20.4675	20.4889	20.4908	20.4906	20.4805	20.3666	20.0087	19.6290	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9284	0.8946	0.8123	0.6747	0.5066	0.3237	0.2192	0.2468	0.4514	0.7195	0.8849	0.9390	(94)
Useful gains	616.7542	654.3562	662.7445	613.5164	480.3688	312.4086	200.7270	212.4866	355.9841	501.4699	568.3460	595.6609	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	894.1989	869.7259	780.1151	656.2023	489.6376	313.2306	200.8149	212.6482	360.1136	548.8046	740.8152	895.9997	(97)
Space heating kWh	206.4188	144.7284	87.3238	30.7339	6.8960	0.0000	0.0000	0.0000	0.0000	35.2170	124.1778	223.4521	(98a)
Space heating requirement - total per year (kWh/year)												858.9478	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	206.4188	144.7284	87.3238	30.7339	6.8960	0.0000	0.0000	0.0000	0.0000	35.2170	124.1778	223.4521	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												858.9478	
Space heating per m2											(98c) / (4) =	12.0099	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	206.4188	144.7284	87.3238	30.7339	6.8960	0.0000	0.0000	0.0000	0.0000	35.2170	124.1778	223.4521	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	309.6282	217.0926	130.9856	46.1008	10.3441	0.0000	0.0000	0.0000	0.0000	52.8255	186.2667	335.1781	
Space heating requirement	309.6282	217.0926	130.9856	46.1008	10.3441	0.0000	0.0000	0.0000	0.0000	52.8255	186.2667	335.1781	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1288.4217	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3896.0468	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	12.8842	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(330a)
Total electricity for the above, kWh/year	19.6671	(331)
Electricity for lighting (calculated in Appendix L)	174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5378.8498	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1288.4217	6.5500	84.3916	(340a)
Space heating total			84.3916	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3896.0468	6.5500	255.1911	(342a)
Water heating total			255.1911	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	28.4300	5.5914	(349)
Energy for lighting	174.7141	28.4300	49.6712	(350)
Additional standing charges			104.0000	(351)
Total energy cost			498.8453	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1382.5249	0.1577	54.1726	(367)
Electrical energy for heat distribution (space & water)	12.8842	0.0000	7.5194	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			208.0380	(373)
Space and water heating			208.0380	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Total CO2, kg/year			235.9828	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1382.5249	1.5837	544.1155	(467)
Electrical energy for heat distribution (space & water)	12.8842	0.0000	79.6573	(472)
Overall CO2 factor for heat network			0.4251	(486)
Total CO2 associated with community systems			2203.8508	(473)
Space and water heating			2203.8508	(476)
Pumps, fans and electric keep-hot	19.6671	1.5128	29.7525	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Total Primary energy kWh/year			2501.5856	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Be Clean

Current energy efficiency rating:	B 82
Current environmental impact rating:	A 97

N	Solar water heating	Recommended
U	Solar photovoltaic panels	Recommended
V2	Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.4	-£ 46	-26 kg (11.0%)
U Solar photovoltaic panels	+ 8.7	-£ 278	-242 kg (115.3%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£46	0.36 kg/m²	B 83	A 97
Solar photovoltaic panels	£278	3.39 kg/m²	A 92	A 100
Total Savings	£323	3.75 kg/m²		

Potential energy efficiency rating:	A 92
Potential environmental impact rating:	A 100

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)

Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£55	£78	-£23
Community scheme	£444	£375	£69
Space heating	£194	£217	-£23
Water heating	£255	£187	£69
Lighting	£50	£50	£0
Generated (PV)	-£0	-£278	£278
Total cost of fuels	£499	£175	£324
Total cost of uses	£499	£176	£324
Delivered energy	75 kWh/m²	35 kWh/m²	40 kWh/m²
Carbon dioxide emissions	0.2 tonnes	-0.0 tonnes	0.3 tonnes
CO2 emissions per m²	3 kg/m²	-0 kg/m²	4 kg/m²
Primary energy	35 kWh/m²	8 kWh/m²	27 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b) x	2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c) x	2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												623.4568	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												623.4568	
Solar input	-0.0000	-16.2208	-58.0195	-79.9223	-105.1350	-97.1484	-96.5940	-84.1560	-57.6291	-28.6318	-0.0000	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	211.3732	183.9246	132.9320	101.3423	89.0407	87.1521	106.7357	135.2126	186.2632	228.3672	254.3760	(64)
										Total per year (kWh/year) = Sum(64)m =		1973.9077	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains	570.7610	568.7779	552.3532	521.4980	490.9997	463.3358	446.9330	449.7815	465.4657	493.4744	527.3747	556.9668	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8900	19.6403	0.6800	0.7000	0.7700	64.0743	(76)

East			2.0370		19.6403		0.6800	0.7000		0.7700		13.1971	(76)
Solar gains	77.2714	151.1592	248.9377	363.0608	444.9447	455.4800	433.6356	372.4865	289.5249	179.3632	96.3483	63.5442	(83)
Total gains	648.0324	719.9372	801.2909	884.5588	935.9444	918.8159	880.5685	822.2681	754.9906	672.8376	623.7230	620.5110	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area	0.9534	0.9245	0.8589	0.7338	0.5700	0.4094	0.2954	0.3304	0.5289	0.7927	0.9237	0.9610	(86)
MIT	20.2131	20.3897	20.6386	20.8569	20.9633	20.9940	20.9990	20.9983	20.9803	20.8250	20.4762	20.1550	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house	0.9450	0.9118	0.8375	0.7004	0.5275	0.3613	0.2439	0.2754	0.4740	0.7562	0.9086	0.9538	(89)
MIT 2	19.3287	19.5452	19.8428	20.0892	20.1981	20.2252	20.2286	20.2283	20.2151	20.0618	19.6556	19.2567	(90)
Living area fraction									fLA = Living area / (4) =			0.3398	(91)
MIT	19.6292	19.8322	20.1132	20.3501	20.4581	20.4864	20.4904	20.4899	20.4750	20.3211	19.9344	19.5619	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6292	19.8322	20.1132	20.3501	20.4581	20.4864	20.4904	20.4899	20.4750	20.3211	19.9344	19.5619	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9373	0.9044	0.8340	0.7059	0.5403	0.3774	0.2614	0.2941	0.4918	0.7608	0.9021	0.9463	(94)
Useful gains	607.3936	651.1154	668.2927	624.3678	505.7312	346.7966	230.1773	241.8109	371.2739	511.9078	562.6498	587.2096	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	907.8587	884.3433	806.2270	678.1206	518.6902	348.6161	230.4054	242.2221	377.5565	575.7256	760.1069	909.7955	(97)
Space heating kWh	223.5460	156.7291	102.6231	38.7020	9.6415	0.0000	0.0000	0.0000	0.0000	47.4804	142.1691	240.0039	(98a)
Space heating requirement - total per year (kWh/year)												960.8953	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	223.5460	156.7291	102.6231	38.7020	9.6415	0.0000	0.0000	0.0000	0.0000	47.4804	142.1691	240.0039	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												960.8953	
Space heating per m2											(98c) / (4) =	13.4353	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	223.5460	156.7291	102.6231	38.7020	9.6415	0.0000	0.0000	0.0000	0.0000	47.4804	142.1691	240.0039	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	335.3190	235.0937	153.9347	58.0530	14.4623	0.0000	0.0000	0.0000	0.0000	71.2207	213.2537	360.0058	
Space heating requirement	335.3190	235.0937	153.9347	58.0530	14.4623	0.0000	0.0000	0.0000	0.0000	71.2207	213.2537	360.0058	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	257.1882	211.3732	183.9246	132.9320	101.3423	89.0407	87.1521	106.7357	135.2126	186.2632	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	317.0598	275.8868	199.3980	152.0134	133.5610	130.7281	160.1036	202.8189	279.3948	342.5508	381.5640	
Water heating fuel	385.7824	317.0598	275.8868	199.3980	152.0134	133.5610	130.7281	160.1036	202.8189	279.3948	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	8.4649	7.6457	8.4649	8.1918	8.4649	8.1918	8.4649	8.4649	8.1918	8.4649	8.1918	8.4649	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-32.4492	-46.1399	-66.9756	-76.0177	-82.4927	-77.2030	-76.2278	-71.6807	-63.7018	-53.0543	-35.8004	-27.9999	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-17.6373	-37.4400	-75.3707	-114.7543	-153.1901	-154.5108	-152.4237	-128.0933	-92.7613	-53.7916	-23.6094	-13.9139	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1441.3429	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2960.8616	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												14.4134	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.6671	(330a)
pump for solar water heating												80.0000	(330g)
Total electricity for the above, kWh/year												99.6671	(331)
Electricity for lighting (calculated in Appendix L)												174.7141	(332)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1727.2394	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	2949.3464	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1441.3429	4.4400	63.9956	(340a)
Space heating total			63.9956	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2960.8616	4.4400	131.4623	(342a)
Water heating total			131.4623	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	16.4900	3.2431	(349)
Pump for solar water heating	80.0000	16.4900	13.1920	(349)
Energy for lighting	174.7141	16.4900	28.8104	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-709.7430	16.4900	-117.0366	
PV Unit electricity exported	-1017.4964	5.5900	-56.8780	
Total			-173.9147	(352)
Total energy cost			158.7887	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4906	(357)
SAP value		92.0475	
SAP rating (Section 12)		92	(358)
SAP band		A	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1173.9212	0.1572	60.4274	(367)
Electrical energy for heat distribution (space & water)	14.4134	0.0000	6.5614	(372)
Overall CO2 factor for heat network			0.0412	(386)
Total CO2 associated with community systems			181.5312	(373)
Space and water heating			181.5312	(376)
Pumps, fans and electric keep-hot	99.6671	0.1387	13.8251	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-709.7430	0.1344	-95.3892	
PV Unit electricity exported	-1017.4964	0.1256	-127.7511	
Total			-223.1403	(380)
Total CO2, kg/year			-2.5674	(383)
CO2 emissions per m2			-0.0400	(384)
EI value			100.0295	(384a)
EI rating			100	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor		35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)

Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.6151 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2825 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day)	117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	

Distribution loss (46)m = 0.15 x (45)m

30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)

Aperture area of solar collector	3.0000 (H1)
Zero-loss collector efficiency	0.8000 (H2)
Collector linear heat loss coefficient	1.8000 (H3)
Collector 2nd order heat loss coefficient	0.0000 (H4)
Collector loop efficiency	0.9000 (H5)
Incidence angle modifier	1.0000 (H6)

Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												697.5235	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												697.5235	
Solar input	-0.3007	-19.8927	-63.0021	-86.8105	-108.5158	-108.4282	-105.5589	-94.8548	-67.4076	-37.8155	-4.9366	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	256.8875	207.7013	178.9419	126.0438	97.9614	77.7608	78.1872	96.0370	125.4340	177.0795	223.4306	254.3760	(64)
									Total per year (kWh/year) = Sum(64)m =			1899.8410	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month													
	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)													
	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains													
	570.7610	568.7779	552.3532	521.4980	490.9997	463.3358	446.9330	449.7815	465.4657	493.4744	527.3747	556.9668	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8900	23.7835	0.6800	0.7000	0.7700	77.5911	(76)
East	2.0370	23.7835	0.6800	0.7000	0.7700	15.9811	(76)

Solar gains	93.5722	162.6475	263.5188	387.8277	457.1329	501.7079	468.7900	411.0428	323.2212	203.5286	114.9325	77.3917	(83)
Total gains	664.3333	731.4254	815.8720	909.3257	948.1326	965.0438	915.7229	860.8244	788.6869	697.0030	642.3072	634.3585	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9458	0.9157	0.8381	0.7028	0.5364	0.3545	0.2520	0.2817	0.4877	0.7525	0.9082	0.9549	(86)
MIT	20.2730	20.4362	20.6919	20.8858	20.9733	20.9971	20.9996	20.9993	20.9867	20.8689	20.5418	20.2126	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9361	0.9017	0.8142	0.6676	0.4931	0.3080	0.2023	0.2289	0.4335	0.7119	0.8905	0.9466	(89)
MIT 2	19.4029	19.6019	19.9048	20.1197	20.2073	20.2274	20.2289	20.2288	20.2200	20.1080	19.7343	19.3286	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.6986	19.8853	20.1723	20.3800	20.4675	20.4889	20.4908	20.4906	20.4805	20.3666	20.0087	19.6290	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6986	19.8853	20.1723	20.3800	20.4675	20.4889	20.4908	20.4906	20.4805	20.3666	20.0087	19.6290	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9284	0.8946	0.8123	0.6747	0.5066	0.3237	0.2192	0.2468	0.4514	0.7195	0.8849	0.9390	(94)
Useful gains	616.7542	654.3562	662.7445	613.5164	480.3688	312.4086	200.7270	212.4866	355.9841	501.4699	568.3460	595.6609	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	894.1989	869.7259	780.1151	656.2023	489.6376	313.2306	200.8149	212.6482	360.1136	548.8046	740.8152	895.9997	(97)
Space heating kWh													
	206.4188	144.7284	87.3238	30.7339	6.8960	0.0000	0.0000	0.0000	0.0000	35.2170	124.1778	223.4521	(98a)
Space heating requirement - total per year (kWh/year)												858.9478	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	206.4188	144.7284	87.3238	30.7339	6.8960	0.0000	0.0000	0.0000	0.0000	35.2170	124.1778	223.4521	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												858.9478	
Space heating per m2											(98c) / (4) =	12.0099	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)

Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	206.4188	144.7284	87.3238	30.7339	6.8960	0.0000	0.0000	0.0000	0.0000	35.2170	124.1778	223.4521	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	309.6282	217.0926	130.9856	46.1008	10.3441	0.0000	0.0000	0.0000	0.0000	52.8255	186.2667	335.1781	
Space heating requirement													
	309.6282	217.0926	130.9856	46.1008	10.3441	0.0000	0.0000	0.0000	0.0000	52.8255	186.2667	335.1781	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	256.8875	207.7013	178.9419	126.0438	97.9614	77.7608	78.1872	96.0370	125.4340	177.0795	223.4306	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.3312	311.5520	268.4128	189.0656	146.9421	116.6412	117.2807	144.0554	188.1511	265.6193	335.1459	381.5640	
Water heating fuel													
	385.3312	311.5520	268.4128	189.0656	146.9421	116.6412	117.2807	144.0554	188.1511	265.6193	335.1459	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	8.4649	7.6457	8.4649	8.1918	8.4649	8.1918	8.4649	8.4649	8.1918	8.4649	8.1918	8.4649	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-37.1376	-48.0632	-68.8776	-78.4004	-83.3711	-80.3407	-78.7000	-74.8350	-67.1857	-56.9881	-40.2681	-32.2740	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-22.5718	-40.5994	-80.1534	-123.9757	-157.7969	-174.1606	-167.6615	-144.3847	-105.8531	-62.6673	-29.5229	-17.9661	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1288.4217	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2849.7616	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												12.8842	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.6671	(330a)
pump for solar water heating												80.0000	(330g)
Total electricity for the above, kWh/year												99.6671	(331)
Electricity for lighting (calculated in Appendix L)												174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1873.7550	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2538.8096	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1288.4217	6.5500	84.3916	(340a)
Space heating total			84.3916	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2849.7616	6.5500	186.6594	(342a)
Water heating total			186.6594	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	28.4300	5.5914	(349)
Pump for solar water heating	80.0000	28.4300	22.7440	(349)
Energy for lighting	174.7141	28.4300	49.6712	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-746.4415	28.4300	-212.2133	
PV Unit electricity exported	-1127.3134	5.8100	-65.4969	
Total			-277.7102	(352)
Total energy cost			175.3474	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1103.5155	0.1577	54.1726	(367)
Electrical energy for heat distribution (space & water)	12.8842	0.0000	6.1833	(372)
Overall CO2 factor for heat network			0.0413	(386)
Total CO2 associated with community systems			171.0726	(373)
Space and water heating			171.0726	(376)
Pumps, fans and electric keep-hot	99.6671	0.1387	13.8251	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-746.4415	0.1347	-100.5443	
PV Unit electricity exported	-1127.3134	0.1256	-141.6232	
Total			-242.1675	(380)
Total CO2, kg/year			-32.0532	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1103.5155	1.5837	544.1155	(467)
Electrical energy for heat distribution (space & water)	12.8842	0.0000	64.2599	(472)
Overall CO2 factor for heat network			0.4296	(486)
Total CO2 associated with community systems			1777.8559	(473)
Space and water heating			1777.8559	(476)
Pumps, fans and electric keep-hot	99.6671	1.5128	150.7765	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-746.4415	1.4978	-1118.0319	
PV Unit electricity exported	-1127.3134	0.4611	-519.7580	
Total			-1637.7899	(480)
Total Primary energy kWh/year			558.8249	(483)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.80	**TER**	10.88
Environmental	99 A	**% DER < TER**			83.46
CO_2 Emissions (t/year)	0.1	**DFEE**	24.15	**TFEE**	32.03
Compliance Check	See BREL	**% DFEE < TFEE**			24.60
% DPER < TPER	57.59	**DPER**	24.05	**TPER**	56.71

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				3	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 3.6151 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
										Total per year (kWh/year) = Sum(64)m =		2597.3645	(64)
12Total per year (kWh/year)												2597	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.6996	119.2388	107.6996	111.2896	107.6996	111.2896	107.6996	107.6996	111.2896	107.6996	111.2896	107.6996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains	515.4281	526.7231	505.4479	488.0289	464.3062	448.3397	432.0236	433.1332	445.7187	460.2911	487.4158	505.3106	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8900	19.6403	0.6800	0.7000	0.7700	64.0743	(76)
East	2.0370	19.6403	0.6800	0.7000	0.7700	13.1971	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	77.2714	151.1592	248.9377	363.0608	444.9447	455.4800	433.6356	372.4865	289.5249	179.3632	96.3483	63.5442	(83)
Total gains	592.6994	677.8824	754.3856	851.0898	909.2509	903.8197	865.6592	805.6198	735.2435	639.6543	583.7641	568.8548	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9664	0.9381	0.8805	0.7530	0.5845	0.4160	0.3005	0.3371	0.5418	0.8154	0.9387	0.9718	(86)
MIT	20.1176	20.3268	20.5876	20.8394	20.9591	20.9936	20.9990	20.9982	20.9781	20.8000	20.4165	20.0628	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9599	0.9272	0.8610	0.7201	0.5415	0.3672	0.2481	0.2811	0.4859	0.7804	0.9259	0.9664	(89)
MIT 2	19.2106	19.4693	19.7842	20.0710	20.1944	20.2249	20.2286	20.2282	20.2135	20.0358	19.5843	19.1422	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.5188	19.7607	20.0572	20.3321	20.4542	20.4860	20.4904	20.4898	20.4733	20.2954	19.8670	19.4550	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5188	19.7607	20.0572	20.3321	20.4542	20.4860	20.4904	20.4898	20.4733	20.2954	19.8670	19.4550	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9528	0.9195	0.8563	0.7247	0.5543	0.3835	0.2659	0.3001	0.5039	0.7837	0.9189	0.9596	(94)
Useful gains	564.7170	623.3387	645.9790	616.7599	504.0057	346.6426	230.1559	241.7651	370.4730	501.2766	536.4375	545.8828	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	901.3170	880.1092	802.9129	677.0558	518.4613	348.5959	230.4025	242.2160	377.4510	574.2031	756.1163	903.4611	(97)
Space heating kWh													
	250.4305	172.5498	116.7588	43.4131	10.7550	0.0000	0.0000	0.0000	0.0000	54.2573	158.1687	266.0383	(98a)
Space heating requirement - total per year (kWh/year)												1072.3714	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	250.4305	172.5498	116.7588	43.4131	10.7550	0.0000	0.0000	0.0000	0.0000	54.2573	158.1687	266.0383	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1072.3714	
Space heating per m2											(98c) / (4) =	14.9940	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	250.4305	172.5498	116.7588	43.4131	10.7550	0.0000	0.0000	0.0000	0.0000	54.2573	158.1687	266.0383	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	375.6457	258.8247	175.1383	65.1196	16.1324	0.0000	0.0000	0.0000	0.0000	81.3860	237.2531	399.0574	
Space heating requirement													
	375.6457	258.8247	175.1383	65.1196	16.1324	0.0000	0.0000	0.0000	0.0000	81.3860	237.2531	399.0574	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.8619	-24.6522	-41.9801	-54.0165	-62.8534	-60.2005	-59.0498	-53.1061	-43.0156	-30.6311	-17.3392	-12.2904	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.6369	-11.9261	-30.0153	-54.8475	-81.1374	-84.9515	-82.6912	-64.6364	-40.4468	-18.8657	-6.6109	-3.4586	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1608.5572	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3896.0468	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												16.0856	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.6671	(330a)
Total electricity for the above, kWh/year												19.6671	(331)
Electricity for lighting (calculated in Appendix L)												174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4740.7643	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1467.8944	0.1572	67.4187	(367)
Electrical energy for heat distribution (space & water)	16.0856	0.0000	8.0162	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			221.7808	(373)
Space and water heating			221.7808	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	0.1320	-62.5726	
PV Unit electricity exported	-484.2242	0.1214	-58.7607	
Total			-121.3332	(380)
Total CO2, kg/year			128.3923	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.8000	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1467.8944	1.5818	678.5237	(467)
Electrical energy for heat distribution (space & water)	16.0856	0.0000	84.6976	(472)
Overall CO2 factor for heat network			0.4257	(486)
Total CO2 associated with community systems			2343.2993	(473)
Space and water heating			2343.2993	(476)
Pumps, fans and electric keep-hot	19.6671	1.5128	29.7525	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	1.4877	-705.1878	
PV Unit electricity exported	-484.2242	0.4452	-215.5829	
Total			-920.7707	(480)
Total Primary energy kWh/year			1720.2634	(483)
Dwelling Primary energy Rate (DPER)			24.0500	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b) x	2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c) x	2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3264	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3020	0.3264	0.3509	0.3672	0.3836	(22b)
Effective ac	0.5866	0.5833	0.5800	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			11.9270	1.1450	13.6603			(27)
Heatloss floor			35.7600	0.1300	4.6488			(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.1800	6.3023			(29a)
500mm mineral wool	35.7600		35.7600	0.1100	3.9336			(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5850			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.9097 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.0600	0.0500	0.3530
E3 Sill	3.7400	0.0500	0.1870
E4 Jamb	23.3600	0.0500	1.1680
E5 Ground floor (normal)	11.1200	0.1600	1.7792
E6 Intermediate floor within a dwelling	4.0300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.3800	0.0600	0.3828
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	12.9900	0.0800	1.0392
P2 Party wall - Intermediate floor within a dwelling	15.4400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	15.4400	0.1200	1.8528
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.3500	0.0200	0.0470

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.3690 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 38.9540 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.9203	33.7259	33.5352	32.6398	32.4723	31.6925	31.6925	31.5481	31.9929	32.4723	32.8112	33.1655	(38)
Heat transfer coeff	72.8744	72.6799	72.4893	71.5939	71.4264	70.6465	70.6465	70.5021	70.9469	71.4264	71.7653	72.1196	(39)
Average = Sum(39)m / 12 =												71.5931	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0189	1.0162	1.0136	1.0010	0.9987	0.9878	0.9878	0.9858	0.9920	0.9987	1.0034	1.0084	(40)
HLP (average)												1.0010	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

Hot water usage for mixer showers

62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day) 117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	248.5063	219.7523	233.2621	204.4524	197.7953	177.7872	175.0641	182.2099	184.4398	206.2131	219.9654	245.6941	(62)
WWHRS	-28.5673	-25.2652	-26.4562	-21.9068	-20.4164	-17.4704	-16.3757	-17.4139	-18.0756	-21.3091	-24.1406	-28.0383	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
									Total per year (kWh/year) = Sum(64)m =			2229.7066	(64)
12Total per year (kWh/year)												2230	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	104.4115	92.7427	99.3428	89.0609	87.5501	80.1947	79.9919	82.3679	82.4067	90.3490	94.2189	103.4764	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.8362	116.0686	104.8362	108.3307	104.8362	108.3307	104.8362	104.8362	108.3307	104.8362	108.3307	104.8362	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	140.3380	138.0100	133.5252	123.6956	117.6748	111.3815	107.5160	110.7095	114.4537	121.4368	130.8596	139.0812	(72)
Total internal gains													

	506.2293	517.2176	496.2491	478.7347	455.1075	436.0455	419.8249	420.9345	433.4245	451.0924	478.1216	496.1119	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	11.9270	19.6403	0.6300	0.7000	0.7700	71.5897	(76)

Solar gains	71.5897	140.0446	230.6335	336.3652	412.2282	421.9889	401.7506	345.0978	268.2363	166.1747	89.2639	58.8719	(83)
Total gains	577.8190	657.2622	726.8826	815.0999	867.3356	858.0344	821.5755	766.0323	701.6608	617.2671	567.3855	554.9837	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.9557	48.0840	48.2104	48.8134	48.9279	49.4680	49.4680	49.5693	49.2585	48.9279	48.6968	48.4576	
alpha	4.1970	4.2056	4.2140	4.2542	4.2619	4.2979	4.2979	4.3046	4.2839	4.2619	4.2465	4.2305	
util living area													
	0.9765	0.9592	0.9236	0.8335	0.6896	0.5105	0.3747	0.4173	0.6446	0.8767	0.9586	0.9797	(86)
MIT	19.6811	19.9089	20.2318	20.6207	20.8657	20.9713	20.9939	20.9905	20.9243	20.5905	20.0799	19.6471	(87)
Th 2	20.0676	20.0698	20.0721	20.0825	20.0844	20.0935	20.0935	20.0952	20.0900	20.0844	20.0805	20.0764	(88)
util rest of house													
	0.9714	0.9508	0.9081	0.8023	0.6391	0.4440	0.2992	0.3379	0.5757	0.8456	0.9486	0.9754	(89)
MIT 2	18.5438	18.8308	19.2316	19.7007	19.9682	20.0749	20.0910	20.0909	20.0351	19.6793	19.0568	18.5072	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	18.9302	19.1971	19.5714	20.0133	20.2732	20.3795	20.3978	20.3965	20.3372	19.9889	19.4044	18.8945	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9302	19.1971	19.5714	20.0133	20.2732	20.3795	20.3978	20.3965	20.3372	19.9889	19.4044	18.8945	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9635	0.9410	0.8983	0.7998	0.6500	0.4654	0.3248	0.3647	0.5952	0.8419	0.9394	0.9681	(94)
Useful gains	556.7074	618.5041	652.9330	651.8923	563.7341	399.3278	266.8216	279.3473	417.6525	519.6993	533.0088	537.2541	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1066.1689	1039.1099	947.5387	795.6428	612.3498	408.2987	268.2979	281.7634	442.5112	670.6156	883.0306	1059.7608	(97)
Space heating kWh	379.0393	282.6471	219.1867	103.5004	36.1701	0.0000	0.0000	0.0000	0.0000	112.2818	252.0157	388.7449	(98a)
Space heating requirement - total per year (kWh/year)												1773.5859	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	379.0393	282.6471	219.1867	103.5004	36.1701	0.0000	0.0000	0.0000	0.0000	112.2818	252.0157	388.7449	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1773.5859	
Space heating per m2											(98c) / (4) =	24.7985	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	379.0393	282.6471	219.1867	103.5004	36.1701	0.0000	0.0000	0.0000	0.0000	112.2818	252.0157	388.7449	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	410.6601	306.2266	237.4720	112.1347	39.1875	0.0000	0.0000	0.0000	0.0000	121.6487	273.0398	421.1754	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.2688	84.8971	84.1904	82.8378	81.1938	79.8000	79.8000	79.8000	79.8000	82.9774	84.6266	85.3452	(217)
Fuel for water heating, kWh/month	257.9361	229.0856	245.6407	220.3650	218.4637	200.8982	198.8576	206.5112	208.4765	222.8366	231.3986	255.0301	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.7829	17.4750	15.7343	11.5277	8.9043	7.2749	8.1228	10.5583	13.7142	17.9938	20.3239	22.3883	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.5568	-47.3592	-68.1531	-76.7310	-82.8400	-77.3720	-76.4273	-72.1080	-64.4904	-54.2111	-36.9141	-29.0069	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-18.8029	-39.5749	-78.6914	-118.2335	-156.3709	-157.1182	-155.2578	-131.4301	-96.3075	-56.5975	-25.1064	-14.8664	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1921.5449	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2695.5000	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	175.8004	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1767.5275	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3111.3177	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1921.5449	0.2100	403.5244	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2695.5000	0.2100	566.0550	(264)
Space and water heating			969.5794	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	175.8004	0.1443	25.3734	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	0.1346	-96.7689	
PV Unit electricity exported	-1048.3576	0.1259	-131.9744	
Total			-228.7433	(269)
Total CO2, kg/year			778.1388	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.8800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1921.5449	1.1300	2171.3457	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2695.5000	1.1300	3045.9150	(278)
Space and water heating			5217.2607	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	175.8004	1.5338	269.6485	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	1.4973	-1076.8103	
PV Unit electricity exported	-1048.3576	0.4621	-484.4365	
Total			-1561.2467	(283)
Total Primary energy kWh/year			4055.7633	(286)
Target Primary Energy Rate (TPER)			56.7100	(287)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.80	**TER**	10.88
Environmental	99 A	**% DER < TER**			83.46
CO_2 Emissions (t/year)	0.1	**DFEE**	24.15	**TFEE**	32.03
Compliance Check	See BREL	**% DFEE < TFEE**			24.60
% DPER < TPER	57.59	**DPER**	24.05	**TPER**	56.71

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2489	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3174	0.3112	0.3049	0.2738	0.2676	0.2365	0.2365	0.2303	0.2489	0.2676	0.2801	0.2925	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5504	0.5484	0.5465	0.5375	0.5358	0.5280	0.5280	0.5265	0.5310	0.5358	0.5392	0.5428	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.8245	31.7114	31.6006	31.0799	30.9825	30.5289	30.5289	30.4450	30.7036	30.9825	31.1795	31.3856	(38)
Heat transfer coeff	62.1367	62.0236	61.9127	61.3920	61.2946	60.8411	60.8411	60.7571	61.0158	61.2946	61.4917	61.6977	(39)

Average = Sum(39)m / 12 = 61.3916

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8688	0.8672	0.8657	0.8584	0.8570	0.8507	0.8507	0.8495	0.8531	0.8570	0.8598	0.8627	(40)
HLP (average)												0.8584	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day) 59.5787 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.0001	63.2172	61.2706	58.8477	56.6862	54.4399	53.9730	55.9157	57.9081	60.2149	62.6593	64.9088	(44)
Energy conte	102.9443	90.0205	94.1707	80.5595	76.3105	66.9402	65.2757	69.2353	71.4064	81.7111	89.2697	101.6316	(45)

Energy content (annual) Total = Sum(45)m = 989.4754

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(64)

Total per year (kWh/year) = Sum(64)m = 841.0541 (64)

12Total per year (kWh/year) 841 (64)

Electric shower(s)

50.0432	44.5889	48.6894	46.4637	47.3355	45.1535	46.6586	47.3355	46.4637	48.6894	47.7738	50.0432	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 569.2384 (64a)

Heat gains from water heating, kWh/month

34.3865	30.2766	32.1836	28.7348	28.0499	25.5132	25.5357	26.5464	26.7898	29.5359	30.9133	34.1075	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.6996	119.2388	107.6996	111.2896	107.6996	111.2896	107.6996	107.6996	111.2896	107.6996	111.2896	107.6996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	46.2184	45.0544	43.2575	39.9095	37.7014	35.4350	34.3222	35.6806	37.2080	39.6988	42.9351	45.8434	(72)
Total internal gains	411.9730	424.4322	405.8448	394.9074	374.9975	363.0578	349.4944	348.7689	359.1376	369.2178	390.1559	402.7375	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8900	19.6403	0.6800	0.7000	0.7700	64.0743	(76)
East	2.0370	19.6403	0.6800	0.7000	0.7700	13.1971	(76)

Solar gains	77.2714	151.1592	248.9377	363.0608	444.9447	455.4800	433.6356	372.4865	289.5249	179.3632	96.3483	63.5442	(83)
Total gains	489.2444	575.5914	654.7825	757.9682	819.9421	818.5378	783.1300	721.2555	648.6625	548.5809	486.5042	466.2817	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.2428	56.3453	56.4462	56.9250	57.0154	57.4404	57.4404	57.5198	57.2760	57.0154	56.8327	56.6429	
alpha	4.7495	4.7564	4.7631	4.7950	4.8010	4.8294	4.8294	4.8347	4.8184	4.8010	4.7888	4.7762	
util living area	0.9849	0.9678	0.9281	0.8190	0.6531	0.4687	0.3406	0.3851	0.6182	0.8834	0.9699	0.9878	(86)

MIT	19.8341	20.0735	20.3912	20.7432	20.9274	20.9879	20.9979	20.9963	20.9578	20.6784	20.1949	19.7899 (87)
Th 2	20.1941	20.1955	20.1968	20.2030	20.2042	20.2096	20.2096	20.2106	20.2075	20.2042	20.2018	20.1994 (88)
util rest of house												
	0.9817	0.9613	0.9142	0.7890	0.6074	0.4134	0.2800	0.3201	0.5569	0.8555	0.9626	0.9851 (89)
MIT 2	19.1299	19.3657	19.6731	20.0013	20.1552	20.2034	20.2089	20.2093	20.1835	19.9530	19.4925	19.0905 (90)
Living area fraction										fLA = Living area / (4) =		0.3398 (91)
MIT	19.3691	19.6062	19.9171	20.2534	20.4176	20.4700	20.4770	20.4767	20.4466	20.1994	19.7312	19.3281 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3691	19.6062	19.9171	20.2534	20.4176	20.4700	20.4770	20.4767	20.4466	20.1994	19.7312	19.3281 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9776	0.9556	0.9086	0.7910	0.6200	0.4318	0.3006	0.3421	0.5759	0.8553	0.9574	0.9815	(94)
Useful gains	478.2776	550.0109	594.9630	599.5662	508.3514	353.4402	235.3777	246.7579	373.5646	469.1850	465.7776	457.6444	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	936.3469	912.1310	830.6888	697.0090	534.3408	357.1366	235.8797	247.6866	387.2400	588.3936	776.7123	933.3703	(97)
Space heating kWh													
	340.8035	243.3448	175.3800	70.1588	19.3361	0.0000	0.0000	0.0000	0.0000	88.6912	223.8729	353.9401	(98a)
Space heating requirement - total per year (kWh/year)												1515.5275	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	340.8035	243.3448	175.3800	70.1588	19.3361	0.0000	0.0000	0.0000	0.0000	88.6912	223.8729	353.9401	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1515.5275	
Space heating per m2											(98c) / (4) =	21.1903	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	571.9062	450.2240	461.7539	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9580	0.9797	0.9694	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	547.8683	441.0946	447.6135	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	911.3212	872.2100	802.0383	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	261.6861	320.7499	263.6921	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	65.4215	80.1875	65.9230	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												211.5320	(107)
Energy for space heating												21.1903	(99)
Energy for space cooling												2.9577	(108)
Total												24.1479	(109)
Fabric Energy Efficiency (DFEE)												24.1	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor		35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3264	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3020	0.3264	0.3509	0.3672	0.3836	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5866	0.5833	0.5800	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			11.9270	1.1450	13.6603			(27)
Heatloss floor			35.7600	0.1300	4.6488			(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.1800	6.3023			(29a)
500mm mineral wool	35.7600		35.7600	0.1100	3.9336			(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5850			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	175.9097	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.0600	0.0500	0.3530
E3 Sill	3.7400	0.0500	0.1870
E4 Jamb	23.3600	0.0500	1.1680
E5 Ground floor (normal)	11.1200	0.1600	1.7792
E6 Intermediate floor within a dwelling	4.0300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.3800	0.0600	0.3828
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	12.9900	0.0800	1.0392
P2 Party wall - Intermediate floor within a dwelling	15.4400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	15.4400	0.1200	1.8528
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.3500	0.0200	0.0470

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.3690	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	38.9540	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.9203	33.7259	33.5352	32.6398	32.4723	31.6925	31.6925	31.5481	31.9929	32.4723	32.8112	33.1655	(38)
Heat transfer coeff													
	72.8744	72.6799	72.4893	71.5939	71.4264	70.6465	70.6465	70.5021	70.9469	71.4264	71.7653	72.1196	(39)
Average = Sum(39)m / 12 =												71.5931	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0189	1.0162	1.0136	1.0010	0.9987	0.9878	0.9878	0.9858	0.9920	0.9987	1.0034	1.0084	(40)
HLP (average)												1.0010	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2825	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses													
	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												59.5787	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	65.0001	63.2172	61.2706	58.8477	56.6862	54.4399	53.9730	55.9157	57.9081	60.2149	62.6593	64.9088	(44)
Energy conte	102.9443	90.0205	94.1707	80.5595	76.3105	66.9402	65.2757	69.2353	71.4064	81.7111	89.2697	101.6316	(45)
Energy content (annual)										Total = Sum(45)m =		989.4754	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(64)
										Total per year (kWh/year) = Sum(64)m =		841.0541	(64)
12Total per year (kWh/year)												841	(64)
Electric shower(s)													
	50.0432	44.5889	48.6894	46.4637	47.3355	45.1535	46.6586	47.3355	46.4637	48.6894	47.7738	50.0432	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		569.2384	(64a)
Heat gains from water heating, kWh/month													
	34.3865	30.2766	32.1836	28.7348	28.0499	25.5132	25.5357	26.5464	26.7898	29.5359	30.9133	34.1075	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	104.8362	116.0686	104.8362	108.3307	104.8362	108.3307	104.8362	104.8362	108.3307	104.8362	108.3307	104.8362 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982 (71)

Water heating gains (Table 5)

	46.2184	45.0544	43.2575	39.9095	37.7014	35.4350	34.3222	35.6806	37.2080	39.6988	42.9351	45.8434 (72)

Total internal gains

	409.1097	421.2621	402.9814	391.9486	372.1341	360.0989	346.6311	345.9056	356.1788	366.3544	387.1971	399.8741 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	11.9270	19.6403	0.6300	0.7000	0.7700	71.5897	(76)

Solar gains	71.5897	140.0446	230.6335	336.3652	412.2282	421.9889	401.7506	345.0978	268.2363	166.1747	89.2639	58.8719 (83)
Total gains	480.6993	561.3066	633.6149	728.3137	784.3622	782.0878	748.3817	691.0034	624.4151	532.5291	476.4610	458.7460 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.9557	48.0840	48.2104	48.8134	48.9279	49.4680	49.4680	49.5693	49.2585	48.9279	48.6968	48.4576	
alpha	4.1970	4.2056	4.2140	4.2542	4.2619	4.2979	4.2979	4.3046	4.2839	4.2619	4.2465	4.2305	
util living area	0.9876	0.9758	0.9493	0.8727	0.7373	0.5536	0.4097	0.4596	0.7015	0.9171	0.9769	0.9897	(86)
MIT	19.5003	19.7416	20.0904	20.5319	20.8255	20.9610	20.9914	20.9862	20.8952	20.4833	19.9208	19.4654	(87)
Th 2	20.0676	20.0698	20.0721	20.0825	20.0844	20.0935	20.0935	20.0952	20.0900	20.0844	20.0805	20.0764	(88)
util rest of house	0.9848	0.9704	0.9380	0.8459	0.6881	0.4836	0.3279	0.3735	0.6325	0.8932	0.9708	0.9874	(89)
MIT 2	18.7025	18.9420	19.2841	19.7080	19.9643	20.0734	20.0907	20.0902	20.0289	19.6747	19.1293	18.6745	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	18.9736	19.2137	19.5580	19.9879	20.2569	20.3750	20.3967	20.3947	20.3232	19.9494	19.3982	18.9432	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9736	19.2137	19.5580	19.9879	20.2569	20.3750	20.3967	20.3947	20.3232	19.9494	19.3982	18.9432	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9805	0.9642	0.9305	0.8428	0.6979	0.5059	0.3556	0.4025	0.6512	0.8891	0.9650	0.9836	(94)
Useful gains	471.3216	541.2028	589.5901	613.8489	547.4295	395.6872	266.1233	278.0989	406.6322	473.4699	459.8083	451.2075	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1069.3277	1040.3166	946.5684	793.8289	611.1905	407.9842	268.2243	281.6317	441.5202	667.7967	882.5843	1063.2751	(97)
Space heating kWh	444.9165	335.4045	265.5919	129.5856	47.4382	0.0000	0.0000	0.0000	0.0000	144.5791	304.3987	455.3783	(98a)
Space heating requirement - total per year (kWh/year)												2127.2927	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	444.9165	335.4045	265.5919	129.5856	47.4382	0.0000	0.0000	0.0000	0.0000	144.5791	304.3987	455.3783	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2127.2927	
Space heating per m2											(98c) / (4) =	29.7440	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	664.0772	522.7842	535.8159	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9032	0.9454	0.9251	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	599.7645	494.2384	495.6975	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	871.9251	834.6712	769.6736	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	195.9556	253.2820	203.8382	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	48.9889	63.3205	50.9596	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												163.2690	(107)
Energy for space heating												29.7440	(99)
Energy for space cooling												2.2828	(108)
Total												32.0269	(109)
Fabric Energy Efficiency (TFEE)												32.0	(109)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.80	**TER**	10.88
Environmental	99 A	**% DER < TER**			83.46
CO_2 Emissions (t/year)	0.1	**DFEE**	24.15	**TFEE**	32.03
Compliance Check	See BREL	**% DFEE < TFEE**			24.60
% DPER < TPER	57.59	**DPER**	24.05	**TPER**	56.71

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				3	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 3.6151 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
										Total per year (kWh/year) = Sum(64)m =		2597.3645	(64)
12Total per year (kWh/year)												2597	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.6996	119.2388	107.6996	111.2896	107.6996	111.2896	107.6996	107.6996	111.2896	107.6996	111.2896	107.6996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains	515.4281	526.7231	505.4479	488.0289	464.3062	448.3397	432.0236	433.1332	445.7187	460.2911	487.4158	505.3106	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8900	19.6403	0.6800	0.7000	0.7700	64.0743	(76)
East	2.0370	19.6403	0.6800	0.7000	0.7700	13.1971	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	77.2714	151.1592	248.9377	363.0608	444.9447	455.4800	433.6356	372.4865	289.5249	179.3632	96.3483	63.5442	(83)
Total gains	592.6994	677.8824	754.3856	851.0898	909.2509	903.8197	865.6592	805.6198	735.2435	639.6543	583.7641	568.8548	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9664	0.9381	0.8805	0.7530	0.5845	0.4160	0.3005	0.3371	0.5418	0.8154	0.9387	0.9718	(86)
MIT	20.1176	20.3268	20.5876	20.8394	20.9591	20.9936	20.9990	20.9982	20.9781	20.8000	20.4165	20.0628	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9599	0.9272	0.8610	0.7201	0.5415	0.3672	0.2481	0.2811	0.4859	0.7804	0.9259	0.9664	(89)
MIT 2	19.2106	19.4693	19.7842	20.0710	20.1944	20.2249	20.2286	20.2282	20.2135	20.0358	19.5843	19.1422	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.5188	19.7607	20.0572	20.3321	20.4542	20.4860	20.4904	20.4898	20.4733	20.2954	19.8670	19.4550	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5188	19.7607	20.0572	20.3321	20.4542	20.4860	20.4904	20.4898	20.4733	20.2954	19.8670	19.4550	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9528	0.9195	0.8563	0.7247	0.5543	0.3835	0.2659	0.3001	0.5039	0.7837	0.9189	0.9596	(94)
Useful gains	564.7170	623.3387	645.9790	616.7599	504.0057	346.6426	230.1559	241.7651	370.4730	501.2766	536.4375	545.8828	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	901.3170	880.1092	802.9129	677.0558	518.4613	348.5959	230.4025	242.2160	377.4510	574.2031	756.1163	903.4611	(97)
Space heating kWh													
	250.4305	172.5498	116.7588	43.4131	10.7550	0.0000	0.0000	0.0000	0.0000	54.2573	158.1687	266.0383	(98a)
Space heating requirement - total per year (kWh/year)												1072.3714	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	250.4305	172.5498	116.7588	43.4131	10.7550	0.0000	0.0000	0.0000	0.0000	54.2573	158.1687	266.0383	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1072.3714	
Space heating per m2											(98c) / (4) =	14.9940	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	250.4305	172.5498	116.7588	43.4131	10.7550	0.0000	0.0000	0.0000	0.0000	54.2573	158.1687	266.0383	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	375.6457	258.8247	175.1383	65.1196	16.1324	0.0000	0.0000	0.0000	0.0000	81.3860	237.2531	399.0574	
Space heating requirement													
	375.6457	258.8247	175.1383	65.1196	16.1324	0.0000	0.0000	0.0000	0.0000	81.3860	237.2531	399.0574	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.8619	-24.6522	-41.9801	-54.0165	-62.8534	-60.2005	-59.0498	-53.1061	-43.0156	-30.6311	-17.3392	-12.2904	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.6369	-11.9261	-30.0153	-54.8475	-81.1374	-84.9515	-82.6912	-64.6364	-40.4468	-18.8657	-6.6109	-3.4586	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1608.5572	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3896.0468	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												16.0856	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.6671	(330a)
Total electricity for the above, kWh/year												19.6671	(331)
Electricity for lighting (calculated in Appendix L)												174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4740.7643	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1467.8944	0.1572	67.4187	(367)
Electrical energy for heat distribution (space & water)	16.0856	0.0000	8.0162	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			221.7808	(373)
Space and water heating			221.7808	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	0.1320	-62.5726	
PV Unit electricity exported	-484.2242	0.1214	-58.7607	
Total			-121.3332	(380)
Total CO2, kg/year			128.3923	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.8000	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1467.8944	1.5818	678.5237	(467)
Electrical energy for heat distribution (space & water)	16.0856	0.0000	84.6976	(472)
Overall CO2 factor for heat network			0.4257	(486)
Total CO2 associated with community systems			2343.2993	(473)
Space and water heating			2343.2993	(476)
Pumps, fans and electric keep-hot	19.6671	1.5128	29.7525	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	1.4877	-705.1878	
PV Unit electricity exported	-484.2242	0.4452	-215.5829	
Total			-920.7707	(480)
Total Primary energy kWh/year			1720.2634	(483)
Dwelling Primary energy Rate (DPER)			24.0500	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b) x	2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c) x	2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3264	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3020	0.3264	0.3509	0.3672	0.3836	(22b)
Effective ac	0.5866	0.5833	0.5800	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			11.9270	1.1450	13.6603			(27)
Heatloss floor			35.7600	0.1300	4.6488			(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.1800	6.3023			(29a)
500mm mineral wool	35.7600		35.7600	0.1100	3.9336			(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5850			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.9097 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.0600	0.0500	0.3530
E3 Sill	3.7400	0.0500	0.1870
E4 Jamb	23.3600	0.0500	1.1680
E5 Ground floor (normal)	11.1200	0.1600	1.7792
E6 Intermediate floor within a dwelling	4.0300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.3800	0.0600	0.3828
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	12.9900	0.0800	1.0392
P2 Party wall - Intermediate floor within a dwelling	15.4400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	15.4400	0.1200	1.8528
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.3500	0.0200	0.0470

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.3690 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 38.9540 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.9203	33.7259	33.5352	32.6398	32.4723	31.6925	31.6925	31.5481	31.9929	32.4723	32.8112	33.1655	(38)
Heat transfer coeff	72.8744	72.6799	72.4893	71.5939	71.4264	70.6465	70.6465	70.5021	70.9469	71.4264	71.7653	72.1196	(39)
Average = Sum(39)m / 12 =												71.5931	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0189	1.0162	1.0136	1.0010	0.9987	0.9878	0.9878	0.9858	0.9920	0.9987	1.0034	1.0084	(40)
HLP (average)												1.0010	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

Hot water usage for mixer showers

62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day) 117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	248.5063	219.7523	233.2621	204.4524	197.7953	177.7872	175.0641	182.2099	184.4398	206.2131	219.9654	245.6941	(62)
WWHRS	-28.5673	-25.2652	-26.4562	-21.9068	-20.4164	-17.4704	-16.3757	-17.4139	-18.0756	-21.3091	-24.1406	-28.0383	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
									Total per year (kWh/year) = Sum(64)m =			2229.7066	(64)
12Total per year (kWh/year)												2230	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	104.4115	92.7427	99.3428	89.0609	87.5501	80.1947	79.9919	82.3679	82.4067	90.3490	94.2189	103.4764	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.8362	116.0686	104.8362	108.3307	104.8362	108.3307	104.8362	104.8362	108.3307	104.8362	108.3307	104.8362	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	140.3380	138.0100	133.5252	123.6956	117.6748	111.3815	107.5160	110.7095	114.4537	121.4368	130.8596	139.0812	(72)
Total internal gains													

	506.2293	517.2176	496.2491	478.7347	455.1075	436.0455	419.8249	420.9345	433.4245	451.0924	478.1216	496.1119	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	11.9270	19.6403	0.6300	0.7000	0.7700	71.5897	(76)

Solar gains	71.5897	140.0446	230.6335	336.3652	412.2282	421.9889	401.7506	345.0978	268.2363	166.1747	89.2639	58.8719	(83)
Total gains	577.8190	657.2622	726.8826	815.0999	867.3356	858.0344	821.5755	766.0323	701.6608	617.2671	567.3855	554.9837	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.9557	48.0840	48.2104	48.8134	48.9279	49.4680	49.4680	49.5693	49.2585	48.9279	48.6968	48.4576	
alpha	4.1970	4.2056	4.2140	4.2542	4.2619	4.2979	4.2979	4.3046	4.2839	4.2619	4.2465	4.2305	
util living area													
	0.9765	0.9592	0.9236	0.8335	0.6896	0.5105	0.3747	0.4173	0.6446	0.8767	0.9586	0.9797	(86)
MIT	19.6811	19.9089	20.2318	20.6207	20.8657	20.9713	20.9939	20.9905	20.9243	20.5905	20.0799	19.6471	(87)
Th 2	20.0676	20.0698	20.0721	20.0825	20.0844	20.0935	20.0935	20.0952	20.0900	20.0844	20.0805	20.0764	(88)
util rest of house													
	0.9714	0.9508	0.9081	0.8023	0.6391	0.4440	0.2992	0.3379	0.5757	0.8456	0.9486	0.9754	(89)
MIT 2	18.5438	18.8308	19.2316	19.7007	19.9682	20.0749	20.0910	20.0909	20.0351	19.6793	19.0568	18.5072	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	18.9302	19.1971	19.5714	20.0133	20.2732	20.3795	20.3978	20.3965	20.3372	19.9889	19.4044	18.8945	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9302	19.1971	19.5714	20.0133	20.2732	20.3795	20.3978	20.3965	20.3372	19.9889	19.4044	18.8945	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9635	0.9410	0.8983	0.7998	0.6500	0.4654	0.3248	0.3647	0.5952	0.8419	0.9394	0.9681	(94)
Useful gains	556.7074	618.5041	652.9330	651.8923	563.7341	399.3278	266.8216	279.3473	417.6525	519.6993	533.0088	537.2541	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1066.1689	1039.1099	947.5387	795.6428	612.3498	408.2987	268.2979	281.7634	442.5112	670.6156	883.0306	1059.7608	(97)
Space heating kWh	379.0393	282.6471	219.1867	103.5004	36.1701	0.0000	0.0000	0.0000	0.0000	112.2818	252.0157	388.7449	(98a)
Space heating requirement - total per year (kWh/year)												1773.5859	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	379.0393	282.6471	219.1867	103.5004	36.1701	0.0000	0.0000	0.0000	0.0000	112.2818	252.0157	388.7449	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1773.5859	
Space heating per m2											(98c) / (4) =	24.7985	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	379.0393	282.6471	219.1867	103.5004	36.1701	0.0000	0.0000	0.0000	0.0000	112.2818	252.0157	388.7449	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	410.6601	306.2266	237.4720	112.1347	39.1875	0.0000	0.0000	0.0000	0.0000	121.6487	273.0398	421.1754	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.2688	84.8971	84.1904	82.8378	81.1938	79.8000	79.8000	79.8000	79.8000	82.9774	84.6266	85.3452	(217)
Fuel for water heating, kWh/month	257.9361	229.0856	245.6407	220.3650	218.4637	200.8982	198.8576	206.5112	208.4765	222.8366	231.3986	255.0301	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.7829	17.4750	15.7343	11.5277	8.9043	7.2749	8.1228	10.5583	13.7142	17.9938	20.3239	22.3883	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.5568	-47.3592	-68.1531	-76.7310	-82.8400	-77.3720	-76.4273	-72.1080	-64.4904	-54.2111	-36.9141	-29.0069	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-18.8029	-39.5749	-78.6914	-118.2335	-156.3709	-157.1182	-155.2578	-131.4301	-96.3075	-56.5975	-25.1064	-14.8664	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1921.5449	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2695.5000	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	175.8004	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1767.5275	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3111.3177	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1921.5449	0.2100	403.5244	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2695.5000	0.2100	566.0550	(264)
Space and water heating			969.5794	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	175.8004	0.1443	25.3734	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	0.1346	-96.7689	
PV Unit electricity exported	-1048.3576	0.1259	-131.9744	
Total			-228.7433	(269)
Total CO2, kg/year			778.1388	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.8800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1921.5449	1.1300	2171.3457	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2695.5000	1.1300	3045.9150	(278)
Space and water heating			5217.2607	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	175.8004	1.5338	269.6485	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	1.4973	-1076.8103	
PV Unit electricity exported	-1048.3576	0.4621	-484.4365	
Total			-1561.2467	(283)
Total Primary energy kWh/year			4055.7633	(286)
Target Primary Energy Rate (TPER)			56.7100	(287)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.80	**TER**	10.88
Environmental	99 A	**% DER < TER**			83.46
CO_2 Emissions (t/year)	0.1	**DFEE**	24.15	**TFEE**	32.03
Compliance Check	See BREL	**% DFEE < TFEE**			24.60
% DPER < TPER	57.59	**DPER**	24.05	**TPER**	56.71

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												175.9097	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6151	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	30.3121	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
										Total per year (kWh/year) = Sum(64)m =		2597.3645	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains	570.7610	568.7779	552.3532	521.4980	490.9997	463.3358	446.9330	449.7815	465.4657	493.4744	527.3747	556.9668	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8900	19.6403	0.6800	0.7000	0.7700	64.0743	(76)
East	2.0370	19.6403	0.6800	0.7000	0.7700	13.1971	(76)

Solar gains	77.2714	151.1592	248.9377	363.0608	444.9447	455.4800	433.6356	372.4865	289.5249	179.3632	96.3483	63.5442	(83)
Total gains	648.0324	719.9372	801.2909	884.5588	935.9444	918.8159	880.5685	822.2681	754.9906	672.8376	623.7230	620.5110	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area	0.9534	0.9245	0.8589	0.7338	0.5700	0.4094	0.2954	0.3304	0.5289	0.7927	0.9237	0.9610	(86)
MIT	20.2131	20.3897	20.6386	20.8569	20.9633	20.9940	20.9990	20.9983	20.9803	20.8250	20.4762	20.1550	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house	0.9450	0.9118	0.8375	0.7004	0.5275	0.3613	0.2439	0.2754	0.4740	0.7562	0.9086	0.9538	(89)
MIT 2	19.3287	19.5452	19.8428	20.0892	20.1981	20.2252	20.2286	20.2283	20.2151	20.0618	19.6556	19.2567	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.6292	19.8322	20.1132	20.3501	20.4581	20.4864	20.4904	20.4899	20.4750	20.3211	19.9344	19.5619	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6292	19.8322	20.1132	20.3501	20.4581	20.4864	20.4904	20.4899	20.4750	20.3211	19.9344	19.5619	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9373	0.9044	0.8340	0.7059	0.5403	0.3774	0.2614	0.2941	0.4918	0.7608	0.9021	0.9463	(94)
Useful gains	607.3936	651.1154	668.2927	624.3678	505.7312	346.7966	230.1773	241.8109	371.2739	511.9078	562.6498	587.2096	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	907.8587	884.3433	806.2270	678.1206	518.6902	348.6161	230.4054	242.2221	377.5565	575.7256	760.1069	909.7955	(97)
Space heating kWh	223.5460	156.7291	102.6231	38.7020	9.6415	0.0000	0.0000	0.0000	0.0000	47.4804	142.1691	240.0039	(98a)
Space heating requirement - total per year (kWh/year)												960.8953	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	223.5460	156.7291	102.6231	38.7020	9.6415	0.0000	0.0000	0.0000	0.0000	47.4804	142.1691	240.0039	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												960.8953	
Space heating per m2											(98c) / (4) =	13.4353	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	223.5460	156.7291	102.6231	38.7020	9.6415	0.0000	0.0000	0.0000	0.0000	47.4804	142.1691	240.0039	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	335.3190	235.0937	153.9347	58.0530	14.4623	0.0000	0.0000	0.0000	0.0000	71.2207	213.2537	360.0058	
Space heating requirement													
	335.3190	235.0937	153.9347	58.0530	14.4623	0.0000	0.0000	0.0000	0.0000	71.2207	213.2537	360.0058	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.8619	-24.6522	-41.9801	-54.0165	-62.8534	-60.2005	-59.0498	-53.1061	-43.0156	-30.6311	-17.3392	-12.2904	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.6369	-11.9261	-30.0153	-54.8475	-81.1374	-84.9515	-82.6912	-64.6364	-40.4468	-18.8657	-6.6109	-3.4586	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1441.3429	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3896.0468	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												14.4134	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.6671	(330a)
Total electricity for the above, kWh/year												19.6671	(331)
Electricity for lighting (calculated in Appendix L)												174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4573.5501	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1441.3429	4.4400	63.9956	(340a)
Space heating total			63.9956	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3896.0468	4.4400	172.9845	(342a)
Water heating total			172.9845	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	16.4900	3.2431	(349)
Energy for lighting	174.7141	16.4900	28.8104	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	16.4900	-78.1621	
PV Unit electricity exported	-484.2242	5.5900	-27.0681	
Total			-105.2302	(352)
Total energy cost			255.8034	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.7903	(357)
SAP value	87.1888	
SAP rating (Section 12)	87	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1423.3039	0.1572	60.4274	(367)
Electrical energy for heat distribution (space & water)	14.4134	0.0000	7.7540	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			214.5274	(373)
Space and water heating			214.5274	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	0.1320	-62.5726	
PV Unit electricity exported	-484.2242	0.1214	-58.7607	
Total			-121.3332	(380)
Total CO2, kg/year			121.1389	(383)
CO2 emissions per m2			1.6900	(384)
EI value			98.6069	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b)	x 2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c)	x 2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =		0.7750	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =		0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
									Total per year (kWh/year) = Sum(64)m =			2597.3645	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)													
	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains													
	570.7610	568.7779	552.3532	521.4980	490.9997	463.3358	446.9330	449.7815	465.4657	493.4744	527.3747	556.9668	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8900	23.7835	0.6800	0.7000	0.7700	77.5911	(76)
East	2.0370	23.7835	0.6800	0.7000	0.7700	15.9811	(76)

Solar gains	93.5722	162.6475	263.5188	387.8277	457.1329	501.7079	468.7900	411.0428	323.2212	203.5286	114.9325	77.3917	(83)
Total gains	664.3333	731.4254	815.8720	909.3257	948.1326	965.0438	915.7229	860.8244	788.6869	697.0030	642.3072	634.3585	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9458	0.9157	0.8381	0.7028	0.5364	0.3545	0.2520	0.2817	0.4877	0.7525	0.9082	0.9549	(86)
MIT	20.2730	20.4362	20.6919	20.8858	20.9733	20.9971	20.9996	20.9993	20.9867	20.8689	20.5418	20.2126	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9361	0.9017	0.8142	0.6676	0.4931	0.3080	0.2023	0.2289	0.4335	0.7119	0.8905	0.9466	(89)
MIT 2	19.4029	19.6019	19.9048	20.1197	20.2073	20.2274	20.2289	20.2288	20.2200	20.1080	19.7343	19.3286	(90)
Living area fraction									fLA = Living area / (4) =			0.3398	(91)
MIT	19.6986	19.8853	20.1723	20.3800	20.4675	20.4889	20.4908	20.4906	20.4805	20.3666	20.0087	19.6290	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6986	19.8853	20.1723	20.3800	20.4675	20.4889	20.4908	20.4906	20.4805	20.3666	20.0087	19.6290	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9284	0.8946	0.8123	0.6747	0.5066	0.3237	0.2192	0.2468	0.4514	0.7195	0.8849	0.9390	(94)
Useful gains	616.7542	654.3562	662.7445	613.5164	480.3688	312.4086	200.7270	212.4866	355.9841	501.4699	568.3460	595.6609	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	894.1989	869.7259	780.1151	656.2023	489.6376	313.2306	200.8149	212.6482	360.1136	548.8046	740.8152	895.9997	(97)
Space heating kWh													
	206.4188	144.7284	87.3238	30.7339	6.8960	0.0000	0.0000	0.0000	0.0000	35.2170	124.1778	223.4521	(98a)
Space heating requirement - total per year (kWh/year)												858.9478	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	206.4188	144.7284	87.3238	30.7339	6.8960	0.0000	0.0000	0.0000	0.0000	35.2170	124.1778	223.4521	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												858.9478	
Space heating per m2										(98c) / (4) =		12.0099	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	206.4188	144.7284	87.3238	30.7339	6.8960	0.0000	0.0000	0.0000	0.0000	35.2170	124.1778	223.4521	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	309.6282	217.0926	130.9856	46.1008	10.3441	0.0000	0.0000	0.0000	0.0000	52.8255	186.2667	335.1781	
Space heating requirement													
	309.6282	217.0926	130.9856	46.1008	10.3441	0.0000	0.0000	0.0000	0.0000	52.8255	186.2667	335.1781	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.7439	-26.4473	-44.1602	-56.7208	-64.1553	-63.6776	-61.8747	-56.5668	-46.5864	-34.0293	-20.3275	-14.7878	(333a)

Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.2546	-13.5179	-33.0849	-60.8523	-85.0852	-97.4411	-92.6154	-74.6748	-47.7624	-22.9670	-8.7029	-4.7110	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1288.4217	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3896.0468	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	12.8842	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(330a)
Total electricity for the above, kWh/year	19.6671	(331)
Electricity for lighting (calculated in Appendix L)	174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4324.1028	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1288.4217	6.5500	84.3916	(340a)
Space heating total			84.3916	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3896.0468	6.5500	255.1911	(342a)
Water heating total			255.1911	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	28.4300	5.5914	(349)
Energy for lighting	174.7141	28.4300	49.6712	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-507.0777	28.4300	-144.1622	
PV Unit electricity exported	-547.6693	5.8100	-31.8196	
Total			-175.9818	(352)
Total energy cost			322.8635	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1382.5249	0.1577	54.1726	(367)
Electrical energy for heat distribution (space & water)	12.8842	0.0000	7.5194	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			208.0380	(373)
Space and water heating			208.0380	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-507.0777	0.1323	-67.0962	
PV Unit electricity exported	-547.6693	0.1214	-66.4868	
Total			-133.5830	(380)
Total CO2, kg/year			102.3997	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1382.5249	1.5837	544.1155	(467)
Electrical energy for heat distribution (space & water)	12.8842	0.0000	79.6573	(472)
Overall CO2 factor for heat network			0.4251	(486)
Total CO2 associated with community systems			2203.8508	(473)
Space and water heating			2203.8508	(476)
Pumps, fans and electric keep-hot	19.6671	1.5128	29.7525	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-507.0777	1.4889	-754.9866	
PV Unit electricity exported	-547.6693	0.4453	-243.8963	
Total			-998.8829	(480)
Total Primary energy kWh/year			1502.7027	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Be Green

Current energy efficiency rating: B 87
Current environmental impact rating: A 99

N Solar water heating	Recommended
U Solar photovoltaic panels	Already installed
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.4	-£ 47	-26 kg (25.3%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£47	0.36 kg/m²	B 89	A 99
Total Savings	£47	0.36 kg/m²		

Potential energy efficiency rating: B 89
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£55	£78	-£23
Community scheme	£444	£375	£69
Space heating	£194	£217	-£23
Water heating	£255	£187	£69
Lighting	£50	£50	£0
Generated (PV)	-£176	-£177	£1
Total cost of fuels	£323	£276	£47
Total cost of uses	£323	£277	£47
Delivered energy	60 kWh/m²	47 kWh/m²	14 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	21 kWh/m²	17 kWh/m²	4 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120 (1b) - (3b)	
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff													
	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers													
	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths													
	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses													
	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	
Distribution loss (46)m = 0.15 x (45)m													
	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												623.4568	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												623.4568	
Solar input	-0.0000	-16.2208	-58.0195	-79.9223	-105.1350	-97.1484	-96.5940	-84.1560	-57.6291	-28.6318	-0.0000	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	257.1882	211.3732	183.9246	132.9320	101.3423	89.0407	87.1521	106.7357	135.2126	186.2632	228.3672	254.3760	(64)
											Total per year (kWh/year) = Sum(64)m =	1973.9077	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
299.7288 302.8391 295.0013 278.3158 257.2532 237.4574 224.2325 221.1223 228.9600 245.6456 266.7082 286.5040 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 (71)
Water heating gains (Table 5)
149.6734 147.3454 142.8606 133.0310 127.0102 120.7169 116.8514 120.0449 123.7891 130.7722 140.1950 148.4166 (72)
Total internal gains
570.7610 568.7779 552.3532 521.4980 490.9997 463.3358 446.9330 449.7815 465.4657 493.4744 527.3747 556.9668 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8900	19.6403	0.6800	0.7000	0.7700	64.0743	(76)
East	2.0370	19.6403	0.6800	0.7000	0.7700	13.1971	(76)

Solar gains	77.2714	151.1592	248.9377	363.0608	444.9447	455.4800	433.6356	372.4865	289.5249	179.3632	96.3483	63.5442	(83)
Total gains	648.0324	719.9372	801.2909	884.5588	935.9444	918.8159	880.5685	822.2681	754.9906	672.8376	623.7230	620.5110	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area	0.9534	0.9245	0.8589	0.7338	0.5700	0.4094	0.2954	0.3304	0.5289	0.7927	0.9237	0.9610	(86)
MIT	20.2131	20.3897	20.6386	20.8569	20.9633	20.9940	20.9990	20.9983	20.9803	20.8250	20.4762	20.1550	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house	0.9450	0.9118	0.8375	0.7004	0.5275	0.3613	0.2439	0.2754	0.4740	0.7562	0.9086	0.9538	(89)
MIT 2	19.3287	19.5452	19.8428	20.0892	20.1981	20.2252	20.2286	20.2283	20.2151	20.0618	19.6556	19.2567	(90)
Living area fraction									fLA = Living area / (4) =			0.3398	(91)
MIT	19.6292	19.8322	20.1132	20.3501	20.4581	20.4864	20.4904	20.4899	20.4750	20.3211	19.9344	19.5619	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6292	19.8322	20.1132	20.3501	20.4581	20.4864	20.4904	20.4899	20.4750	20.3211	19.9344	19.5619	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9373	0.9044	0.8340	0.7059	0.5403	0.3774	0.2614	0.2941	0.4918	0.7608	0.9021	0.9463	(94)
Useful gains	607.3936	651.1154	668.2927	624.3678	505.7312	346.7966	230.1773	241.8109	371.2739	511.9078	562.6498	587.2096	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	907.8587	884.3433	806.2270	678.1206	518.6902	348.6161	230.4054	242.2221	377.5565	575.7256	760.1069	909.7955	(97)
Space heating kWh	223.5460	156.7291	102.6231	38.7020	9.6415	0.0000	0.0000	0.0000	0.0000	47.4804	142.1691	240.0039	(98a)
Space heating requirement - total per year (kWh/year)												960.8953	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	223.5460	156.7291	102.6231	38.7020	9.6415	0.0000	0.0000	0.0000	0.0000	47.4804	142.1691	240.0039	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												960.8953	
Space heating per m2											(98c) / (4) =	13.4353	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement
223.5460 156.7291 102.6231 38.7020 9.6415 0.0000 0.0000 0.0000 0.0000 47.4804 142.1691 240.0039 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50
307a 335.3190 235.0937 153.9347 58.0530 14.4623 0.0000 0.0000 0.0000 0.0000 71.2207 213.2537 360.0058
Space heating requirement
335.3190 235.0937 153.9347 58.0530 14.4623 0.0000 0.0000 0.0000 0.0000 71.2207 213.2537 360.0058 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)

Water heating
Annual water heating requirement
257.1882 211.3732 183.9246 132.9320 101.3423 89.0407 87.1521 106.7357 135.2126 186.2632 228.3672 254.3760 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50
310a 385.7824 317.0598 275.8868 199.3980 152.0134 133.5610 130.7281 160.1036 202.8189 279.3948 342.5508 381.5640
Water heating fuel
385.7824 317.0598 275.8868 199.3980 152.0134 133.5610 130.7281 160.1036 202.8189 279.3948 342.5508 381.5640 (310)
Cooling System Energy Efficiency Ratio 0.0000 (314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (315)
Pumps and Fa 8.4649 7.6457 8.4649 8.1918 8.4649 8.1918 8.4649 8.4649 8.1918 8.4649 8.1918 8.4649 (331)
Lighting 21.6483 17.3671 15.6371 11.4564 8.8493 7.2299 8.0726 10.4931 13.6295 17.8826 20.1983 22.2500 (332)
Electricity generated by PVs (Appendix M) (negative quantity)
(333a)m -14.9141 -24.7783 -42.2847 -54.5605 -63.6655 -61.0911 -59.9595 -53.8492 -43.4933 -30.8592 -17.4193 -12.3313 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)

(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5846	-11.8000	-29.7107	-54.3035	-80.3253	-84.0609	-81.7814	-63.8933	-39.9691	-18.6376	-6.5308	-3.4177	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1441.3429	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2960.8616	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	14.4134	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.6671	(331)
Electricity for lighting (calculated in Appendix L)	174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3718.3648	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1441.3429	4.4400	63.9956	(340a)
Space heating total			63.9956	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2960.8616	4.4400	131.4623	(342a)
Water heating total			131.4623	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	16.4900	3.2431	(349)
Pump for solar water heating	80.0000	16.4900	13.1920	(349)
Energy for lighting	174.7141	16.4900	28.8104	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-479.2061	16.4900	-79.0211	
PV Unit electricity exported	-479.0149	5.5900	-26.7769	
Total			-105.7980	(352)
Total energy cost			226.9053	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.7010	(357)
SAP value	88.6360	
SAP rating (Section 12)	89	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1173.9212	0.1572	60.4274	(367)
Electrical energy for heat distribution (space & water)	14.4134	0.0000	6.5614	(372)
Overall CO2 factor for heat network			0.0412	(386)
Total CO2 associated with community systems			181.5312	(373)
Space and water heating			181.5312	(376)
Pumps, fans and electric keep-hot	99.6671	0.1387	13.8251	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-479.2061	0.1320	-63.2320	
PV Unit electricity exported	-479.0149	0.1214	-58.1324	
Total			-121.3643	(380)
Total CO2, kg/year			99.2085	(383)
CO2 emissions per m2			1.3900	(384)
EI value			98.8591	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120 (1b) - (3b)	
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)

Average = Sum(39)m / 12 =	59.2241

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2825 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day)	117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	

Distribution loss (46)m = 0.15 x (45)m

30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:
Store volume 110.0000 (47)
  b) If manufacturer declared loss factor is not known :
  Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
  Volume factor from Table 2a 1.0294 (52)
  Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 (56)
If cylinder contains dedicated solar storage
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 (57)
Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120 23.2624 (59)
Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)
Total heat required for water heating calculated for each month
257.1882 227.5940 241.9440 212.8542 206.4772 186.1891 183.7460 190.8918 192.8417 214.8950 228.3672 254.3760 (62)
WWHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63a)
PV diverter -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 (63b)
Aperture area of solar collector 3.0000 (H1)
Zero-loss collector efficiency 0.8000 (H2)
Collector linear heat loss coefficient 1.8000 (H3)
Collector 2nd order heat loss coefficient 0.0000 (H4)
Collector loop efficiency 0.9000 (H5)
Incidence angle modifier 1.0000 (H6)
Overshading factor 0.8000 (H8)
Overall heat loss coefficient of system 6.5000 (H10)
Heat loss coefficient of collector loop 3.9667 (H11)
Dedicated solar storage volume 75.0000 (H12)
Effective solar volume 75.0000 (H14)
Reference volume 225.0000 (H15)
Storage tank correction coefficient 1.3161 (H16)
Heat delivered to hot water 697.5235 (H24)
Heat delivered to space heating 0.0000 (H29)
Solar input 697.5235
Solar input -0.3007 -19.8927 -63.0021 -86.8105 -108.5158 -108.4282 -105.5589 -94.8548 -67.4076 -37.8155 -4.9366 -0.0000 (63c)
FGHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63d)
Output from w/h
256.8875 207.7013 178.9419 126.0438 97.9614 77.7608 78.1872 96.0370 125.4340 177.0795 223.4306 254.3760 (64)
Total per year (kWh/year) = Sum(64)m = 1899.8410 (64)
Electric shower(s)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month
111.3570 99.0161 106.2883 95.7823 94.4956 86.9162 86.9375 89.3134 89.1281 97.2945 100.9404 110.4219 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)

Water heating gains (Table 5)

	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)

Total internal gains

	570.7610	568.7779	552.3532	521.4980	490.9997	463.3358	446.9330	449.7815	465.4657	493.4744	527.3747	556.9668	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8900	23.7835	0.6800	0.7000	0.7700	77.5911	(76)
East	2.0370	23.7835	0.6800	0.7000	0.7700	15.9811	(76)

Solar gains	93.5722	162.6475	263.5188	387.8277	457.1329	501.7079	468.7900	411.0428	323.2212	203.5286	114.9325	77.3917	(83)
Total gains	664.3333	731.4254	815.8720	909.3257	948.1326	965.0438	915.7229	860.8244	788.6869	697.0030	642.3072	634.3585	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9458	0.9157	0.8381	0.7028	0.5364	0.3545	0.2520	0.2817	0.4877	0.7525	0.9082	0.9549	(86)
MIT	20.2730	20.4362	20.6919	20.8858	20.9733	20.9971	20.9996	20.9993	20.9867	20.8689	20.5418	20.2126	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9361	0.9017	0.8142	0.6676	0.4931	0.3080	0.2023	0.2289	0.4335	0.7119	0.8905	0.9466	(89)
MIT 2	19.4029	19.6019	19.9048	20.1197	20.2073	20.2274	20.2289	20.2288	20.2200	20.1080	19.7343	19.3286	(90)
Living area fraction									fLA = Living area / (4) =			0.3398	(91)
MIT	19.6986	19.8853	20.1723	20.3800	20.4675	20.4889	20.4908	20.4906	20.4805	20.3666	20.0087	19.6290	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6986	19.8853	20.1723	20.3800	20.4675	20.4889	20.4908	20.4906	20.4805	20.3666	20.0087	19.6290	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9284	0.8946	0.8123	0.6747	0.5066	0.3237	0.2192	0.2468	0.4514	0.7195	0.8849	0.9390	(94)
Useful gains	616.7542	654.3562	662.7445	613.5164	480.3688	312.4086	200.7270	212.4866	355.9841	501.4699	568.3460	595.6609	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	894.1989	869.7259	780.1151	656.2023	489.6376	313.2306	200.8149	212.6482	360.1136	548.8046	740.8152	895.9997	(97)
Space heating kWh	206.4188	144.7284	87.3238	30.7339	6.8960	0.0000	0.0000	0.0000	0.0000	35.2170	124.1778	223.4521	(98a)
Space heating requirement - total per year (kWh/year)												858.9478	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	206.4188	144.7284	87.3238	30.7339	6.8960	0.0000	0.0000	0.0000	0.0000	35.2170	124.1778	223.4521	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												858.9478	
Space heating per m2											(98c) / (4) =	12.0099	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement													
	206.4188	144.7284	87.3238	30.7339	6.8960	0.0000	0.0000	0.0000	0.0000	35.2170	124.1778	223.4521	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	309.6282	217.0926	130.9856	46.1008	10.3441	0.0000	0.0000	0.0000	0.0000	52.8255	186.2667	335.1781	
Space heating requirement													
	309.6282	217.0926	130.9856	46.1008	10.3441	0.0000	0.0000	0.0000	0.0000	52.8255	186.2667	335.1781	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement													
	256.8875	207.7013	178.9419	126.0438	97.9614	77.7608	78.1872	96.0370	125.4340	177.0795	223.4306	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.3312	311.5520	268.4128	189.0656	146.9421	116.6412	117.2807	144.0554	188.1511	265.6193	335.1459	381.5640	
Water heating fuel													
	385.3312	311.5520	268.4128	189.0656	146.9421	116.6412	117.2807	144.0554	188.1511	265.6193	335.1459	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	8.4649	7.6457	8.4649	8.1918	8.4649	8.1918	8.4649	8.4649	8.1918	8.4649	8.1918	8.4649	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.8133	-26.5889	-44.4924	-57.3150	-64.9996	-64.6716	-62.8712	-57.4038	-47.1375	-34.3017	-20.4312	-14.8426	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.1852	-13.3763	-32.7527	-60.2581	-84.2408	-96.4471	-91.6189	-73.8378	-47.2113	-22.6946	-8.5992	-4.6561	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1288.4217	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2849.7616	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	12.8842	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.6671	(331)
Electricity for lighting (calculated in Appendix L)	174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3357.8175	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1288.4217	6.5500	84.3916	(340a)
Space heating total			84.3916	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2849.7616	6.5500	186.6594	(342a)
Water heating total			186.6594	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	28.4300	5.5914	(349)
Pump for solar water heating	80.0000	28.4300	22.7440	(349)
Energy for lighting	174.7141	28.4300	49.6712	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-512.8689	28.4300	-145.8086	
PV Unit electricity exported	-541.8781	5.8100	-31.4831	
Total			-177.2917	(352)
Total energy cost			275.7659	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1103.5155	0.1577	54.1726	(367)
Electrical energy for heat distribution (space & water)	12.8842	0.0000	6.1833	(372)
Overall CO2 factor for heat network			0.0413	(386)
Total CO2 associated with community systems			171.0726	(373)
Space and water heating			171.0726	(376)
Pumps, fans and electric keep-hot	99.6671	0.1387	13.8251	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-512.8689	0.1323	-67.8299	
PV Unit electricity exported	-541.8781	0.1214	-65.7869	
Total			-133.6168	(380)
Total CO2, kg/year			76.4974	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1103.5155	1.5837	544.1155	(467)
Electrical energy for heat distribution (space & water)	12.8842	0.0000	64.2599	(472)
Overall CO2 factor for heat network			0.4296	(486)
Total CO2 associated with community systems			1777.8559	(473)
Space and water heating			1777.8559	(476)
Pumps, fans and electric keep-hot	99.6671	1.5128	150.7765	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-512.8689	1.4887	-763.4867	
PV Unit electricity exported	-541.8781	0.4454	-241.3296	
Total			-1004.8163	(480)
Total Primary energy kWh/year			1191.7985	(483)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	11.51	**TER**	11.34
Environmental	91 B	**% DER < TER**			-1.50
CO_2 Emissions (t/year)	0.77	**DFEE**	24.15	**TFEE**	32.03
Compliance Check	See BREL	**% DFEE < TFEE**			24.60
% DPER < TPER	-9.69	**DPER**	64.90	**TPER**	59.17

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				3	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 3.6151 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)

Average = Sum(39)m / 12 = 59.2241

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

Hot water usage for mixer showers

62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day) 117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)

Energy content (annual) Total = Sum(45)m = 1946.5248

Distribution loss (46)m = 0.15 x (45)m												
30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2411	12.8517	14.2046	13.6953	14.1194	13.6313	14.0649	14.0820	13.6472	14.1396	13.7325	14.2344	(61)
Total heat required for water heating calculated for each month												
216.1526	190.5183	200.8718	173.0558	165.3199	146.3266	142.5341	149.6970	152.9952	173.7579	188.6060	213.3336	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
216.1526	190.5183	200.8718	173.0558	165.3199	146.3266	142.5341	149.6970	152.9952	173.7579	188.6060	213.3336	(64)

Total per year (kWh/year) = Sum(64)m = 2113.1688 (64)

12Total per year (kWh/year) 2113 (64)

Electric shower(s)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month												
70.6958	62.2871	65.6180	56.4112	53.8040	47.5290	46.2322	48.6125	49.7450	56.6080	61.5786	69.7591	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
107.6996	119.2388	107.6996	111.2896	107.6996	111.2896	107.6996	107.6996	111.2896	107.6996	111.2896	107.6996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)													
95.0213	92.6891	88.1962	78.3489	72.3172	66.0125	62.1401	65.3394	69.0903	76.0860	85.5258	93.7622	(72)
Total internal gains													
463.7760	475.0669	453.7835	436.3468	412.6132	393.6353	377.3123	378.4277	391.0199	408.6049	435.7466	453.6563	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8900	19.6403	0.6800	0.7000	0.7700	64.0743	(76)
East	2.0370	19.6403	0.6800	0.7000	0.7700	13.1971	(76)

Solar gains	77.2714	151.1592	248.9377	363.0608	444.9447	455.4800	433.6356	372.4865	289.5249	179.3632	96.3483	63.5442	(83)
Total gains	541.0474	626.2261	702.7212	799.4076	857.5579	849.1154	810.9479	750.9142	680.5447	587.9681	532.0950	517.2005	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339
util living area												

	0.9762	0.9530	0.9029	0.7830	0.6144	0.4417	0.3205	0.3612	0.5801	0.8502	0.9556	0.9806	(86)
MIT	20.0231	20.2439	20.5246	20.8078	20.9493	20.9916	20.9986	20.9975	20.9706	20.7540	20.3328	19.9660	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9715	0.9442	0.8859	0.7514	0.5704	0.3902	0.2648	0.3014	0.5219	0.8185	0.9457	0.9766	(89)
MIT 2	19.0927	19.3680	19.7108	20.0379	20.1857	20.2236	20.2285	20.2279	20.2078	19.9870	19.4828	19.0208	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.4088	19.6656	19.9873	20.2995	20.4452	20.4845	20.4901	20.4894	20.4670	20.2476	19.7716	19.3419	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.2588	19.5156	19.8373	20.1495	20.2952	20.3345	20.3401	20.3394	20.3170	20.0976	19.6216	19.1919	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9639	0.9344	0.8761	0.7479	0.5743	0.3974	0.2728	0.3100	0.5287	0.8125	0.9362	0.9698	(94)
Useful gains	521.5141	585.1445	615.6784	597.8954	492.5122	337.3965	221.2388	232.8031	359.8190	477.7461	498.1400	501.5590	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	885.9243	865.5937	789.8886	666.2407	509.0415	339.6224	221.5056	233.3066	368.1962	562.4855	741.5816	887.8844	(97)
Space heating kWh													
	271.1212	188.4618	129.6124	49.2086	12.2978	0.0000	0.0000	0.0000	0.0000	63.0461	175.2780	287.4261	(98a)
Space heating requirement - total per year (kWh/year)												1176.4519	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	271.1212	188.4618	129.6124	49.2086	12.2978	0.0000	0.0000	0.0000	0.0000	63.0461	175.2780	287.4261	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1176.4519	
Space heating per m2											(98c) / (4) =	16.4493	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	89.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	271.1212	188.4618	129.6124	49.2086	12.2978	0.0000	0.0000	0.0000	0.0000	63.0461	175.2780	287.4261	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	304.6306	211.7549	145.6319	55.2905	13.8178	0.0000	0.0000	0.0000	0.0000	70.8383	196.9415	322.9507	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	216.1526	190.5183	200.8718	173.0558	165.3199	146.3266	142.5341	149.6970	152.9952	173.7579	188.6060	213.3336	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.2378	88.1372	87.9589	87.6708	87.4156	87.3000	87.3000	87.3000	87.3000	87.7462	88.1107	88.2677	(217)
Fuel for water heating, kWh/month													
	244.9660	216.1610	228.3700	197.3929	189.1194	167.6136	163.2693	171.4742	175.2522	198.0232	214.0558	241.6892	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.9745	8.1060	8.9745	8.6850	8.9745	8.6850	8.9745	8.9745	8.6850	8.9745	8.6850	8.9745	(231)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1321.8561 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	87.3000
Water heating fuel used	2407.3869 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)	
mechanical ventilation fans (SFP = 0.0920)	19.6671 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	105.6671 (231)
Electricity for lighting (calculated in Appendix L)	174.7141 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4009.6242 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1321.8561	0.2100	277.5898	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2407.3869	0.2100	505.5512	(264)
Space and water heating			783.1410	(265)
Pumps, fans and electric keep-hot	105.6671	0.1387	14.6573	(267)
Energy for lighting	174.7141	0.1443	25.2167	(268)
Total CO2, kg/year			823.0150	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.5100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1321.8561	1.1300	1493.6974	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2407.3869	1.1300	2720.3472	(278)
Space and water heating			4214.0445	(279)
Pumps, fans and electric keep-hot	105.6671	1.5128	159.8533	(281)
Energy for lighting	174.7141	1.5338	267.9824	(282)
Total Primary energy kWh/year			4641.8802	(286)
Dwelling Primary energy Rate (DPER)			64.9000	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b) x	2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c) x	2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3264	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3020	0.3264	0.3509	0.3672	0.3836	(22b)
Effective ac	0.5866	0.5833	0.5800	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			11.9270	1.1450	13.6603			(27)
Heatloss floor			35.7600	0.1300	4.6488			(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.1800	6.3023			(29a)
500mm mineral wool	35.7600		35.7600	0.1100	3.9336			(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.5850			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.9097 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	7.0600	0.0500	0.3530
E3	Sill	3.7400	0.0500	0.1870
E4	Jamb	23.3600	0.0500	1.1680
E5	Ground floor (normal)	11.1200	0.1600	1.7792
E6	Intermediate floor within a dwelling	4.0300	0.0000	0.0000
E10	Eaves (insulation at ceiling level)	6.3800	0.0600	0.3828
E16	Corner (normal)	10.4000	0.0900	0.9360
E18	Party wall between dwellings	10.4000	0.0600	0.6240
P1	Party wall - Ground floor	12.9900	0.0800	1.0392
P2	Party wall - Intermediate floor within a dwelling	15.4400	0.0000	0.0000
P4	Party wall - Roof (insulation at ceiling level)	15.4400	0.1200	1.8528
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	2.3500	0.0200	0.0470

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.3690 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 38.9540 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.9203	33.7259	33.5352	32.6398	32.4723	31.6925	31.6925	31.5481	31.9929	32.4723	32.8112	33.1655	(38)
Heat transfer coeff	72.8744	72.6799	72.4893	71.5939	71.4264	70.6465	70.6465	70.5021	70.9469	71.4264	71.7653	72.1196	(39)
Average = Sum(39)m / 12 =												71.5931	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0189	1.0162	1.0136	1.0010	0.9987	0.9878	0.9878	0.9858	0.9920	0.9987	1.0034	1.0084	(40)
HLP (average)												1.0010	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)
Hot water usage for mixer showers

62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day) 117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	252.8703	223.6940	237.6261	208.6756	202.1594	182.0104	179.4281	186.5739	188.6630	210.5771	224.1886	250.0581	(62)
WWHRS	-28.5673	-25.2652	-26.4562	-21.9068	-20.4164	-17.4704	-16.3757	-17.4139	-18.0756	-21.3091	-24.1406	-28.0383	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	224.3030	198.4288	211.1699	186.7688	181.7430	164.5400	163.0524	169.1599	170.5875	189.2680	200.0480	222.0198	(64)
										Total per year (kWh/year) = Sum(64)m =		2281.0892	(64)
12Total per year (kWh/year)												2281	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	79.8753	70.5810	74.8066	65.3162	63.0139	56.4500	55.4557	57.8317	58.6620	65.8128	70.4742	78.9402	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.8362	116.0686	104.8362	108.3307	104.8362	108.3307	104.8362	104.8362	108.3307	104.8362	108.3307	104.8362	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	107.3592	105.0312	100.5465	90.7169	84.6961	78.4028	74.5373	77.7308	81.4750	88.4580	97.8808	106.1024	(72)
Total internal gains	473.2506	484.2389	463.2704	445.7560	422.1287	403.0667	386.8461	387.9557	400.4457	418.1136	445.1429	463.1331	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	11.9270	19.6403	0.6300	0.7000	0.7700	71.5897	(76)

Solar gains	71.5897	140.0446	230.6335	336.3652	412.2282	421.9889	401.7506	345.0978	268.2363	166.1747	89.2639	58.8719	(83)

Total gains	544.8402	624.2834	693.9039	782.1212	834.3569	825.0556	788.5967	733.0536	668.6820	584.2883	534.4068	522.0050	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.9557	48.0840	48.2104	48.8134	48.9279	49.4680	49.4680	49.5693	49.2585	48.9279	48.6968	48.4576	
alpha	4.1970	4.2056	4.2140	4.2542	4.2619	4.2979	4.2979	4.3046	4.2839	4.2619	4.2465	4.2305	
util living area													
	0.9808	0.9655	0.9333	0.8486	0.7082	0.5285	0.3898	0.4349	0.6682	0.8930	0.9659	0.9836	(86)
MIT	19.6208	19.8528	20.1837	20.5889	20.8511	20.9673	20.9929	20.9888	20.9132	20.5512	20.0238	19.5858	(87)
Th 2	20.0676	20.0698	20.0721	20.0825	20.0844	20.0935	20.0935	20.0952	20.0900	20.0844	20.0805	20.0764	(88)
util rest of house													
	0.9766	0.9582	0.9192	0.8190	0.6580	0.4605	0.3115	0.3527	0.5990	0.8647	0.9574	0.9801	(89)
MIT 2	18.4680	18.7613	19.1739	19.6657	19.9546	20.0721	20.0905	20.0901	20.0262	19.6357	18.9877	18.4299	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	18.8597	19.1322	19.5170	19.9794	20.2592	20.3763	20.3971	20.3954	20.3276	19.9467	19.3397	18.8227	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8597	19.1322	19.5170	19.9794	20.2592	20.3763	20.3971	20.3954	20.3276	19.9467	19.3397	18.8227	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9694	0.9489	0.9093	0.8153	0.6681	0.4822	0.3380	0.3804	0.6180	0.8597	0.9488	0.9736	(94)
Useful gains	528.1563	592.3808	630.9449	637.6920	557.4398	397.8198	266.5289	278.8438	413.2253	502.3320	507.0197	508.1988	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1061.0278	1034.3934	943.5943	793.2180	611.3505	408.0733	268.2535	281.6875	441.8266	667.6025	878.3872	1054.5801	(97)
Space heating kWh													
	396.4564	297.0325	232.6112	111.9788	40.1096	0.0000	0.0000	0.0000	0.0000	122.9613	267.3846	406.5077	(98a)
Space heating requirement - total per year (kWh/year)												1875.0420	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	396.4564	297.0325	232.6112	111.9788	40.1096	0.0000	0.0000	0.0000	0.0000	122.9613	267.3846	406.5077	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1875.0420	
Space heating per m2											(98c) / (4) =	26.2170	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	396.4564	297.0325	232.6112	111.9788	40.1096	0.0000	0.0000	0.0000	0.0000	122.9613	267.3846	406.5077	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	429.0654	321.4637	251.7437	121.1892	43.4086	0.0000	0.0000	0.0000	0.0000	133.0750	289.3773	439.9434	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	224.3030	198.4288	211.1699	186.7688	181.7430	164.5400	163.0524	169.1599	170.5875	189.2680	200.0480	222.0198	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.5879	85.2437	84.5892	83.3212	81.7294	80.3000	80.3000	80.3000	80.3000	83.4804	85.0038	85.6594	(217)
Fuel for water heating, kWh/month													
	262.0734	232.7782	249.6418	224.1552	222.3716	204.9066	203.0540	210.6599	212.4377	226.7216	235.3399	259.1891	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.7829	17.4750	15.7343	11.5277	8.9043	7.2749	8.1228	10.5583	13.7142	17.9938	20.3239	22.3883	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.5568	-47.3592	-68.1531	-76.7310	-82.8400	-77.3720	-76.4273	-72.1080	-64.4904	-54.2111	-36.9141	-29.0069	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-18.8029	-39.5749	-78.6914	-118.2335	-156.3709	-157.1182	-155.2578	-131.4301	-96.3075	-56.5975	-25.1064	-14.8664	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2029.2663	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2743.3291	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												175.8004	(232)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1767.5275	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3266.8682	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2029.2663	0.2100	426.1459	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2743.3291	0.2100	576.0991	(264)
Space and water heating			1002.2450	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	175.8004	0.1443	25.3734	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	0.1346	-96.7689	
PV Unit electricity exported	-1048.3576	0.1259	-131.9744	
Total			-228.7433	(269)
Total CO2, kg/year			810.8044	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.3400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2029.2663	1.1300	2293.0709	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2743.3291	1.1300	3099.9618	(278)
Space and water heating			5393.0327	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	175.8004	1.5338	269.6485	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	1.4973	-1076.8103	
PV Unit electricity exported	-1048.3576	0.4621	-484.4365	
Total			-1561.2467	(283)
Total Primary energy kWh/year			4231.5353	(286)
Target Primary Energy Rate (TPER)			59.1700	(287)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	11.51	**TER**	11.34
Environmental	91 B	**% DER < TER**			-1.50
CO_2 Emissions (t/year)	0.77	**DFEE**	24.15	**TFEE**	32.03
Compliance Check	See BREL	**% DFEE < TFEE**			24.60
% DPER < TPER	-9.69	**DPER**	64.90	**TPER**	59.17

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2489	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3174	0.3112	0.3049	0.2738	0.2676	0.2365	0.2365	0.2303	0.2489	0.2676	0.2801	0.2925	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

Effective ac	0.5504	0.5484	0.5465	0.5375	0.5358	0.5280	0.5280	0.5265	0.5310	0.5358	0.5392	0.5428	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 12581.0601	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	175.9097	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.6151	(36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.8245	31.7114	31.6006	31.0799	30.9825	30.5289	30.5289	30.4450	30.7036	30.9825	31.1795	31.3856	(38)
Heat transfer coeff	62.1367	62.0236	61.9127	61.3920	61.2946	60.8411	60.8411	60.7571	61.0158	61.2946	61.4917	61.6977	(39)

Average = Sum(39)m / 12 = 61.3916

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8688	0.8672	0.8657	0.8584	0.8570	0.8507	0.8507	0.8495	0.8531	0.8570	0.8598	0.8627	(40)
HLP (average)												0.8584	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day) 59.5787 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.0001	63.2172	61.2706	58.8477	56.6862	54.4399	53.9730	55.9157	57.9081	60.2149	62.6593	64.9088	(44)
Energy conte	102.9443	90.0205	94.1707	80.5595	76.3105	66.9402	65.2757	69.2353	71.4064	81.7111	89.2697	101.6316	(45)

Energy content (annual) Total = Sum(45)m = 989.4754

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(64)

Total per year (kWh/year) = Sum(64)m = 841.0541 (64)

12Total per year (kWh/year) 841 (64)

Electric shower(s)

50.0432	44.5889	48.6894	46.4637	47.3355	45.1535	46.6586	47.3355	46.4637	48.6894	47.7738	50.0432	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 569.2384 (64a)

Heat gains from water heating, kWh/month

34.3865	30.2766	32.1836	28.7348	28.0499	25.5132	25.5357	26.5464	26.7898	29.5359	30.9133	34.1075	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.6996	119.2388	107.6996	111.2896	107.6996	111.2896	107.6996	107.6996	111.2896	107.6996	111.2896	107.6996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	46.2184	45.0544	43.2575	39.9095	37.7014	35.4350	34.3222	35.6806	37.2080	39.6988	42.9351	45.8434	(72)
Total internal gains	411.9730	424.4322	405.8448	394.9074	374.9975	363.0578	349.4944	348.7689	359.1376	369.2178	390.1559	402.7375	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8900	19.6403	0.6800	0.7000	0.7700	64.0743	(76)
East	2.0370	19.6403	0.6800	0.7000	0.7700	13.1971	(76)

Solar gains	77.2714	151.1592	248.9377	363.0608	444.9447	455.4800	433.6356	372.4865	289.5249	179.3632	96.3483	63.5442	(83)
Total gains	489.2444	575.5914	654.7825	757.9682	819.9421	818.5378	783.1300	721.2555	648.6625	548.5809	486.5042	466.2817	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.2428	56.3453	56.4462	56.9250	57.0154	57.4404	57.4404	57.5198	57.2760	57.0154	56.8327	56.6429	
alpha	4.7495	4.7564	4.7631	4.7950	4.8010	4.8294	4.8294	4.8347	4.8184	4.8010	4.7888	4.7762	
util living area	0.9849	0.9678	0.9281	0.8190	0.6531	0.4687	0.3406	0.3851	0.6182	0.8834	0.9699	0.9878	(86)

MIT	19.8341	20.0735	20.3912	20.7432	20.9274	20.9879	20.9979	20.9963	20.9578	20.6784	20.1949	19.7899 (87)
Th 2	20.1941	20.1955	20.1968	20.2030	20.2042	20.2096	20.2096	20.2106	20.2075	20.2042	20.2018	20.1994 (88)
util rest of house												
	0.9817	0.9613	0.9142	0.7890	0.6074	0.4134	0.2800	0.3201	0.5569	0.8555	0.9626	0.9851 (89)
MIT 2	19.1299	19.3657	19.6731	20.0013	20.1552	20.2034	20.2089	20.2093	20.1835	19.9530	19.4925	19.0905 (90)
Living area fraction										fLA = Living area / (4) =		0.3398 (91)
MIT	19.3691	19.6062	19.9171	20.2534	20.4176	20.4700	20.4770	20.4767	20.4466	20.1994	19.7312	19.3281 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3691	19.6062	19.9171	20.2534	20.4176	20.4700	20.4770	20.4767	20.4466	20.1994	19.7312	19.3281 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9776	0.9556	0.9086	0.7910	0.6200	0.4318	0.3006	0.3421	0.5759	0.8553	0.9574	0.9815	(94)
Useful gains	478.2776	550.0109	594.9630	599.5662	508.3514	353.4402	235.3777	246.7579	373.5646	469.1850	465.7776	457.6444	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	936.3469	912.1310	830.6888	697.0090	534.3408	357.1366	235.8797	247.6866	387.2400	588.3936	776.7123	933.3703	(97)
Space heating kWh													
	340.8035	243.3448	175.3800	70.1588	19.3361	0.0000	0.0000	0.0000	0.0000	88.6912	223.8729	353.9401	(98a)
Space heating requirement - total per year (kWh/year)												1515.5275	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	340.8035	243.3448	175.3800	70.1588	19.3361	0.0000	0.0000	0.0000	0.0000	88.6912	223.8729	353.9401	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1515.5275	
Space heating per m2											(98c) / (4) =	21.1903	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	571.9062	450.2240	461.7539	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9580	0.9797	0.9694	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	547.8683	441.0946	447.6135	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	911.3212	872.2100	802.0383	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	261.6861	320.7499	263.6921	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	65.4215	80.1875	65.9230	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												211.5320	(107)
Energy for space heating												21.1903	(99)
Energy for space cooling												2.9577	(108)
Total												24.1479	(109)
Fabric Energy Efficiency (DFEE)												24.1	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor		35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3264	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3020	0.3264	0.3509	0.3672	0.3836	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5866	0.5833	0.5800	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			11.9270	1.1450	13.6603			(27)
Heatloss floor			35.7600	0.1300	4.6488			(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.1800	6.3023			(29a)
500mm mineral wool	35.7600		35.7600	0.1100	3.9336			(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5850			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	175.9097	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.0600	0.0500	0.3530
E3 Sill	3.7400	0.0500	0.1870
E4 Jamb	23.3600	0.0500	1.1680
E5 Ground floor (normal)	11.1200	0.1600	1.7792
E6 Intermediate floor within a dwelling	4.0300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.3800	0.0600	0.3828
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	12.9900	0.0800	1.0392
P2 Party wall - Intermediate floor within a dwelling	15.4400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	15.4400	0.1200	1.8528
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.3500	0.0200	0.0470

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.3690	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	38.9540	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.9203	33.7259	33.5352	32.6398	32.4723	31.6925	31.6925	31.5481	31.9929	32.4723	32.8112	33.1655	(38)
Heat transfer coeff													
	72.8744	72.6799	72.4893	71.5939	71.4264	70.6465	70.6465	70.5021	70.9469	71.4264	71.7653	72.1196	(39)
Average = Sum(39)m / 12 =												71.5931	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0189	1.0162	1.0136	1.0010	0.9987	0.9878	0.9878	0.9858	0.9920	0.9987	1.0034	1.0084	(40)
HLP (average)												1.0010	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2825	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses													
	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												59.5787	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	65.0001	63.2172	61.2706	58.8477	56.6862	54.4399	53.9730	55.9157	57.9081	60.2149	62.6593	64.9088	(44)
Energy conte	102.9443	90.0205	94.1707	80.5595	76.3105	66.9402	65.2757	69.2353	71.4064	81.7111	89.2697	101.6316	(45)
Energy content (annual)										Total = Sum(45)m =		989.4754	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(64)
										Total per year (kWh/year) = Sum(64)m =		841.0541	(64)
12Total per year (kWh/year)												841	(64)
Electric shower(s)													
	50.0432	44.5889	48.6894	46.4637	47.3355	45.1535	46.6586	47.3355	46.4637	48.6894	47.7738	50.0432	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		569.2384	(64a)
Heat gains from water heating, kWh/month													
	34.3865	30.2766	32.1836	28.7348	28.0499	25.5132	25.5357	26.5464	26.7898	29.5359	30.9133	34.1075	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	104.8362	116.0686	104.8362	108.3307	104.8362	108.3307	104.8362	104.8362	108.3307	104.8362	108.3307	104.8362 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982 (71)

Water heating gains (Table 5)

	46.2184	45.0544	43.2575	39.9095	37.7014	35.4350	34.3222	35.6806	37.2080	39.6988	42.9351	45.8434 (72)

Total internal gains

	409.1097	421.2621	402.9814	391.9486	372.1341	360.0989	346.6311	345.9056	356.1788	366.3544	387.1971	399.8741 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	11.9270	19.6403	0.6300	0.7000	0.7700	71.5897	(76)

Solar gains	71.5897	140.0446	230.6335	336.3652	412.2282	421.9889	401.7506	345.0978	268.2363	166.1747	89.2639	58.8719 (83)
Total gains	480.6993	561.3066	633.6149	728.3137	784.3622	782.0878	748.3817	691.0034	624.4151	532.5291	476.4610	458.7460 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.9557	48.0840	48.2104	48.8134	48.9279	49.4680	49.4680	49.5693	49.2585	48.9279	48.6968	48.4576	
alpha	4.1970	4.2056	4.2140	4.2542	4.2619	4.2979	4.2979	4.3046	4.2839	4.2619	4.2465	4.2305	
util living area	0.9876	0.9758	0.9493	0.8727	0.7373	0.5536	0.4097	0.4596	0.7015	0.9171	0.9769	0.9897	(86)
MIT	19.5003	19.7416	20.0904	20.5319	20.8255	20.9610	20.9914	20.9862	20.8952	20.4833	19.9208	19.4654	(87)
Th 2	20.0676	20.0698	20.0721	20.0825	20.0844	20.0935	20.0935	20.0952	20.0900	20.0844	20.0805	20.0764	(88)
util rest of house	0.9848	0.9704	0.9380	0.8459	0.6881	0.4836	0.3279	0.3735	0.6325	0.8932	0.9708	0.9874	(89)
MIT 2	18.7025	18.9420	19.2841	19.7080	19.9643	20.0734	20.0907	20.0902	20.0289	19.6747	19.1293	18.6745	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	18.9736	19.2137	19.5580	19.9879	20.2569	20.3750	20.3967	20.3947	20.3232	19.9494	19.3982	18.9432	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9736	19.2137	19.5580	19.9879	20.2569	20.3750	20.3967	20.3947	20.3232	19.9494	19.3982	18.9432	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9805	0.9642	0.9305	0.8428	0.6979	0.5059	0.3556	0.4025	0.6512	0.8891	0.9650	0.9836	(94)
Useful gains	471.3216	541.2028	589.5901	613.8489	547.4295	395.6872	266.1233	278.0989	406.6322	473.4699	459.8083	451.2075	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1069.3277	1040.3166	946.5684	793.8289	611.1905	407.9842	268.2243	281.6317	441.5202	667.7967	882.5843	1063.2751	(97)
Space heating kWh	444.9165	335.4045	265.5919	129.5856	47.4382	0.0000	0.0000	0.0000	0.0000	144.5791	304.3987	455.3783	(98a)
Space heating requirement - total per year (kWh/year)												2127.2927	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	444.9165	335.4045	265.5919	129.5856	47.4382	0.0000	0.0000	0.0000	0.0000	144.5791	304.3987	455.3783	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2127.2927	
Space heating per m2											(98c) / (4) =	29.7440	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	664.0772	522.7842	535.8159	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9032	0.9454	0.9251	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	599.7645	494.2384	495.6975	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	871.9251	834.6712	769.6736	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	195.9556	253.2820	203.8382	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	48.9889	63.3205	50.9596	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												163.2690	(107)
Energy for space heating												29.7440	(99)
Energy for space cooling												2.2828	(108)
Total												32.0269	(109)
Fabric Energy Efficiency (TFEE)												32.0	(109)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	11.51	**TER**	11.34
Environmental	91 B	**% DER < TER**			-1.50
CO_2 Emissions (t/year)	0.77	**DFEE**	24.15	**TFEE**	32.03
Compliance Check	See BREL	**% DFEE < TFEE**			24.60
% DPER < TPER	-9.69	**DPER**	64.90	**TPER**	59.17

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				3	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 3.6151 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)

Average = Sum(39)m / 12 = 59.2241

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

Hot water usage for mixer showers

62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day) 117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)

Energy content (annual) Total = Sum(45)m = 1946.5248

Distribution loss (46)m = 0.15 x (45)m												
30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2411	12.8517	14.2046	13.6953	14.1194	13.6313	14.0649	14.0820	13.6472	14.1396	13.7325	14.2344	(61)
Total heat required for water heating calculated for each month												
216.1526	190.5183	200.8718	173.0558	165.3199	146.3266	142.5341	149.6970	152.9952	173.7579	188.6060	213.3336	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
216.1526	190.5183	200.8718	173.0558	165.3199	146.3266	142.5341	149.6970	152.9952	173.7579	188.6060	213.3336	(64)

Total per year (kWh/year) = Sum(64)m = 2113.1688 (64)

12Total per year (kWh/year) 2113 (64)

Electric shower(s)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month												
70.6958	62.2871	65.6180	56.4112	53.8040	47.5290	46.2322	48.6125	49.7450	56.6080	61.5786	69.7591	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
107.6996	119.2388	107.6996	111.2896	107.6996	111.2896	107.6996	107.6996	111.2896	107.6996	111.2896	107.6996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)													
95.0213	92.6891	88.1962	78.3489	72.3172	66.0125	62.1401	65.3394	69.0903	76.0860	85.5258	93.7622	(72)
Total internal gains													
463.7760	475.0669	453.7835	436.3468	412.6132	393.6353	377.3123	378.4277	391.0199	408.6049	435.7466	453.6563	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8900	19.6403	0.6800	0.7000	0.7700	64.0743	(76)
East	2.0370	19.6403	0.6800	0.7000	0.7700	13.1971	(76)

Solar gains	77.2714	151.1592	248.9377	363.0608	444.9447	455.4800	433.6356	372.4865	289.5249	179.3632	96.3483	63.5442	(83)
Total gains	541.0474	626.2261	702.7212	799.4076	857.5579	849.1154	810.9479	750.9142	680.5447	587.9681	532.0950	517.2005	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339
util living area												

	0.9762	0.9530	0.9029	0.7830	0.6144	0.4417	0.3205	0.3612	0.5801	0.8502	0.9556	0.9806	(86)
MIT	20.0231	20.2439	20.5246	20.8078	20.9493	20.9916	20.9986	20.9975	20.9706	20.7540	20.3328	19.9660	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9715	0.9442	0.8859	0.7514	0.5704	0.3902	0.2648	0.3014	0.5219	0.8185	0.9457	0.9766	(89)
MIT 2	19.0927	19.3680	19.7108	20.0379	20.1857	20.2236	20.2285	20.2279	20.2078	19.9870	19.4828	19.0208	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.4088	19.6656	19.9873	20.2995	20.4452	20.4845	20.4901	20.4894	20.4670	20.2476	19.7716	19.3419	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.2588	19.5156	19.8373	20.1495	20.2952	20.3345	20.3401	20.3394	20.3170	20.0976	19.6216	19.1919	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9639	0.9344	0.8761	0.7479	0.5743	0.3974	0.2728	0.3100	0.5287	0.8125	0.9362	0.9698	(94)
Useful gains	521.5141	585.1445	615.6784	597.8954	492.5122	337.3965	221.2388	232.8031	359.8190	477.7461	498.1400	501.5590	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	885.9243	865.5937	789.8886	666.2407	509.0415	339.6224	221.5056	233.3066	368.1962	562.4855	741.5816	887.8844	(97)
Space heating kWh													
	271.1212	188.4618	129.6124	49.2086	12.2978	0.0000	0.0000	0.0000	0.0000	63.0461	175.2780	287.4261	(98a)
Space heating requirement - total per year (kWh/year)												1176.4519	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	271.1212	188.4618	129.6124	49.2086	12.2978	0.0000	0.0000	0.0000	0.0000	63.0461	175.2780	287.4261	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1176.4519	
Space heating per m2											(98c) / (4) =	16.4493	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	89.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	271.1212	188.4618	129.6124	49.2086	12.2978	0.0000	0.0000	0.0000	0.0000	63.0461	175.2780	287.4261	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	304.6306	211.7549	145.6319	55.2905	13.8178	0.0000	0.0000	0.0000	0.0000	70.8383	196.9415	322.9507	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	216.1526	190.5183	200.8718	173.0558	165.3199	146.3266	142.5341	149.6970	152.9952	173.7579	188.6060	213.3336	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.2378	88.1372	87.9589	87.6708	87.4156	87.3000	87.3000	87.3000	87.3000	87.7462	88.1107	88.2677	(217)
Fuel for water heating, kWh/month													
	244.9660	216.1610	228.3700	197.3929	189.1194	167.6136	163.2693	171.4742	175.2522	198.0232	214.0558	241.6892	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.9745	8.1060	8.9745	8.6850	8.9745	8.6850	8.9745	8.9745	8.6850	8.9745	8.6850	8.9745	(231)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1321.8561 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	87.3000
Water heating fuel used	2407.3869 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)	
mechanical ventilation fans (SFP = 0.0920)	19.6671 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	105.6671 (231)
Electricity for lighting (calculated in Appendix L)	174.7141 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4009.6242 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1321.8561	0.2100	277.5898	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2407.3869	0.2100	505.5512	(264)
Space and water heating			783.1410	(265)
Pumps, fans and electric keep-hot	105.6671	0.1387	14.6573	(267)
Energy for lighting	174.7141	0.1443	25.2167	(268)
Total CO2, kg/year			823.0150	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.5100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1321.8561	1.1300	1493.6974	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2407.3869	1.1300	2720.3472	(278)
Space and water heating			4214.0445	(279)
Pumps, fans and electric keep-hot	105.6671	1.5128	159.8533	(281)
Energy for lighting	174.7141	1.5338	267.9824	(282)
Total Primary energy kWh/year			4641.8802	(286)
Dwelling Primary energy Rate (DPER)			64.9000	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b) x	2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c) x	2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3264	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3020	0.3264	0.3509	0.3672	0.3836	(22b)
Effective ac	0.5866	0.5833	0.5800	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			11.9270	1.1450	13.6603			(27)
Heatloss floor			35.7600	0.1300	4.6488			(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.1800	6.3023			(29a)
500mm mineral wool	35.7600		35.7600	0.1100	3.9336			(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.5850			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.9097 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	7.0600	0.0500	0.3530
E3	Sill	3.7400	0.0500	0.1870
E4	Jamb	23.3600	0.0500	1.1680
E5	Ground floor (normal)	11.1200	0.1600	1.7792
E6	Intermediate floor within a dwelling	4.0300	0.0000	0.0000
E10	Eaves (insulation at ceiling level)	6.3800	0.0600	0.3828
E16	Corner (normal)	10.4000	0.0900	0.9360
E18	Party wall between dwellings	10.4000	0.0600	0.6240
P1	Party wall - Ground floor	12.9900	0.0800	1.0392
P2	Party wall - Intermediate floor within a dwelling	15.4400	0.0000	0.0000
P4	Party wall - Roof (insulation at ceiling level)	15.4400	0.1200	1.8528
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	2.3500	0.0200	0.0470

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.3690 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 38.9540 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.9203	33.7259	33.5352	32.6398	32.4723	31.6925	31.6925	31.5481	31.9929	32.4723	32.8112	33.1655	(38)
Heat transfer coeff	72.8744	72.6799	72.4893	71.5939	71.4264	70.6465	70.6465	70.5021	70.9469	71.4264	71.7653	72.1196	(39)
Average = Sum(39)m / 12 =												71.5931	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0189	1.0162	1.0136	1.0010	0.9987	0.9878	0.9878	0.9858	0.9920	0.9987	1.0034	1.0084	(40)
HLP (average)												1.0010	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)
Hot water usage for mixer showers

62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day) 117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	252.8703	223.6940	237.6261	208.6756	202.1594	182.0104	179.4281	186.5739	188.6630	210.5771	224.1886	250.0581	(62)
WWHRS	-28.5673	-25.2652	-26.4562	-21.9068	-20.4164	-17.4704	-16.3757	-17.4139	-18.0756	-21.3091	-24.1406	-28.0383	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	224.3030	198.4288	211.1699	186.7688	181.7430	164.5400	163.0524	169.1599	170.5875	189.2680	200.0480	222.0198	(64)
										Total per year (kWh/year) = Sum(64)m =		2281.0892	(64)
12Total per year (kWh/year)												2281	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	79.8753	70.5810	74.8066	65.3162	63.0139	56.4500	55.4557	57.8317	58.6620	65.8128	70.4742	78.9402	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.8362	116.0686	104.8362	108.3307	104.8362	108.3307	104.8362	104.8362	108.3307	104.8362	108.3307	104.8362	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	107.3592	105.0312	100.5465	90.7169	84.6961	78.4028	74.5373	77.7308	81.4750	88.4580	97.8808	106.1024	(72)
Total internal gains	473.2506	484.2389	463.2704	445.7560	422.1287	403.0667	386.8461	387.9557	400.4457	418.1136	445.1429	463.1331	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	11.9270	19.6403	0.6300	0.7000	0.7700	71.5897	(76)

Solar gains	71.5897	140.0446	230.6335	336.3652	412.2282	421.9889	401.7506	345.0978	268.2363	166.1747	89.2639	58.8719	(83)

Total gains	544.8402	624.2834	693.9039	782.1212	834.3569	825.0556	788.5967	733.0536	668.6820	584.2883	534.4068	522.0050	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.9557	48.0840	48.2104	48.8134	48.9279	49.4680	49.4680	49.5693	49.2585	48.9279	48.6968	48.4576	
alpha	4.1970	4.2056	4.2140	4.2542	4.2619	4.2979	4.2979	4.3046	4.2839	4.2619	4.2465	4.2305	
util living area													
	0.9808	0.9655	0.9333	0.8486	0.7082	0.5285	0.3898	0.4349	0.6682	0.8930	0.9659	0.9836	(86)
MIT	19.6208	19.8528	20.1837	20.5889	20.8511	20.9673	20.9929	20.9888	20.9132	20.5512	20.0238	19.5858	(87)
Th 2	20.0676	20.0698	20.0721	20.0825	20.0844	20.0935	20.0935	20.0952	20.0900	20.0844	20.0805	20.0764	(88)
util rest of house													
	0.9766	0.9582	0.9192	0.8190	0.6580	0.4605	0.3115	0.3527	0.5990	0.8647	0.9574	0.9801	(89)
MIT 2	18.4680	18.7613	19.1739	19.6657	19.9546	20.0721	20.0905	20.0901	20.0262	19.6357	18.9877	18.4299	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	18.8597	19.1322	19.5170	19.9794	20.2592	20.3763	20.3971	20.3954	20.3276	19.9467	19.3397	18.8227	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8597	19.1322	19.5170	19.9794	20.2592	20.3763	20.3971	20.3954	20.3276	19.9467	19.3397	18.8227	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9694	0.9489	0.9093	0.8153	0.6681	0.4822	0.3380	0.3804	0.6180	0.8597	0.9488	0.9736	(94)
Useful gains	528.1563	592.3808	630.9449	637.6920	557.4398	397.8198	266.5289	278.8438	413.2253	502.3320	507.0197	508.1988	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1061.0278	1034.3934	943.5943	793.2180	611.3505	408.0733	268.2535	281.6875	441.8266	667.6025	878.3872	1054.5801	(97)
Space heating kWh													
	396.4564	297.0325	232.6112	111.9788	40.1096	0.0000	0.0000	0.0000	0.0000	122.9613	267.3846	406.5077	(98a)
Space heating requirement - total per year (kWh/year)												1875.0420	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	396.4564	297.0325	232.6112	111.9788	40.1096	0.0000	0.0000	0.0000	0.0000	122.9613	267.3846	406.5077	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1875.0420	
Space heating per m2											(98c) / (4) =	26.2170	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	396.4564	297.0325	232.6112	111.9788	40.1096	0.0000	0.0000	0.0000	0.0000	122.9613	267.3846	406.5077	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	429.0654	321.4637	251.7437	121.1892	43.4086	0.0000	0.0000	0.0000	0.0000	133.0750	289.3773	439.9434	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	224.3030	198.4288	211.1699	186.7688	181.7430	164.5400	163.0524	169.1599	170.5875	189.2680	200.0480	222.0198	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.5879	85.2437	84.5892	83.3212	81.7294	80.3000	80.3000	80.3000	80.3000	83.4804	85.0038	85.6594	(217)
Fuel for water heating, kWh/month													
	262.0734	232.7782	249.6418	224.1552	222.3716	204.9066	203.0540	210.6599	212.4377	226.7216	235.3399	259.1891	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.7829	17.4750	15.7343	11.5277	8.9043	7.2749	8.1228	10.5583	13.7142	17.9938	20.3239	22.3883	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.5568	-47.3592	-68.1531	-76.7310	-82.8400	-77.3720	-76.4273	-72.1080	-64.4904	-54.2111	-36.9141	-29.0069	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-18.8029	-39.5749	-78.6914	-118.2335	-156.3709	-157.1182	-155.2578	-131.4301	-96.3075	-56.5975	-25.1064	-14.8664	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2029.2663	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2743.3291	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												175.8004	(232)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1767.5275	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3266.8682	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2029.2663	0.2100	426.1459	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2743.3291	0.2100	576.0991	(264)
Space and water heating			1002.2450	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	175.8004	0.1443	25.3734	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	0.1346	-96.7689	
PV Unit electricity exported	-1048.3576	0.1259	-131.9744	
Total			-228.7433	(269)
Total CO2, kg/year			810.8044	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.3400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2029.2663	1.1300	2293.0709	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2743.3291	1.1300	3099.9618	(278)
Space and water heating			5393.0327	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	175.8004	1.5338	269.6485	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	1.4973	-1076.8103	
PV Unit electricity exported	-1048.3576	0.4621	-484.4365	
Total			-1561.2467	(283)
Total Primary energy kWh/year			4231.5353	(286)
Target Primary Energy Rate (TPER)			59.1700	(287)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	11.51	**TER**	11.34
Environmental	91 B	**% DER < TER**			-1.50
CO_2 Emissions (t/year)	0.77	**DFEE**	24.15	**TFEE**	32.03
Compliance Check	See BREL	**% DFEE < TFEE**			24.60
% DPER < TPER	-9.69	**DPER**	64.90	**TPER**	59.17

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 3.6151 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)

Average = Sum(39)m / 12 = 59.2241

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

Hot water usage for mixer showers

62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day) 117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)

Energy content (annual) Total = Sum(45)m = 1946.5248

Distribution loss (46)m = 0.15 x (45)m

30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
14.2411	12.8517	14.2046	13.6953	14.1194	13.6313	14.0649	14.0820	13.6472	14.1396	13.7325	14.2344	(61)

Total heat required for water heating calculated for each month

216.1526	190.5183	200.8718	173.0558	165.3199	146.3266	142.5341	149.6970	152.9952	173.7579	188.6060	213.3336	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

216.1526	190.5183	200.8718	173.0558	165.3199	146.3266	142.5341	149.6970	152.9952	173.7579	188.6060	213.3336	(64)

Total per year (kWh/year) = Sum(64)m = 2113.1688 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

70.6958	62.2871	65.6180	56.4112	53.8040	47.5290	46.2322	48.6125	49.7450	56.6080	61.5786	69.7591	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	95.0213	92.6891	88.1962	78.3489	72.3172	66.0125	62.1401	65.3394	69.0903	76.0860	85.5258	93.7622	(72)
Total internal gains	519.1090	517.1217	500.6888	469.8158	439.3067	408.6315	392.2216	395.0760	410.7669	441.7882	475.7055	505.3124	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8900	19.6403	0.6800	0.7000	0.7700	64.0743	(76)
East	2.0370	19.6403	0.6800	0.7000	0.7700	13.1971	(76)

Solar gains	77.2714	151.1592	248.9377	363.0608	444.9447	455.4800	433.6356	372.4865	289.5249	179.3632	96.3483	63.5442	(83)
Total gains	596.3803	668.2809	749.6265	832.8767	884.2514	864.1115	825.8572	767.5625	700.2918	621.1514	572.0538	568.8567	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area	0.9656	0.9411	0.8826	0.7635	0.5987	0.4344	0.3148	0.3535	0.5658	0.8279	0.9428	0.9718	(86)

MIT	20.1241	20.3119	20.5821	20.8289	20.9547	20.9922	20.9987	20.9977	20.9736	20.7845	20.3982	20.0628 (87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291 (88)
util rest of house	0.9590	0.9305	0.8634	0.7310	0.5552	0.3836	0.2600	0.2949	0.5084	0.7941	0.9306	0.9664 (89)
MIT 2	19.2187	19.4511	19.7779	20.0601	20.1905	20.2240	20.2285	20.2280	20.2101	20.0195	19.5622	19.1422 (90)
Living area fraction										fLA = Living area / (4) =		0.3398 (91)
MIT	19.5263	19.7436	20.0511	20.3213	20.4501	20.4850	20.4902	20.4895	20.4695	20.2795	19.8462	19.4550 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.3763	19.5936	19.9011	20.1713	20.3001	20.3350	20.3402	20.3395	20.3195	20.1295	19.6962	19.3050 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9501	0.9203	0.8543	0.7284	0.5593	0.3907	0.2679	0.3034	0.5153	0.7893	0.9207	0.9581	(94)
Useful gains	566.6287	615.0142	640.4021	606.6981	494.5745	337.5846	221.2641	232.8592	360.8452	490.2678	526.6693	545.0450	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	892.8830	870.2142	793.6698	667.5337	509.3351	339.6499	221.5097	233.3155	368.3454	564.3733	745.9996	894.5777	(97)
Space heating kWh	242.7333	171.4944	114.0312	43.8016	10.9819	0.0000	0.0000	0.0000	0.0000	55.1345	157.9179	260.0524	(98a)
Space heating requirement - total per year (kWh/year)												1056.1470	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	242.7333	171.4944	114.0312	43.8016	10.9819	0.0000	0.0000	0.0000	0.0000	55.1345	157.9179	260.0524	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1056.1470	
Space heating per m2											(98c) / (4) =	14.7672	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	242.7333	171.4944	114.0312	43.8016	10.9819	0.0000	0.0000	0.0000	0.0000	55.1345	157.9179	260.0524	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	272.7340	192.6903	128.1249	49.2153	12.3392	0.0000	0.0000	0.0000	0.0000	61.9488	177.4358	292.1937	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	216.1526	190.5183	200.8718	173.0558	165.3199	146.3266	142.5341	149.6970	152.9952	173.7579	188.6060	213.3336	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.1911	88.0972	87.9080	87.6381	87.4040	87.3000	87.3000	87.3000	87.3000	87.7035	88.0666	88.2258	(217)
Fuel for water heating, kWh/month	245.0958	216.2592	228.5022	197.4664	189.1445	167.6136	163.2693	171.4742	175.2522	198.1196	214.1629	241.8042	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.9745	8.1060	8.9745	8.6850	8.9745	8.6850	8.9745	8.9745	8.6850	8.9745	8.6850	8.9745	(231)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1186.6820	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.3000	
Water heating fuel used												2408.1643	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.6671	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												105.6671	(231)
Electricity for lighting (calculated in Appendix L)												174.7141	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												3875.2276	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1186.6820	3.6400	43.1952	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2408.1643	3.6400	87.6572	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	105.6671	16.4900	17.4245	(249)
Energy for lighting	174.7141	16.4900	28.8104	(250)
Additional standing charges			92.0000	(251)
Total energy cost			269.0873	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8314	(257)
SAP value		86.5235	
SAP rating (Section 12)		87	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1186.6820	0.2100	249.2032	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2408.1643	0.2100	505.7145	(264)
Space and water heating			754.9177	(265)
Pumps, fans and electric keep-hot	105.6671	0.1387	14.6573	(267)
Energy for lighting	174.7141	0.1443	25.2167	(268)
Total CO2, kg/year			794.7917	(272)
CO2 emissions per m2			11.1100	(273)
EI value			90.8598	
EI rating			91	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b) x	2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c) x	2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2825	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day)	117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	

Distribution loss (46)m = 0.15 x (45)m

30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 14.2411	12.8517	14.2046	13.6953	14.1194	13.6313	14.0649	14.0820	13.6472	14.1396	13.7325	14.2344	(61)

Total heat required for water heating calculated for each month

216.1526	190.5183	200.8718	173.0558	165.3199	146.3266	142.5341	149.6970	152.9952	173.7579	188.6060	213.3336	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
216.1526	190.5183	200.8718	173.0558	165.3199	146.3266	142.5341	149.6970	152.9952	173.7579	188.6060	213.3336	(64)
Total per year (kWh/year) = Sum(64)m =												2113.1688	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)

Heat gains from water heating, kWh/month

70.6958	62.2871	65.6180	56.4112	53.8040	47.5290	46.2322	48.6125	49.7450	56.6080	61.5786	69.7591	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)													
	95.0213	92.6891	88.1962	78.3489	72.3172	66.0125	62.1401	65.3394	69.0903	76.0860	85.5258	93.7622	(72)
Total internal gains													
	519.1090	517.1217	500.6888	469.8158	439.3067	408.6315	392.2216	395.0760	410.7669	441.7882	475.7055	505.3124	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8900	23.7835	0.6800	0.7000	0.7700	77.5911	(76)
East	2.0370	23.7835	0.6800	0.7000	0.7700	15.9811	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	93.5722	162.6475	263.5188	387.8277	457.1329	501.7079	468.7900	411.0428	323.2212	203.5286	114.9325	77.3917	(83)
Total gains	612.6812	679.7691	764.2076	857.6436	896.4396	910.3394	861.0116	806.1188	733.9881	645.3168	590.6380	582.7041	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9593	0.9335	0.8635	0.7325	0.5639	0.3754	0.2680	0.3007	0.5212	0.7893	0.9297	0.9670	(86)
MIT	20.1871	20.3616	20.6412	20.8628	20.9668	20.9963	20.9995	20.9990	20.9823	20.8368	20.4692	20.1230	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9517	0.9217	0.8417	0.6978	0.5193	0.3263	0.2151	0.2444	0.4642	0.7505	0.9151	0.9606	(89)
MIT 2	19.2973	19.5122	19.8475	20.0964	20.2018	20.2269	20.2289	20.2287	20.2169	20.0758	19.6486	19.2177	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.5996	19.8008	20.1172	20.3568	20.4618	20.4883	20.4907	20.4904	20.4769	20.3344	19.9274	19.5253	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.4496	19.6508	19.9672	20.2068	20.3118	20.3383	20.3407	20.3404	20.3269	20.1844	19.7774	19.3753	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9423	0.9114	0.8335	0.6968	0.5242	0.3333	0.2228	0.2525	0.4716	0.7481	0.9050	0.9518	(94)
Useful gains	577.3041	619.5239	636.9764	597.5769	469.8813	303.3999	191.8359	203.5835	346.1465	482.7632	534.5543	554.6201	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	879.4563	855.8350	767.9697	645.9437	480.4114	304.3104	191.9266	203.7556	351.0181	538.0144	727.1203	880.9758	(97)
Space heating kWh													
	224.8012	158.8011	97.4590	34.8241	7.8344	0.0000	0.0000	0.0000	0.0000	41.1068	138.6475	242.8086	(98a)
Space heating requirement - total per year (kWh/year)												946.2828	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	224.8012	158.8011	97.4590	34.8241	7.8344	0.0000	0.0000	0.0000	0.0000	41.1068	138.6475	242.8086	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												946.2828	
Space heating per m2											(98c) / (4) =	13.2310	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	224.8012	158.8011	97.4590	34.8241	7.8344	0.0000	0.0000	0.0000	0.0000	41.1068	138.6475	242.8086	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	252.5856	178.4282	109.5045	39.1282	8.8027	0.0000	0.0000	0.0000	0.0000	46.1875	155.7837	272.8187	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	216.1526	190.5183	200.8718	173.0558	165.3199	146.3266	142.5341	149.6970	152.9952	173.7579	188.6060	213.3336	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.1585	88.0647	87.8482	87.5802	87.3755	87.3000	87.3000	87.3000	87.3000	87.6202	88.0122	88.1968	(217)
Fuel for water heating, kWh/month													
	245.1864	216.3390	228.6579	197.5969	189.2062	167.6136	163.2693	171.4742	175.2522	198.3080	214.2952	241.8837	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.9745	8.1060	8.9745	8.6850	8.9745	8.6850	8.9745	8.9745	8.6850	8.9745	8.6850	8.9745	(231)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1063.2391	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2409.0827	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	105.6671	(231)
Electricity for lighting (calculated in Appendix L)	174.7141	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3752.7031	(238)

10a. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1063.2391	6.5500	69.6422	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2409.0827	6.5500	157.7949	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	105.6671	28.4300	30.0412	(249)
Energy for lighting	174.7141	28.4300	49.6712	(250)
Additional standing charges			104.0000	(251)
Total energy cost			411.1495	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1063.2391	0.2100	223.2802	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2409.0827	0.2100	505.9074	(264)
Space and water heating			729.1876	(265)
Pumps, fans and electric keep-hot	105.6671	0.1387	14.6573	(267)
Energy for lighting	174.7141	0.1443	25.2167	(268)
Total CO2, kg/year			769.0616	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1063.2391	1.1300	1201.4602	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2409.0827	1.1300	2722.2634	(278)
Space and water heating			3923.7236	(279)
Pumps, fans and electric keep-hot	105.6671	1.5128	159.8533	(281)
Energy for lighting	174.7141	1.5338	267.9824	(282)
Total Primary energy kWh/year			4351.5593	(286)

SAP 10 EPC IMPROVEMENTS

Rev C - Be Lean

Current energy efficiency rating: B 87
Current environmental impact rating: B 91

N	Solar water heating	SAP increase too small
U	Solar photovoltaic panels	Recommended
V2	Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
U Solar photovoltaic panels	+ 8.7	-£ 278	-242 kg (31.5%)

Measures omitted - SAP change or cost saving too small:

N Solar water heating	+ 0.6	-£ 26	-146 kg (19.0%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar photovoltaic panels	£278	3.39 kg/m²	A 95	A 93
Total Savings	£278	3.39 kg/m²		

Potential energy efficiency rating: A 95
Potential environmental impact rating: A 93

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£80	£80	£0
Mains gas	£331	£331	£0

Space heating	£204	£204	£0
Water heating	£158	£158	£0
Lighting	£50	£50	£0
Generated (PV)	-£0	-£278	£278
Total cost of fuels	£411	£133	£278
Total cost of uses	£412	£134	£278
Delivered energy	52 kWh/m²	26 kWh/m²	26 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.5 tonnes	0.2 tonnes
CO2 emissions per m²	11 kg/m²	7 kg/m²	3 kg/m²
Primary energy	61 kWh/m²	38 kWh/m²	23 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b) x	2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c) x	2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							175.9097	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							3.6151	(36)
Point Thermal bridges					(36a) =		0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		30.3121	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers													
	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths													
	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses													
	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m													
	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2411	12.8517	14.2046	13.6953	14.1194	13.6313	14.0649	14.0820	13.6472	14.1396	13.7325	14.2344	(61)
Total heat required for water heating calculated for each month													
	216.1526	190.5183	200.8718	173.0558	165.3199	146.3266	142.5341	149.6970	152.9952	173.7579	188.6060	213.3336	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	216.1526	190.5183	200.8718	173.0558	165.3199	146.3266	142.5341	149.6970	152.9952	173.7579	188.6060	213.3336	(64)
										Total per year (kWh/year) = Sum(64)m =		2113.1688	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Heat gains from water heating, kWh/month													
	70.6958	62.2871	65.6180	56.4112	53.8040	47.5290	46.2322	48.6125	49.7450	56.6080	61.5786	69.7591	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)													
	95.0213	92.6891	88.1962	78.3489	72.3172	66.0125	62.1401	65.3394	69.0903	76.0860	85.5258	93.7622	(72)
Total internal gains													
	519.1090	517.1217	500.6888	469.8158	439.3067	408.6315	392.2216	395.0760	410.7669	441.7882	475.7055	505.3124	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8900	19.6403	0.6800	0.7000	0.7700	64.0743	(76)
East	2.0370	19.6403	0.6800	0.7000	0.7700	13.1971	(76)

Solar gains	77.2714	151.1592	248.9377	363.0608	444.9447	455.4800	433.6356	372.4865	289.5249	179.3632	96.3483	63.5442	(83)
Total gains	596.3803	668.2809	749.6265	832.8767	884.2514	864.1115	825.8572	767.5625	700.2918	621.1514	572.0538	568.8567	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9656	0.9411	0.8826	0.7635	0.5987	0.4344	0.3148	0.3535	0.5658	0.8279	0.9428	0.9718	(86)
MIT	20.1241	20.3119	20.5821	20.8289	20.9547	20.9922	20.9987	20.9977	20.9736	20.7845	20.3982	20.0628	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9590	0.9305	0.8634	0.7310	0.5552	0.3836	0.2600	0.2949	0.5084	0.7941	0.9306	0.9664	(89)
MIT 2	19.2187	19.4511	19.7779	20.0601	20.1905	20.2240	20.2285	20.2280	20.2101	20.0195	19.5622	19.1422	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.5263	19.7436	20.0511	20.3213	20.4501	20.4850	20.4902	20.4895	20.4695	20.2795	19.8462	19.4550	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.3763	19.5936	19.9011	20.1713	20.3001	20.3350	20.3402	20.3395	20.3195	20.1295	19.6962	19.3050	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9501	0.9203	0.8543	0.7284	0.5593	0.3907	0.2679	0.3034	0.5153	0.7893	0.9207	0.9581	(94)
Useful gains	566.6287	615.0142	640.4021	606.6981	494.5745	337.5846	221.2641	232.8592	360.8452	490.2678	526.6693	545.0450	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	892.8830	870.2142	793.6698	667.5337	509.3351	339.6499	221.5097	233.3155	368.3454	564.3733	745.9996	894.5777	(97)
Space heating kWh	242.7333	171.4944	114.0312	43.8016	10.9819	0.0000	0.0000	0.0000	0.0000	55.1345	157.9179	260.0524	(98a)
Space heating requirement - total per year (kWh/year)												1056.1470	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	242.7333	171.4944	114.0312	43.8016	10.9819	0.0000	0.0000	0.0000	0.0000	55.1345	157.9179	260.0524	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1056.1470	
Space heating per m2											(98c) / (4) =	14.7672	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	242.7333	171.4944	114.0312	43.8016	10.9819	0.0000	0.0000	0.0000	0.0000	55.1345	157.9179	260.0524	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	272.7340	192.6903	128.1249	49.2153	12.3392	0.0000	0.0000	0.0000	0.0000	61.9488	177.4358	292.1937	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	216.1526	190.5183	200.8718	173.0558	165.3199	146.3266	142.5341	149.6970	152.9952	173.7579	188.6060	213.3336	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.1911	88.0972	87.9080	87.6381	87.4040	87.3000	87.3000	87.3000	87.3000	87.7035	88.0666	88.2258	(217)
Fuel for water heating, kWh/month													
	245.0958	216.2592	228.5022	197.4664	189.1445	167.6136	163.2693	171.4742	175.2522	198.1196	214.1629	241.8042	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.9745	8.1060	8.9745	8.6850	8.9745	8.6850	8.9745	8.9745	8.6850	8.9745	8.6850	8.9745	(231)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-32.4628	-46.1663	-67.0260	-76.0921	-82.5924	-77.3082	-76.3364	-71.7759	-63.7727	-53.0970	-35.8197	-28.0112	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-17.6237	-37.4136	-75.3203	-114.6799	-153.0904	-154.4055	-152.3151	-127.9980	-92.6904	-53.7489	-23.5901	-13.9027	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1186.6820	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2408.1643	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	105.6671	(231)
Electricity for lighting (calculated in Appendix L)	174.7141	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1727.2394	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2147.9882	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1186.6820	3.6400	43.1952	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2408.1643	3.6400	87.6572	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)

Pumps, fans and electric keep-hot	105.6671	16.4900	17.4245	(249)
Energy for lighting	174.7141	16.4900	28.8104	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-710.4606	16.4900	-117.1550	
PV Unit electricity exported	-1016.7788	5.5900	-56.8379	
Total			-173.9929	(252)
Total energy cost			95.0944	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.2938	(257)
SAP value		95.2374	
SAP rating (Section 12)		95	(258)
SAP band		A	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1186.6820	0.2100	249.2032	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2408.1643	0.2100	505.7145	(264)
Space and water heating			754.9177	(265)
Pumps, fans and electric keep-hot	105.6671	0.1387	14.6573	(267)
Energy for lighting	174.7141	0.1443	25.2167	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-710.4606	0.1344	-95.4817	
PV Unit electricity exported	-1016.7788	0.1256	-127.6612	
Total			-223.1429	(269)
Total CO2, kg/year			571.6488	(272)
CO2 emissions per m2			7.9900	(273)
EI value			93.4259	
EI rating			93	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825 (42)
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495 (42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042 (42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046 (42c)
Average daily hot water use (litres/day)												117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2411	12.8517	14.2046	13.6953	14.1194	13.6313	14.0649	14.0820	13.6472	14.1396	13.7325	14.2344	(61)
Total heat required for water heating calculated for each month	216.1526	190.5183	200.8718	173.0558	165.3199	146.3266	142.5341	149.6970	152.9952	173.7579	188.6060	213.3336	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	216.1526	190.5183	200.8718	173.0558	165.3199	146.3266	142.5341	149.6970	152.9952	173.7579	188.6060	213.3336	(64)
										Total per year (kWh/year) = Sum(64)m =		2113.1688	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	70.6958	62.2871	65.6180	56.4112	53.8040	47.5290	46.2322	48.6125	49.7450	56.6080	61.5786	69.7591	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	95.0213	92.6891	88.1962	78.3489	72.3172	66.0125	62.1401	65.3394	69.0903	76.0860	85.5258	93.7622	(72)
Total internal gains	519.1090	517.1217	500.6888	469.8158	439.3067	408.6315	392.2216	395.0760	410.7669	441.7882	475.7055	505.3124	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

				m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c		factor Table 6d			W	
East				9.8900	23.7835	0.6800	0.7000		0.7700			77.5911	(76)
East				2.0370	23.7835	0.6800	0.7000		0.7700			15.9811	(76)
Solar gains	93.5722	162.6475	263.5188	387.8277	457.1329	501.7079	468.7900	411.0428	323.2212	203.5286	114.9325	77.3917	(83)
Total gains	612.6812	679.7691	764.2076	857.6436	896.4396	910.3394	861.0116	806.1188	733.9881	645.3168	590.6380	582.7041	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area	0.9593	0.9335	0.8635	0.7325	0.5639	0.3754	0.2680	0.3007	0.5212	0.7893	0.9297	0.9670	(86)
MIT	20.1871	20.3616	20.6412	20.8628	20.9668	20.9963	20.9995	20.9990	20.9823	20.8368	20.4692	20.1230	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house	0.9517	0.9217	0.8417	0.6978	0.5193	0.3263	0.2151	0.2444	0.4642	0.7505	0.9151	0.9606	(89)
MIT 2	19.2973	19.5122	19.8475	20.0964	20.2018	20.2269	20.2289	20.2287	20.2169	20.0758	19.6486	19.2177	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.5996	19.8008	20.1172	20.3568	20.4618	20.4883	20.4907	20.4904	20.4769	20.3344	19.9274	19.5253	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.4496	19.6508	19.9672	20.2068	20.3118	20.3383	20.3407	20.3404	20.3269	20.1844	19.7774	19.3753	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9423	0.9114	0.8335	0.6968	0.5242	0.3333	0.2228	0.2525	0.4716	0.7481	0.9050	0.9518	(94)
Useful gains	577.3041	619.5239	636.9764	597.5769	469.8813	303.3999	191.8359	203.5835	346.1465	482.7632	534.5543	554.6201	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	879.4563	855.8350	767.9697	645.9437	480.4114	304.3104	191.9266	203.7556	351.0181	538.0144	727.1203	880.9758	(97)
Space heating kWh	224.8012	158.8011	97.4590	34.8241	7.8344	0.0000	0.0000	0.0000	0.0000	41.1068	138.6475	242.8086	(98a)
Space heating requirement - total per year (kWh/year)												946.2828	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	224.8012	158.8011	97.4590	34.8241	7.8344	0.0000	0.0000	0.0000	0.0000	41.1068	138.6475	242.8086	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												946.2828	
Space heating per m2										(98c) / (4) =		13.2310	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	224.8012	158.8011	97.4590	34.8241	7.8344	0.0000	0.0000	0.0000	0.0000	41.1068	138.6475	242.8086	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	252.5856	178.4282	109.5045	39.1282	8.8027	0.0000	0.0000	0.0000	0.0000	46.1875	155.7837	272.8187	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	216.1526	190.5183	200.8718	173.0558	165.3199	146.3266	142.5341	149.6970	152.9952	173.7579	188.6060	213.3336	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.1585	88.0647	87.8482	87.5802	87.3755	87.3000	87.3000	87.3000	87.3000	87.6202	88.0122	88.1968	(217)
Fuel for water heating, kWh/month	245.1864	216.3390	228.6579	197.5969	189.2062	167.6136	163.2693	171.4742	175.2522	198.3080	214.2952	241.8837	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.9745	8.1060	8.9745	8.6850	8.9745	8.6850	8.9745	8.9745	8.6850	8.9745	8.6850	8.9745	(231)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-37.1545	-48.0916	-68.9306	-78.4795	-83.4731	-80.4555	-78.8165	-74.9393	-67.2644	-57.0367	-40.2916	-32.2883	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-22.5549	-40.5711	-80.1004	-123.8966	-157.6949	-174.0457	-167.5450	-144.2805	-105.7744	-62.6187	-29.4994	-17.9519	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1063.2391	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	87.3000	
Water heating fuel used	2409.0827	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	105.6671	(231)
Electricity for lighting (calculated in Appendix L)	174.7141	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1873.7550	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1878.9481	(238)

10a. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1063.2391	6.5500	69.6422	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2409.0827	6.5500	157.7949	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	105.6671	28.4300	30.0412	(249)
Energy for lighting	174.7141	28.4300	49.6712	(250)
Additional standing charges			104.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-747.2216	28.4300	-212.4351	
PV Unit electricity exported	-1126.5333	5.8100	-65.4516	
Total			-277.8867	(252)
Total energy cost			133.2628	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1063.2391	0.2100	223.2802	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2409.0827	0.2100	505.9074	(264)
Space and water heating			729.1876	(265)
Pumps, fans and electric keep-hot	105.6671	0.1387	14.6573	(267)
Energy for lighting	174.7141	0.1443	25.2167	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-747.2216	0.1347	-100.6450	
PV Unit electricity exported	-1126.5333	0.1256	-141.5252	
Total			-242.1702	(269)
Total CO2, kg/year			526.8914	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1063.2391	1.1300	1201.4602	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2409.0827	1.1300	2722.2634	(278)
Space and water heating			3923.7236	(279)
Pumps, fans and electric keep-hot	105.6671	1.5128	159.8533	(281)
Energy for lighting	174.7141	1.5338	267.9824	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-747.2216	1.4978	-1119.1837	
PV Unit electricity exported	-1126.5333	0.4611	-519.3985	
Total			-1638.5822	(283)
Total Primary energy kWh/year			2712.9770	(286)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.80	**TER**	10.88
Environmental	99 A	**% DER < TER**			83.46
CO_2 Emissions (t/year)	0.1	**DFEE**	24.15	**TFEE**	32.03
Compliance Check	See BREL	**% DFEE < TFEE**			24.60
% DPER < TPER	57.59	**DPER**	24.05	**TPER**	56.71

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 3.6151 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
										Total per year (kWh/year) = Sum(64)m =		2597.3645	(64)
12Total per year (kWh/year)												2597	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.6996	119.2388	107.6996	111.2896	107.6996	111.2896	107.6996	107.6996	111.2896	107.6996	111.2896	107.6996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains	515.4281	526.7231	505.4479	488.0289	464.3062	448.3397	432.0236	433.1332	445.7187	460.2911	487.4158	505.3106	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8900	19.6403	0.6800	0.7000	0.7700	64.0743	(76)
East	2.0370	19.6403	0.6800	0.7000	0.7700	13.1971	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	77.2714	151.1592	248.9377	363.0608	444.9447	455.4800	433.6356	372.4865	289.5249	179.3632	96.3483	63.5442	(83)
Total gains	592.6994	677.8824	754.3856	851.0898	909.2509	903.8197	865.6592	805.6198	735.2435	639.6543	583.7641	568.8548	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9664	0.9381	0.8805	0.7530	0.5845	0.4160	0.3005	0.3371	0.5418	0.8154	0.9387	0.9718	(86)
MIT	20.1176	20.3268	20.5876	20.8394	20.9591	20.9936	20.9990	20.9982	20.9781	20.8000	20.4165	20.0628	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9599	0.9272	0.8610	0.7201	0.5415	0.3672	0.2481	0.2811	0.4859	0.7804	0.9259	0.9664	(89)
MIT 2	19.2106	19.4693	19.7842	20.0710	20.1944	20.2249	20.2286	20.2282	20.2135	20.0358	19.5843	19.1422	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.5188	19.7607	20.0572	20.3321	20.4542	20.4860	20.4904	20.4898	20.4733	20.2954	19.8670	19.4550	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5188	19.7607	20.0572	20.3321	20.4542	20.4860	20.4904	20.4898	20.4733	20.2954	19.8670	19.4550	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9528	0.9195	0.8563	0.7247	0.5543	0.3835	0.2659	0.3001	0.5039	0.7837	0.9189	0.9596	(94)
Useful gains	564.7170	623.3387	645.9790	616.7599	504.0057	346.6426	230.1559	241.7651	370.4730	501.2766	536.4375	545.8828	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	901.3170	880.1092	802.9129	677.0558	518.4613	348.5959	230.4025	242.2160	377.4510	574.2031	756.1163	903.4611	(97)
Space heating kWh													
	250.4305	172.5498	116.7588	43.4131	10.7550	0.0000	0.0000	0.0000	0.0000	54.2573	158.1687	266.0383	(98a)
Space heating requirement - total per year (kWh/year)												1072.3714	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	250.4305	172.5498	116.7588	43.4131	10.7550	0.0000	0.0000	0.0000	0.0000	54.2573	158.1687	266.0383	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1072.3714	
Space heating per m2											(98c) / (4) =	14.9940	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	250.4305	172.5498	116.7588	43.4131	10.7550	0.0000	0.0000	0.0000	0.0000	54.2573	158.1687	266.0383	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	375.6457	258.8247	175.1383	65.1196	16.1324	0.0000	0.0000	0.0000	0.0000	81.3860	237.2531	399.0574	
Space heating requirement													
	375.6457	258.8247	175.1383	65.1196	16.1324	0.0000	0.0000	0.0000	0.0000	81.3860	237.2531	399.0574	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.8619	-24.6522	-41.9801	-54.0165	-62.8534	-60.2005	-59.0498	-53.1061	-43.0156	-30.6311	-17.3392	-12.2904	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.6369	-11.9261	-30.0153	-54.8475	-81.1374	-84.9515	-82.6912	-64.6364	-40.4468	-18.8657	-6.6109	-3.4586	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1608.5572	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3896.0468	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												16.0856	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.6671	(330a)
Total electricity for the above, kWh/year												19.6671	(331)
Electricity for lighting (calculated in Appendix L)												174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4740.7643	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1467.8944	0.1572	67.4187	(367)
Electrical energy for heat distribution (space & water)	16.0856	0.0000	8.0162	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			221.7808	(373)
Space and water heating			221.7808	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	0.1320	-62.5726	
PV Unit electricity exported	-484.2242	0.1214	-58.7607	
Total			-121.3332	(380)
Total CO2, kg/year			128.3923	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.8000	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1467.8944	1.5818	678.5237	(467)
Electrical energy for heat distribution (space & water)	16.0856	0.0000	84.6976	(472)
Overall CO2 factor for heat network			0.4257	(486)
Total CO2 associated with community systems			2343.2993	(473)
Space and water heating			2343.2993	(476)
Pumps, fans and electric keep-hot	19.6671	1.5128	29.7525	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	1.4877	-705.1878	
PV Unit electricity exported	-484.2242	0.4452	-215.5829	
Total			-920.7707	(480)
Total Primary energy kWh/year			1720.2634	(483)
Dwelling Primary energy Rate (DPER)			24.0500	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b) x	2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c) x	2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3264	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3020	0.3264	0.3509	0.3672	0.3836	(22b)
Effective ac	0.5866	0.5833	0.5800	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			11.9270	1.1450	13.6603			(27)
Heatloss floor			35.7600	0.1300	4.6488			(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.1800	6.3023			(29a)
500mm mineral wool	35.7600		35.7600	0.1100	3.9336			(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5850			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.9097 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.0600	0.0500	0.3530
E3 Sill	3.7400	0.0500	0.1870
E4 Jamb	23.3600	0.0500	1.1680
E5 Ground floor (normal)	11.1200	0.1600	1.7792
E6 Intermediate floor within a dwelling	4.0300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.3800	0.0600	0.3828
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	12.9900	0.0800	1.0392
P2 Party wall - Intermediate floor within a dwelling	15.4400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	15.4400	0.1200	1.8528
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.3500	0.0200	0.0470

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.3690 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 38.9540 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.9203	33.7259	33.5352	32.6398	32.4723	31.6925	31.6925	31.5481	31.9929	32.4723	32.8112	33.1655	(38)
Heat transfer coeff	72.8744	72.6799	72.4893	71.5939	71.4264	70.6465	70.6465	70.5021	70.9469	71.4264	71.7653	72.1196	(39)
Average = Sum(39)m / 12 =												71.5931	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0189	1.0162	1.0136	1.0010	0.9987	0.9878	0.9878	0.9858	0.9920	0.9987	1.0034	1.0084	(40)
HLP (average)												1.0010	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

Hot water usage for mixer showers

62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day) 117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	248.5063	219.7523	233.2621	204.4524	197.7953	177.7872	175.0641	182.2099	184.4398	206.2131	219.9654	245.6941	(62)
WWHRS	-28.5673	-25.2652	-26.4562	-21.9068	-20.4164	-17.4704	-16.3757	-17.4139	-18.0756	-21.3091	-24.1406	-28.0383	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
									Total per year (kWh/year) = Sum(64)m =			2229.7066	(64)
12Total per year (kWh/year)												2230	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	104.4115	92.7427	99.3428	89.0609	87.5501	80.1947	79.9919	82.3679	82.4067	90.3490	94.2189	103.4764	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.8362	116.0686	104.8362	108.3307	104.8362	108.3307	104.8362	104.8362	108.3307	104.8362	108.3307	104.8362	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	140.3380	138.0100	133.5252	123.6956	117.6748	111.3815	107.5160	110.7095	114.4537	121.4368	130.8596	139.0812	(72)
Total internal gains													

	506.2293	517.2176	496.2491	478.7347	455.1075	436.0455	419.8249	420.9345	433.4245	451.0924	478.1216	496.1119	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	11.9270	19.6403	0.6300	0.7000	0.7700	71.5897	(76)

Solar gains	71.5897	140.0446	230.6335	336.3652	412.2282	421.9889	401.7506	345.0978	268.2363	166.1747	89.2639	58.8719	(83)
Total gains	577.8190	657.2622	726.8826	815.0999	867.3356	858.0344	821.5755	766.0323	701.6608	617.2671	567.3855	554.9837	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.9557	48.0840	48.2104	48.8134	48.9279	49.4680	49.4680	49.5693	49.2585	48.9279	48.6968	48.4576	
alpha	4.1970	4.2056	4.2140	4.2542	4.2619	4.2979	4.2979	4.3046	4.2839	4.2619	4.2465	4.2305	
util living area	0.9765	0.9592	0.9236	0.8335	0.6896	0.5105	0.3747	0.4173	0.6446	0.8767	0.9586	0.9797	(86)
MIT	19.6811	19.9089	20.2318	20.6207	20.8657	20.9713	20.9939	20.9905	20.9243	20.5905	20.0799	19.6471	(87)
Th 2	20.0676	20.0698	20.0721	20.0825	20.0844	20.0935	20.0935	20.0952	20.0900	20.0844	20.0805	20.0764	(88)
util rest of house	0.9714	0.9508	0.9081	0.8023	0.6391	0.4440	0.2992	0.3379	0.5757	0.8456	0.9486	0.9754	(89)
MIT 2	18.5438	18.8308	19.2316	19.7007	19.9682	20.0749	20.0910	20.0909	20.0351	19.6793	19.0568	18.5072	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	18.9302	19.1971	19.5714	20.0133	20.2732	20.3795	20.3978	20.3965	20.3372	19.9889	19.4044	18.8945	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9302	19.1971	19.5714	20.0133	20.2732	20.3795	20.3978	20.3965	20.3372	19.9889	19.4044	18.8945	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9635	0.9410	0.8983	0.7998	0.6500	0.4654	0.3248	0.3647	0.5952	0.8419	0.9394	0.9681	(94)
Useful gains	556.7074	618.5041	652.9330	651.8923	563.7341	399.3278	266.8216	279.3473	417.6525	519.6993	533.0088	537.2541	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1066.1689	1039.1099	947.5387	795.6428	612.3498	408.2987	268.2979	281.7634	442.5112	670.6156	883.0306	1059.7608	(97)
Space heating kWh	379.0393	282.6471	219.1867	103.5004	36.1701	0.0000	0.0000	0.0000	0.0000	112.2818	252.0157	388.7449	(98a)
Space heating requirement - total per year (kWh/year)												1773.5859	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	379.0393	282.6471	219.1867	103.5004	36.1701	0.0000	0.0000	0.0000	0.0000	112.2818	252.0157	388.7449	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1773.5859	
Space heating per m2											(98c) / (4) =	24.7985	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	379.0393	282.6471	219.1867	103.5004	36.1701	0.0000	0.0000	0.0000	0.0000	112.2818	252.0157	388.7449	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	410.6601	306.2266	237.4720	112.1347	39.1875	0.0000	0.0000	0.0000	0.0000	121.6487	273.0398	421.1754	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.2688	84.8971	84.1904	82.8378	81.1938	79.8000	79.8000	79.8000	79.8000	82.9774	84.6266	85.3452	(217)
Fuel for water heating, kWh/month	257.9361	229.0856	245.6407	220.3650	218.4637	200.8982	198.8576	206.5112	208.4765	222.8366	231.3986	255.0301	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.7829	17.4750	15.7343	11.5277	8.9043	7.2749	8.1228	10.5583	13.7142	17.9938	20.3239	22.3883	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.5568	-47.3592	-68.1531	-76.7310	-82.8400	-77.3720	-76.4273	-72.1080	-64.4904	-54.2111	-36.9141	-29.0069	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-18.8029	-39.5749	-78.6914	-118.2335	-156.3709	-157.1182	-155.2578	-131.4301	-96.3075	-56.5975	-25.1064	-14.8664	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1921.5449	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2695.5000	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	175.8004	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1767.5275	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3111.3177	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1921.5449	0.2100	403.5244	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2695.5000	0.2100	566.0550	(264)
Space and water heating			969.5794	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	175.8004	0.1443	25.3734	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	0.1346	-96.7689	
PV Unit electricity exported	-1048.3576	0.1259	-131.9744	
Total			-228.7433	(269)
Total CO2, kg/year			778.1388	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.8800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1921.5449	1.1300	2171.3457	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2695.5000	1.1300	3045.9150	(278)
Space and water heating			5217.2607	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	175.8004	1.5338	269.6485	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	1.4973	-1076.8103	
PV Unit electricity exported	-1048.3576	0.4621	-484.4365	
Total			-1561.2467	(283)
Total Primary energy kWh/year			4055.7633	(286)
Target Primary Energy Rate (TPER)			56.7100	(287)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.80	**TER**	10.88
Environmental	99 A	**% DER < TER**			83.46
CO_2 Emissions (t/year)	0.1	**DFEE**	24.15	**TFEE**	32.03
Compliance Check	See BREL	**% DFEE < TFEE**			24.60
% DPER < TPER	57.59	**DPER**	24.05	**TPER**	56.71

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2489	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3174	0.3112	0.3049	0.2738	0.2676	0.2365	0.2365	0.2303	0.2489	0.2676	0.2801	0.2925	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

Effective ac	0.5504	0.5484	0.5465	0.5375	0.5358	0.5280	0.5280	0.5265	0.5310	0.5358	0.5392	0.5428	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.8245	31.7114	31.6006	31.0799	30.9825	30.5289	30.5289	30.4450	30.7036	30.9825	31.1795	31.3856	(38)
Heat transfer coeff	62.1367	62.0236	61.9127	61.3920	61.2946	60.8411	60.8411	60.7571	61.0158	61.2946	61.4917	61.6977	(39)

Average = Sum(39)m / 12 = 61.3916

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8688	0.8672	0.8657	0.8584	0.8570	0.8507	0.8507	0.8495	0.8531	0.8570	0.8598	0.8627	(40)
HLP (average)												0.8584	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day) 59.5787 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.0001	63.2172	61.2706	58.8477	56.6862	54.4399	53.9730	55.9157	57.9081	60.2149	62.6593	64.9088	(44)
Energy conte	102.9443	90.0205	94.1707	80.5595	76.3105	66.9402	65.2757	69.2353	71.4064	81.7111	89.2697	101.6316	(45)

Energy content (annual) Total = Sum(45)m = 989.4754

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(64)

Total per year (kWh/year) = Sum(64)m = 841.0541 (64)

12Total per year (kWh/year) 841 (64)

Electric shower(s)

50.0432	44.5889	48.6894	46.4637	47.3355	45.1535	46.6586	47.3355	46.4637	48.6894	47.7738	50.0432	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 569.2384 (64a)

Heat gains from water heating, kWh/month

34.3865	30.2766	32.1836	28.7348	28.0499	25.5132	25.5357	26.5464	26.7898	29.5359	30.9133	34.1075	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.6996	119.2388	107.6996	111.2896	107.6996	111.2896	107.6996	107.6996	111.2896	107.6996	111.2896	107.6996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	46.2184	45.0544	43.2575	39.9095	37.7014	35.4350	34.3222	35.6806	37.2080	39.6988	42.9351	45.8434	(72)
Total internal gains	411.9730	424.4322	405.8448	394.9074	374.9975	363.0578	349.4944	348.7689	359.1376	369.2178	390.1559	402.7375	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8900	19.6403	0.6800	0.7000	0.7700	64.0743	(76)
East	2.0370	19.6403	0.6800	0.7000	0.7700	13.1971	(76)

Solar gains	77.2714	151.1592	248.9377	363.0608	444.9447	455.4800	433.6356	372.4865	289.5249	179.3632	96.3483	63.5442	(83)
Total gains	489.2444	575.5914	654.7825	757.9682	819.9421	818.5378	783.1300	721.2555	648.6625	548.5809	486.5042	466.2817	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.2428	56.3453	56.4462	56.9250	57.0154	57.4404	57.4404	57.5198	57.2760	57.0154	56.8327	56.6429	
alpha	4.7495	4.7564	4.7631	4.7950	4.8010	4.8294	4.8294	4.8347	4.8184	4.8010	4.7888	4.7762	
util living area	0.9849	0.9678	0.9281	0.8190	0.6531	0.4687	0.3406	0.3851	0.6182	0.8834	0.9699	0.9878	(86)

MIT	19.8341	20.0735	20.3912	20.7432	20.9274	20.9879	20.9979	20.9963	20.9578	20.6784	20.1949	19.7899 (87)
Th 2	20.1941	20.1955	20.1968	20.2030	20.2042	20.2096	20.2096	20.2106	20.2075	20.2042	20.2018	20.1994 (88)
util rest of house												
	0.9817	0.9613	0.9142	0.7890	0.6074	0.4134	0.2800	0.3201	0.5569	0.8555	0.9626	0.9851 (89)
MIT 2	19.1299	19.3657	19.6731	20.0013	20.1552	20.2034	20.2089	20.2093	20.1835	19.9530	19.4925	19.0905 (90)
Living area fraction										fLA = Living area / (4) =		0.3398 (91)
MIT	19.3691	19.6062	19.9171	20.2534	20.4176	20.4700	20.4770	20.4767	20.4466	20.1994	19.7312	19.3281 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3691	19.6062	19.9171	20.2534	20.4176	20.4700	20.4770	20.4767	20.4466	20.1994	19.7312	19.3281 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9776	0.9556	0.9086	0.7910	0.6200	0.4318	0.3006	0.3421	0.5759	0.8553	0.9574	0.9815	(94)
Useful gains	478.2776	550.0109	594.9630	599.5662	508.3514	353.4402	235.3777	246.7579	373.5646	469.1850	465.7776	457.6444	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	936.3469	912.1310	830.6888	697.0090	534.3408	357.1366	235.8797	247.6866	387.2400	588.3936	776.7123	933.3703	(97)
Space heating kWh													
	340.8035	243.3448	175.3800	70.1588	19.3361	0.0000	0.0000	0.0000	0.0000	88.6912	223.8729	353.9401	(98a)
Space heating requirement - total per year (kWh/year)												1515.5275	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	340.8035	243.3448	175.3800	70.1588	19.3361	0.0000	0.0000	0.0000	0.0000	88.6912	223.8729	353.9401	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1515.5275	
Space heating per m2											(98c) / (4) =	21.1903	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	571.9062	450.2240	461.7539	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9580	0.9797	0.9694	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	547.8683	441.0946	447.6135	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	911.3212	872.2100	802.0383	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	261.6861	320.7499	263.6921	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	65.4215	80.1875	65.9230	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												211.5320	(107)
Energy for space heating												21.1903	(99)
Energy for space cooling												2.9577	(108)
Total												24.1479	(109)
Fabric Energy Efficiency (DFEE)												24.1	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor		35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3264	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3020	0.3264	0.3509	0.3672	0.3836	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5866	0.5833	0.5800	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			11.9270	1.1450	13.6603			(27)
Heatloss floor			35.7600	0.1300	4.6488			(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.1800	6.3023			(29a)
500mm mineral wool	35.7600		35.7600	0.1100	3.9336			(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5850			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	175.9097	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.0600	0.0500	0.3530
E3 Sill	3.7400	0.0500	0.1870
E4 Jamb	23.3600	0.0500	1.1680
E5 Ground floor (normal)	11.1200	0.1600	1.7792
E6 Intermediate floor within a dwelling	4.0300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.3800	0.0600	0.3828
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	12.9900	0.0800	1.0392
P2 Party wall - Intermediate floor within a dwelling	15.4400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	15.4400	0.1200	1.8528
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.3500	0.0200	0.0470

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.3690	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	38.9540	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.9203	33.7259	33.5352	32.6398	32.4723	31.6925	31.6925	31.5481	31.9929	32.4723	32.8112	33.1655	(38)
Heat transfer coeff													
	72.8744	72.6799	72.4893	71.5939	71.4264	70.6465	70.6465	70.5021	70.9469	71.4264	71.7653	72.1196	(39)
Average = Sum(39)m / 12 =												71.5931	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0189	1.0162	1.0136	1.0010	0.9987	0.9878	0.9878	0.9858	0.9920	0.9987	1.0034	1.0084	(40)
HLP (average)												1.0010	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2825	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses													
	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												59.5787	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	65.0001	63.2172	61.2706	58.8477	56.6862	54.4399	53.9730	55.9157	57.9081	60.2149	62.6593	64.9088	(44)
Energy conte	102.9443	90.0205	94.1707	80.5595	76.3105	66.9402	65.2757	69.2353	71.4064	81.7111	89.2697	101.6316	(45)
Energy content (annual)										Total = Sum(45)m =		989.4754	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(64)
										Total per year (kWh/year) = Sum(64)m =		841.0541	(64)
12Total per year (kWh/year)												841	(64)
Electric shower(s)													
	50.0432	44.5889	48.6894	46.4637	47.3355	45.1535	46.6586	47.3355	46.4637	48.6894	47.7738	50.0432	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		569.2384	(64a)
Heat gains from water heating, kWh/month													
	34.3865	30.2766	32.1836	28.7348	28.0499	25.5132	25.5357	26.5464	26.7898	29.5359	30.9133	34.1075	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	104.8362	116.0686	104.8362	108.3307	104.8362	108.3307	104.8362	104.8362	108.3307	104.8362	108.3307	104.8362 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982 (71)

Water heating gains (Table 5)

	46.2184	45.0544	43.2575	39.9095	37.7014	35.4350	34.3222	35.6806	37.2080	39.6988	42.9351	45.8434 (72)

Total internal gains

	409.1097	421.2621	402.9814	391.9486	372.1341	360.0989	346.6311	345.9056	356.1788	366.3544	387.1971	399.8741 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	11.9270	19.6403	0.6300	0.7000	0.7700	71.5897	(76)

Solar gains	71.5897	140.0446	230.6335	336.3652	412.2282	421.9889	401.7506	345.0978	268.2363	166.1747	89.2639	58.8719 (83)
Total gains	480.6993	561.3066	633.6149	728.3137	784.3622	782.0878	748.3817	691.0034	624.4151	532.5291	476.4610	458.7460 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.9557	48.0840	48.2104	48.8134	48.9279	49.4680	49.4680	49.5693	49.2585	48.9279	48.6968	48.4576	
alpha	4.1970	4.2056	4.2140	4.2542	4.2619	4.2979	4.2979	4.3046	4.2839	4.2619	4.2465	4.2305	
util living area	0.9876	0.9758	0.9493	0.8727	0.7373	0.5536	0.4097	0.4596	0.7015	0.9171	0.9769	0.9897	(86)
MIT	19.5003	19.7416	20.0904	20.5319	20.8255	20.9610	20.9914	20.9862	20.8952	20.4833	19.9208	19.4654	(87)
Th 2	20.0676	20.0698	20.0721	20.0825	20.0844	20.0935	20.0935	20.0952	20.0900	20.0844	20.0805	20.0764	(88)
util rest of house	0.9848	0.9704	0.9380	0.8459	0.6881	0.4836	0.3279	0.3735	0.6325	0.8932	0.9708	0.9874	(89)
MIT 2	18.7025	18.9420	19.2841	19.7080	19.9643	20.0734	20.0907	20.0902	20.0289	19.6747	19.1293	18.6745	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	18.9736	19.2137	19.5580	19.9879	20.2569	20.3750	20.3967	20.3947	20.3232	19.9494	19.3982	18.9432	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9736	19.2137	19.5580	19.9879	20.2569	20.3750	20.3967	20.3947	20.3232	19.9494	19.3982	18.9432	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9805	0.9642	0.9305	0.8428	0.6979	0.5059	0.3556	0.4025	0.6512	0.8891	0.9650	0.9836	(94)
Useful gains	471.3216	541.2028	589.5901	613.8489	547.4295	395.6872	266.1233	278.0989	406.6322	473.4699	459.8083	451.2075	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1069.3277	1040.3166	946.5684	793.8289	611.1905	407.9842	268.2243	281.6317	441.5202	667.7967	882.5843	1063.2751	(97)
Space heating kWh	444.9165	335.4045	265.5919	129.5856	47.4382	0.0000	0.0000	0.0000	0.0000	144.5791	304.3987	455.3783	(98a)
Space heating requirement - total per year (kWh/year)												2127.2927	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	444.9165	335.4045	265.5919	129.5856	47.4382	0.0000	0.0000	0.0000	0.0000	144.5791	304.3987	455.3783	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2127.2927	
Space heating per m2											(98c) / (4) =	29.7440	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	664.0772	522.7842	535.8159	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9032	0.9454	0.9251	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	599.7645	494.2384	495.6975	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	871.9251	834.6712	769.6736	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	195.9556	253.2820	203.8382	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	48.9889	63.3205	50.9596	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												163.2690	(107)
Energy for space heating												29.7440	(99)
Energy for space cooling												2.2828	(108)
Total												32.0269	(109)
Fabric Energy Efficiency (TFEE)												32.0	(109)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.80	**TER**	10.88
Environmental	99 A	**% DER < TER**			83.46
CO_2 Emissions (t/year)	0.1	**DFEE**	24.15	**TFEE**	32.03
Compliance Check	See BREL	**% DFEE < TFEE**			24.60
% DPER < TPER	57.59	**DPER**	24.05	**TPER**	56.71

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 3.6151 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
										Total per year (kWh/year) = Sum(64)m =		2597.3645	(64)
12Total per year (kWh/year)												2597	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.6996	119.2388	107.6996	111.2896	107.6996	111.2896	107.6996	107.6996	111.2896	107.6996	111.2896	107.6996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains	515.4281	526.7231	505.4479	488.0289	464.3062	448.3397	432.0236	433.1332	445.7187	460.2911	487.4158	505.3106	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8900	19.6403	0.6800	0.7000	0.7700	64.0743	(76)
East	2.0370	19.6403	0.6800	0.7000	0.7700	13.1971	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	77.2714	151.1592	248.9377	363.0608	444.9447	455.4800	433.6356	372.4865	289.5249	179.3632	96.3483	63.5442	(83)
Total gains	592.6994	677.8824	754.3856	851.0898	909.2509	903.8197	865.6592	805.6198	735.2435	639.6543	583.7641	568.8548	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9664	0.9381	0.8805	0.7530	0.5845	0.4160	0.3005	0.3371	0.5418	0.8154	0.9387	0.9718	(86)
MIT	20.1176	20.3268	20.5876	20.8394	20.9591	20.9936	20.9990	20.9982	20.9781	20.8000	20.4165	20.0628	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9599	0.9272	0.8610	0.7201	0.5415	0.3672	0.2481	0.2811	0.4859	0.7804	0.9259	0.9664	(89)
MIT 2	19.2106	19.4693	19.7842	20.0710	20.1944	20.2249	20.2286	20.2282	20.2135	20.0358	19.5843	19.1422	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.5188	19.7607	20.0572	20.3321	20.4542	20.4860	20.4904	20.4898	20.4733	20.2954	19.8670	19.4550	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5188	19.7607	20.0572	20.3321	20.4542	20.4860	20.4904	20.4898	20.4733	20.2954	19.8670	19.4550	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9528	0.9195	0.8563	0.7247	0.5543	0.3835	0.2659	0.3001	0.5039	0.7837	0.9189	0.9596	(94)
Useful gains	564.7170	623.3387	645.9790	616.7599	504.0057	346.6426	230.1559	241.7651	370.4730	501.2766	536.4375	545.8828	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	901.3170	880.1092	802.9129	677.0558	518.4613	348.5959	230.4025	242.2160	377.4510	574.2031	756.1163	903.4611	(97)
Space heating kWh													
	250.4305	172.5498	116.7588	43.4131	10.7550	0.0000	0.0000	0.0000	0.0000	54.2573	158.1687	266.0383	(98a)
Space heating requirement - total per year (kWh/year)												1072.3714	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	250.4305	172.5498	116.7588	43.4131	10.7550	0.0000	0.0000	0.0000	0.0000	54.2573	158.1687	266.0383	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1072.3714	
Space heating per m2											(98c) / (4) =	14.9940	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	250.4305	172.5498	116.7588	43.4131	10.7550	0.0000	0.0000	0.0000	0.0000	54.2573	158.1687	266.0383	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	375.6457	258.8247	175.1383	65.1196	16.1324	0.0000	0.0000	0.0000	0.0000	81.3860	237.2531	399.0574	
Space heating requirement													
	375.6457	258.8247	175.1383	65.1196	16.1324	0.0000	0.0000	0.0000	0.0000	81.3860	237.2531	399.0574	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.8619	-24.6522	-41.9801	-54.0165	-62.8534	-60.2005	-59.0498	-53.1061	-43.0156	-30.6311	-17.3392	-12.2904	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.6369	-11.9261	-30.0153	-54.8475	-81.1374	-84.9515	-82.6912	-64.6364	-40.4468	-18.8657	-6.6109	-3.4586	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1608.5572	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3896.0468	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												16.0856	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.6671	(330a)
Total electricity for the above, kWh/year												19.6671	(331)
Electricity for lighting (calculated in Appendix L)												174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4740.7643	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1467.8944	0.1572	67.4187	(367)
Electrical energy for heat distribution (space & water)	16.0856	0.0000	8.0162	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			221.7808	(373)
Space and water heating			221.7808	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	0.1320	-62.5726	
PV Unit electricity exported	-484.2242	0.1214	-58.7607	
Total			-121.3332	(380)
Total CO2, kg/year			128.3923	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.8000	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1467.8944	1.5818	678.5237	(467)
Electrical energy for heat distribution (space & water)	16.0856	0.0000	84.6976	(472)
Overall CO2 factor for heat network			0.4257	(486)
Total CO2 associated with community systems			2343.2993	(473)
Space and water heating			2343.2993	(476)
Pumps, fans and electric keep-hot	19.6671	1.5128	29.7525	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	1.4877	-705.1878	
PV Unit electricity exported	-484.2242	0.4452	-215.5829	
Total			-920.7707	(480)
Total Primary energy kWh/year			1720.2634	(483)
Dwelling Primary energy Rate (DPER)			24.0500	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b) x	2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c) x	2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3264	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3020	0.3264	0.3509	0.3672	0.3836	(22b)
Effective ac	0.5866	0.5833	0.5800	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			11.9270	1.1450	13.6603			(27)
Heatloss floor			35.7600	0.1300	4.6488			(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.1800	6.3023			(29a)
500mm mineral wool	35.7600		35.7600	0.1100	3.9336			(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5850			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.9097 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.0600	0.0500	0.3530
E3 Sill	3.7400	0.0500	0.1870
E4 Jamb	23.3600	0.0500	1.1680
E5 Ground floor (normal)	11.1200	0.1600	1.7792
E6 Intermediate floor within a dwelling	4.0300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.3800	0.0600	0.3828
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	12.9900	0.0800	1.0392
P2 Party wall - Intermediate floor within a dwelling	15.4400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	15.4400	0.1200	1.8528
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.3500	0.0200	0.0470

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.3690 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 38.9540 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.9203	33.7259	33.5352	32.6398	32.4723	31.6925	31.6925	31.5481	31.9929	32.4723	32.8112	33.1655	(38)
Heat transfer coeff	72.8744	72.6799	72.4893	71.5939	71.4264	70.6465	70.6465	70.5021	70.9469	71.4264	71.7653	72.1196	(39)
Average = Sum(39)m / 12 =												71.5931	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0189	1.0162	1.0136	1.0010	0.9987	0.9878	0.9878	0.9858	0.9920	0.9987	1.0034	1.0084	(40)
HLP (average)												1.0010	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

Hot water usage for mixer showers

62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day) 117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	248.5063	219.7523	233.2621	204.4524	197.7953	177.7872	175.0641	182.2099	184.4398	206.2131	219.9654	245.6941	(62)
WWHRS	-28.5673	-25.2652	-26.4562	-21.9068	-20.4164	-17.4704	-16.3757	-17.4139	-18.0756	-21.3091	-24.1406	-28.0383	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
									Total per year (kWh/year) = Sum(64)m =			2229.7066	(64)
12Total per year (kWh/year)												2230	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	104.4115	92.7427	99.3428	89.0609	87.5501	80.1947	79.9919	82.3679	82.4067	90.3490	94.2189	103.4764	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.8362	116.0686	104.8362	108.3307	104.8362	108.3307	104.8362	104.8362	108.3307	104.8362	108.3307	104.8362	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	140.3380	138.0100	133.5252	123.6956	117.6748	111.3815	107.5160	110.7095	114.4537	121.4368	130.8596	139.0812	(72)
Total internal gains													

	506.2293	517.2176	496.2491	478.7347	455.1075	436.0455	419.8249	420.9345	433.4245	451.0924	478.1216	496.1119	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	11.9270	19.6403	0.6300	0.7000	0.7700	71.5897	(76)

Solar gains	71.5897	140.0446	230.6335	336.3652	412.2282	421.9889	401.7506	345.0978	268.2363	166.1747	89.2639	58.8719	(83)
Total gains	577.8190	657.2622	726.8826	815.0999	867.3356	858.0344	821.5755	766.0323	701.6608	617.2671	567.3855	554.9837	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.9557	48.0840	48.2104	48.8134	48.9279	49.4680	49.4680	49.5693	49.2585	48.9279	48.6968	48.4576	
alpha	4.1970	4.2056	4.2140	4.2542	4.2619	4.2979	4.2979	4.3046	4.2839	4.2619	4.2465	4.2305	
util living area	0.9765	0.9592	0.9236	0.8335	0.6896	0.5105	0.3747	0.4173	0.6446	0.8767	0.9586	0.9797	(86)
MIT	19.6811	19.9089	20.2318	20.6207	20.8657	20.9713	20.9939	20.9905	20.9243	20.5905	20.0799	19.6471	(87)
Th 2	20.0676	20.0698	20.0721	20.0825	20.0844	20.0935	20.0935	20.0952	20.0900	20.0844	20.0805	20.0764	(88)
util rest of house	0.9714	0.9508	0.9081	0.8023	0.6391	0.4440	0.2992	0.3379	0.5757	0.8456	0.9486	0.9754	(89)
MIT 2	18.5438	18.8308	19.2316	19.7007	19.9682	20.0749	20.0910	20.0909	20.0351	19.6793	19.0568	18.5072	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	18.9302	19.1971	19.5714	20.0133	20.2732	20.3795	20.3978	20.3965	20.3372	19.9889	19.4044	18.8945	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9302	19.1971	19.5714	20.0133	20.2732	20.3795	20.3978	20.3965	20.3372	19.9889	19.4044	18.8945	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9635	0.9410	0.8983	0.7998	0.6500	0.4654	0.3248	0.3647	0.5952	0.8419	0.9394	0.9681	(94)
Useful gains	556.7074	618.5041	652.9330	651.8923	563.7341	399.3278	266.8216	279.3473	417.6525	519.6993	533.0088	537.2541	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1066.1689	1039.1099	947.5387	795.6428	612.3498	408.2987	268.2979	281.7634	442.5112	670.6156	883.0306	1059.7608	(97)
Space heating kWh	379.0393	282.6471	219.1867	103.5004	36.1701	0.0000	0.0000	0.0000	0.0000	112.2818	252.0157	388.7449	(98a)
Space heating requirement - total per year (kWh/year)												1773.5859	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	379.0393	282.6471	219.1867	103.5004	36.1701	0.0000	0.0000	0.0000	0.0000	112.2818	252.0157	388.7449	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1773.5859	
Space heating per m2											(98c) / (4) =	24.7985	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	379.0393	282.6471	219.1867	103.5004	36.1701	0.0000	0.0000	0.0000	0.0000	112.2818	252.0157	388.7449	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	410.6601	306.2266	237.4720	112.1347	39.1875	0.0000	0.0000	0.0000	0.0000	121.6487	273.0398	421.1754	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.2688	84.8971	84.1904	82.8378	81.1938	79.8000	79.8000	79.8000	79.8000	82.9774	84.6266	85.3452	(217)
Fuel for water heating, kWh/month	257.9361	229.0856	245.6407	220.3650	218.4637	200.8982	198.8576	206.5112	208.4765	222.8366	231.3986	255.0301	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.7829	17.4750	15.7343	11.5277	8.9043	7.2749	8.1228	10.5583	13.7142	17.9938	20.3239	22.3883	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.5568	-47.3592	-68.1531	-76.7310	-82.8400	-77.3720	-76.4273	-72.1080	-64.4904	-54.2111	-36.9141	-29.0069	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-18.8029	-39.5749	-78.6914	-118.2335	-156.3709	-157.1182	-155.2578	-131.4301	-96.3075	-56.5975	-25.1064	-14.8664	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1921.5449	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2695.5000	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	175.8004	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1767.5275	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3111.3177	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1921.5449	0.2100	403.5244	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2695.5000	0.2100	566.0550	(264)
Space and water heating			969.5794	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	175.8004	0.1443	25.3734	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	0.1346	-96.7689	
PV Unit electricity exported	-1048.3576	0.1259	-131.9744	
Total			-228.7433	(269)
Total CO2, kg/year			778.1388	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.8800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1921.5449	1.1300	2171.3457	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2695.5000	1.1300	3045.9150	(278)
Space and water heating			5217.2607	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	175.8004	1.5338	269.6485	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	1.4973	-1076.8103	
PV Unit electricity exported	-1048.3576	0.4621	-484.4365	
Total			-1561.2467	(283)
Total Primary energy kWh/year			4055.7633	(286)
Target Primary Energy Rate (TPER)			56.7100	(287)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.80	**TER**	10.88
Environmental	99 A	**% DER < TER**			83.46
CO_2 Emissions (t/year)	0.1	**DFEE**	24.15	**TFEE**	32.03
Compliance Check	See BREL	**% DFEE < TFEE**			24.60
% DPER < TPER	57.59	**DPER**	24.05	**TPER**	56.71

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												175.9097	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6151	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	30.3121	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
										Total per year (kWh/year) = Sum(64)m =		2597.3645	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains	570.7610	568.7779	552.3532	521.4980	490.9997	463.3358	446.9330	449.7815	465.4657	493.4744	527.3747	556.9668	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8900	19.6403	0.6800	0.7000	0.7700	64.0743	(76)
East	2.0370	19.6403	0.6800	0.7000	0.7700	13.1971	(76)

Solar gains	77.2714	151.1592	248.9377	363.0608	444.9447	455.4800	433.6356	372.4865	289.5249	179.3632	96.3483	63.5442	(83)
Total gains	648.0324	719.9372	801.2909	884.5588	935.9444	918.8159	880.5685	822.2681	754.9906	672.8376	623.7230	620.5110	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area	0.9534	0.9245	0.8589	0.7338	0.5700	0.4094	0.2954	0.3304	0.5289	0.7927	0.9237	0.9610	(86)
MIT	20.2131	20.3897	20.6386	20.8569	20.9633	20.9940	20.9990	20.9983	20.9803	20.8250	20.4762	20.1550	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house	0.9450	0.9118	0.8375	0.7004	0.5275	0.3613	0.2439	0.2754	0.4740	0.7562	0.9086	0.9538	(89)
MIT 2	19.3287	19.5452	19.8428	20.0892	20.1981	20.2252	20.2286	20.2283	20.2151	20.0618	19.6556	19.2567	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.6292	19.8322	20.1132	20.3501	20.4581	20.4864	20.4904	20.4899	20.4750	20.3211	19.9344	19.5619	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6292	19.8322	20.1132	20.3501	20.4581	20.4864	20.4904	20.4899	20.4750	20.3211	19.9344	19.5619	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9373	0.9044	0.8340	0.7059	0.5403	0.3774	0.2614	0.2941	0.4918	0.7608	0.9021	0.9463	(94)
Useful gains	607.3936	651.1154	668.2927	624.3678	505.7312	346.7966	230.1773	241.8109	371.2739	511.9078	562.6498	587.2096	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	907.8587	884.3433	806.2270	678.1206	518.6902	348.6161	230.4054	242.2221	377.5565	575.7256	760.1069	909.7955	(97)
Space heating kWh	223.5460	156.7291	102.6231	38.7020	9.6415	0.0000	0.0000	0.0000	0.0000	47.4804	142.1691	240.0039	(98a)
Space heating requirement - total per year (kWh/year)												960.8953	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	223.5460	156.7291	102.6231	38.7020	9.6415	0.0000	0.0000	0.0000	0.0000	47.4804	142.1691	240.0039	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												960.8953	
Space heating per m2											(98c) / (4) =	13.4353	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	223.5460	156.7291	102.6231	38.7020	9.6415	0.0000	0.0000	0.0000	0.0000	47.4804	142.1691	240.0039	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	335.3190	235.0937	153.9347	58.0530	14.4623	0.0000	0.0000	0.0000	0.0000	71.2207	213.2537	360.0058	
Space heating requirement													
	335.3190	235.0937	153.9347	58.0530	14.4623	0.0000	0.0000	0.0000	0.0000	71.2207	213.2537	360.0058	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.8619	-24.6522	-41.9801	-54.0165	-62.8534	-60.2005	-59.0498	-53.1061	-43.0156	-30.6311	-17.3392	-12.2904	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.6369	-11.9261	-30.0153	-54.8475	-81.1374	-84.9515	-82.6912	-64.6364	-40.4468	-18.8657	-6.6109	-3.4586	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1441.3429	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3896.0468	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												14.4134	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.6671	(330a)
Total electricity for the above, kWh/year												19.6671	(331)
Electricity for lighting (calculated in Appendix L)												174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4573.5501	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1441.3429	4.4400	63.9956	(340a)
Space heating total			63.9956	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3896.0468	4.4400	172.9845	(342a)
Water heating total			172.9845	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	16.4900	3.2431	(349)
Energy for lighting	174.7141	16.4900	28.8104	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	16.4900	-78.1621	
PV Unit electricity exported	-484.2242	5.5900	-27.0681	
Total			-105.2302	(352)
Total energy cost			255.8034	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.7903	(357)
SAP value	87.1888	
SAP rating (Section 12)	87	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1423.3039	0.1572	60.4274	(367)
Electrical energy for heat distribution (space & water)	14.4134	0.0000	7.7540	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			214.5274	(373)
Space and water heating			214.5274	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	0.1320	-62.5726	
PV Unit electricity exported	-484.2242	0.1214	-58.7607	
Total			-121.3332	(380)
Total CO2, kg/year			121.1389	(383)
CO2 emissions per m2			1.6900	(384)
EI value			98.6069	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b)	x 2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c)	x 2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =		0.7750	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =		0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
									Total per year (kWh/year) = Sum(64)m =			2597.3645	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)													
	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains													
	570.7610	568.7779	552.3532	521.4980	490.9997	463.3358	446.9330	449.7815	465.4657	493.4744	527.3747	556.9668	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8900	23.7835	0.6800	0.7000	0.7700	77.5911	(76)
East	2.0370	23.7835	0.6800	0.7000	0.7700	15.9811	(76)

Solar gains	93.5722	162.6475	263.5188	387.8277	457.1329	501.7079	468.7900	411.0428	323.2212	203.5286	114.9325	77.3917	(83)
Total gains	664.3333	731.4254	815.8720	909.3257	948.1326	965.0438	915.7229	860.8244	788.6869	697.0030	642.3072	634.3585	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9458	0.9157	0.8381	0.7028	0.5364	0.3545	0.2520	0.2817	0.4877	0.7525	0.9082	0.9549	(86)
MIT	20.2730	20.4362	20.6919	20.8858	20.9733	20.9971	20.9996	20.9993	20.9867	20.8689	20.5418	20.2126	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9361	0.9017	0.8142	0.6676	0.4931	0.3080	0.2023	0.2289	0.4335	0.7119	0.8905	0.9466	(89)
MIT 2	19.4029	19.6019	19.9048	20.1197	20.2073	20.2274	20.2289	20.2288	20.2200	20.1080	19.7343	19.3286	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.6986	19.8853	20.1723	20.3800	20.4675	20.4889	20.4908	20.4906	20.4805	20.3666	20.0087	19.6290	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6986	19.8853	20.1723	20.3800	20.4675	20.4889	20.4908	20.4906	20.4805	20.3666	20.0087	19.6290	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9284	0.8946	0.8123	0.6747	0.5066	0.3237	0.2192	0.2468	0.4514	0.7195	0.8849	0.9390	(94)
Useful gains	616.7542	654.3562	662.7445	613.5164	480.3688	312.4086	200.7270	212.4866	355.9841	501.4699	568.3460	595.6609	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	894.1989	869.7259	780.1151	656.2023	489.6376	313.2306	200.8149	212.6482	360.1136	548.8046	740.8152	895.9997	(97)
Space heating kWh													
	206.4188	144.7284	87.3238	30.7339	6.8960	0.0000	0.0000	0.0000	0.0000	35.2170	124.1778	223.4521	(98a)
Space heating requirement - total per year (kWh/year)												858.9478	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	206.4188	144.7284	87.3238	30.7339	6.8960	0.0000	0.0000	0.0000	0.0000	35.2170	124.1778	223.4521	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												858.9478	
Space heating per m2											(98c) / (4) =	12.0099	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	206.4188	144.7284	87.3238	30.7339	6.8960	0.0000	0.0000	0.0000	0.0000	35.2170	124.1778	223.4521	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	309.6282	217.0926	130.9856	46.1008	10.3441	0.0000	0.0000	0.0000	0.0000	52.8255	186.2667	335.1781	
Space heating requirement													
	309.6282	217.0926	130.9856	46.1008	10.3441	0.0000	0.0000	0.0000	0.0000	52.8255	186.2667	335.1781	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.7439	-26.4473	-44.1602	-56.7208	-64.1553	-63.6776	-61.8747	-56.5668	-46.5864	-34.0293	-20.3275	-14.7878	(333a)

Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.2546	-13.5179	-33.0849	-60.8523	-85.0852	-97.4411	-92.6154	-74.6748	-47.7624	-22.9670	-8.7029	-4.7110	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1288.4217	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3896.0468	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	12.8842	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(330a)
Total electricity for the above, kWh/year	19.6671	(331)
Electricity for lighting (calculated in Appendix L)	174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4324.1028	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1288.4217	6.5500	84.3916	(340a)
Space heating total			84.3916	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3896.0468	6.5500	255.1911	(342a)
Water heating total			255.1911	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	28.4300	5.5914	(349)
Energy for lighting	174.7141	28.4300	49.6712	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-507.0777	28.4300	-144.1622	
PV Unit electricity exported	-547.6693	5.8100	-31.8196	
Total			-175.9818	(352)
Total energy cost			322.8635	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1382.5249	0.1577	54.1726	(367)
Electrical energy for heat distribution (space & water)	12.8842	0.0000	7.5194	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			208.0380	(373)
Space and water heating			208.0380	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-507.0777	0.1323	-67.0962	
PV Unit electricity exported	-547.6693	0.1214	-66.4868	
Total			-133.5830	(380)
Total CO2, kg/year			102.3997	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1382.5249	1.5837	544.1155	(467)
Electrical energy for heat distribution (space & water)	12.8842	0.0000	79.6573	(472)
Overall CO2 factor for heat network			0.4251	(486)
Total CO2 associated with community systems			2203.8508	(473)
Space and water heating			2203.8508	(476)
Pumps, fans and electric keep-hot	19.6671	1.5128	29.7525	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-507.0777	1.4889	-754.9866	
PV Unit electricity exported	-547.6693	0.4453	-243.8963	
Total			-998.8829	(480)
Total Primary energy kWh/year			1502.7027	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - East

Current energy efficiency rating: B 87
Current environmental impact rating: A 99

N Solar water heating	Recommended
U Solar photovoltaic panels	Already installed
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.4	-£ 47	-26 kg (25.3%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£47	0.36 kg/m²	B 89	A 99
Total Savings	£47	0.36 kg/m²		

Potential energy efficiency rating: B 89
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£55	£78	-£23
Community scheme	£444	£375	£69
Space heating	£194	£217	-£23
Water heating	£255	£187	£69
Lighting	£50	£50	£0
Generated (PV)	-£176	-£177	£1
Total cost of fuels	£323	£276	£47
Total cost of uses	£323	£277	£47
Delivered energy	60 kWh/m²	47 kWh/m²	14 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	21 kWh/m²	17 kWh/m²	4 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120 (1b) - (3b)	
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff													
	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers													
	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths													
	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses													
	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	
Distribution loss (46)m = 0.15 x (45)m													
	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												623.4568	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												623.4568	
Solar input	-0.0000	-16.2208	-58.0195	-79.9223	-105.1350	-97.1484	-96.5940	-84.1560	-57.6291	-28.6318	-0.0000	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	257.1882	211.3732	183.9246	132.9320	101.3423	89.0407	87.1521	106.7357	135.2126	186.2632	228.3672	254.3760	(64)
											Total per year (kWh/year) = Sum(64)m =	1973.9077	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
299.7288 302.8391 295.0013 278.3158 257.2532 237.4574 224.2325 221.1223 228.9600 245.6456 266.7082 286.5040 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 (71)
Water heating gains (Table 5)
149.6734 147.3454 142.8606 133.0310 127.0102 120.7169 116.8514 120.0449 123.7891 130.7722 140.1950 148.4166 (72)
Total internal gains
570.7610 568.7779 552.3532 521.4980 490.9997 463.3358 446.9330 449.7815 465.4657 493.4744 527.3747 556.9668 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8900	19.6403	0.6800	0.7000	0.7700	64.0743	(76)
East	2.0370	19.6403	0.6800	0.7000	0.7700	13.1971	(76)

Solar gains	77.2714	151.1592	248.9377	363.0608	444.9447	455.4800	433.6356	372.4865	289.5249	179.3632	96.3483	63.5442	(83)
Total gains	648.0324	719.9372	801.2909	884.5588	935.9444	918.8159	880.5685	822.2681	754.9906	672.8376	623.7230	620.5110	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area	0.9534	0.9245	0.8589	0.7338	0.5700	0.4094	0.2954	0.3304	0.5289	0.7927	0.9237	0.9610	(86)
MIT	20.2131	20.3897	20.6386	20.8569	20.9633	20.9940	20.9990	20.9983	20.9803	20.8250	20.4762	20.1550	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house	0.9450	0.9118	0.8375	0.7004	0.5275	0.3613	0.2439	0.2754	0.4740	0.7562	0.9086	0.9538	(89)
MIT 2	19.3287	19.5452	19.8428	20.0892	20.1981	20.2252	20.2286	20.2283	20.2151	20.0618	19.6556	19.2567	(90)
Living area fraction									fLA = Living area / (4) =			0.3398	(91)
MIT	19.6292	19.8322	20.1132	20.3501	20.4581	20.4864	20.4904	20.4899	20.4750	20.3211	19.9344	19.5619	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6292	19.8322	20.1132	20.3501	20.4581	20.4864	20.4904	20.4899	20.4750	20.3211	19.9344	19.5619	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9373	0.9044	0.8340	0.7059	0.5403	0.3774	0.2614	0.2941	0.4918	0.7608	0.9021	0.9463	(94)
Useful gains	607.3936	651.1154	668.2927	624.3678	505.7312	346.7966	230.1773	241.8109	371.2739	511.9078	562.6498	587.2096	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	907.8587	884.3433	806.2270	678.1206	518.6902	348.6161	230.4054	242.2221	377.5565	575.7256	760.1069	909.7955	(97)
Space heating kWh	223.5460	156.7291	102.6231	38.7020	9.6415	0.0000	0.0000	0.0000	0.0000	47.4804	142.1691	240.0039	(98a)
Space heating requirement - total per year (kWh/year)												960.8953	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	223.5460	156.7291	102.6231	38.7020	9.6415	0.0000	0.0000	0.0000	0.0000	47.4804	142.1691	240.0039	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												960.8953	
Space heating per m2											(98c) / (4) =	13.4353	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement
223.5460 156.7291 102.6231 38.7020 9.6415 0.0000 0.0000 0.0000 0.0000 47.4804 142.1691 240.0039 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50
307a 335.3190 235.0937 153.9347 58.0530 14.4623 0.0000 0.0000 0.0000 0.0000 71.2207 213.2537 360.0058
Space heating requirement
335.3190 235.0937 153.9347 58.0530 14.4623 0.0000 0.0000 0.0000 0.0000 71.2207 213.2537 360.0058 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)

Water heating
Annual water heating requirement
257.1882 211.3732 183.9246 132.9320 101.3423 89.0407 87.1521 106.7357 135.2126 186.2632 228.3672 254.3760 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50
310a 385.7824 317.0598 275.8868 199.3980 152.0134 133.5610 130.7281 160.1036 202.8189 279.3948 342.5508 381.5640
Water heating fuel
385.7824 317.0598 275.8868 199.3980 152.0134 133.5610 130.7281 160.1036 202.8189 279.3948 342.5508 381.5640 (310)
Cooling System Energy Efficiency Ratio 0.0000 (314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (315)
Pumps and Fa 8.4649 7.6457 8.4649 8.1918 8.4649 8.1918 8.4649 8.4649 8.1918 8.4649 8.1918 8.4649 (331)
Lighting 21.6483 17.3671 15.6371 11.4564 8.8493 7.2299 8.0726 10.4931 13.6295 17.8826 20.1983 22.2500 (332)
Electricity generated by PVs (Appendix M) (negative quantity)
(333a)m -14.9141 -24.7783 -42.2847 -54.5605 -63.6655 -61.0911 -59.9595 -53.8492 -43.4933 -30.8592 -17.4193 -12.3313 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)

(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5846	-11.8000	-29.7107	-54.3035	-80.3253	-84.0609	-81.7814	-63.8933	-39.9691	-18.6376	-6.5308	-3.4177	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1441.3429	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2960.8616	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	14.4134	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.6671	(331)
Electricity for lighting (calculated in Appendix L)	174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3718.3648	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1441.3429	4.4400	63.9956	(340a)
Space heating total			63.9956	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2960.8616	4.4400	131.4623	(342a)
Water heating total			131.4623	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	16.4900	3.2431	(349)
Pump for solar water heating	80.0000	16.4900	13.1920	(349)
Energy for lighting	174.7141	16.4900	28.8104	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-479.2061	16.4900	-79.0211	
PV Unit electricity exported	-479.0149	5.5900	-26.7769	
Total			-105.7980	(352)
Total energy cost			226.9053	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.7010	(357)
SAP value	88.6360	
SAP rating (Section 12)	89	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1173.9212	0.1572	60.4274	(367)
Electrical energy for heat distribution (space & water)	14.4134	0.0000	6.5614	(372)
Overall CO2 factor for heat network			0.0412	(386)
Total CO2 associated with community systems			181.5312	(373)
Space and water heating			181.5312	(376)
Pumps, fans and electric keep-hot	99.6671	0.1387	13.8251	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-479.2061	0.1320	-63.2320	
PV Unit electricity exported	-479.0149	0.1214	-58.1324	
Total			-121.3643	(380)
Total CO2, kg/year			99.2085	(383)
CO2 emissions per m2			1.3900	(384)
EI value			98.8591	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120 (1b) - (3b)	
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)

Average = Sum(39)m / 12 =	59.2241

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2825 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day)	117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	

Distribution loss (46)m = 0.15 x (45)m

30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:
Store volume 110.0000 (47)
  b) If manufacturer declared loss factor is not known :
  Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
  Volume factor from Table 2a 1.0294 (52)
  Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 (56)
If cylinder contains dedicated solar storage
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 (57)
Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120 23.2624 (59)
Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)
Total heat required for water heating calculated for each month
257.1882 227.5940 241.9440 212.8542 206.4772 186.1891 183.7460 190.8918 192.8417 214.8950 228.3672 254.3760 (62)
WWHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63a)
PV diverter -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 (63b)
Aperture area of solar collector 3.0000 (H1)
Zero-loss collector efficiency 0.8000 (H2)
Collector linear heat loss coefficient 1.8000 (H3)
Collector 2nd order heat loss coefficient 0.0000 (H4)
Collector loop efficiency 0.9000 (H5)
Incidence angle modifier 1.0000 (H6)
Overshading factor 0.8000 (H8)
Overall heat loss coefficient of system 6.5000 (H10)
Heat loss coefficient of collector loop 3.9667 (H11)
Dedicated solar storage volume 75.0000 (H12)
Effective solar volume 75.0000 (H14)
Reference volume 225.0000 (H15)
Storage tank correction coefficient 1.3161 (H16)
Heat delivered to hot water 697.5235 (H24)
Heat delivered to space heating 0.0000 (H29)
Solar input 697.5235
Solar input -0.3007 -19.8927 -63.0021 -86.8105 -108.5158 -108.4282 -105.5589 -94.8548 -67.4076 -37.8155 -4.9366 -0.0000 (63c)
FGHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63d)
Output from w/h
256.8875 207.7013 178.9419 126.0438 97.9614 77.7608 78.1872 96.0370 125.4340 177.0795 223.4306 254.3760 (64)
Total per year (kWh/year) = Sum(64)m = 1899.8410 (64)
Electric shower(s)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month
111.3570 99.0161 106.2883 95.7823 94.4956 86.9162 86.9375 89.3134 89.1281 97.2945 100.9404 110.4219 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)

Water heating gains (Table 5)

	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)

Total internal gains

	570.7610	568.7779	552.3532	521.4980	490.9997	463.3358	446.9330	449.7815	465.4657	493.4744	527.3747	556.9668	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8900	23.7835	0.6800	0.7000	0.7700	77.5911	(76)
East	2.0370	23.7835	0.6800	0.7000	0.7700	15.9811	(76)

Solar gains	93.5722	162.6475	263.5188	387.8277	457.1329	501.7079	468.7900	411.0428	323.2212	203.5286	114.9325	77.3917	(83)
Total gains	664.3333	731.4254	815.8720	909.3257	948.1326	965.0438	915.7229	860.8244	788.6869	697.0030	642.3072	634.3585	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9458	0.9157	0.8381	0.7028	0.5364	0.3545	0.2520	0.2817	0.4877	0.7525	0.9082	0.9549	(86)
MIT	20.2730	20.4362	20.6919	20.8858	20.9733	20.9971	20.9996	20.9993	20.9867	20.8689	20.5418	20.2126	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9361	0.9017	0.8142	0.6676	0.4931	0.3080	0.2023	0.2289	0.4335	0.7119	0.8905	0.9466	(89)
MIT 2	19.4029	19.6019	19.9048	20.1197	20.2073	20.2274	20.2289	20.2288	20.2200	20.1080	19.7343	19.3286	(90)
Living area fraction									fLA = Living area / (4) =			0.3398	(91)
MIT	19.6986	19.8853	20.1723	20.3800	20.4675	20.4889	20.4908	20.4906	20.4805	20.3666	20.0087	19.6290	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6986	19.8853	20.1723	20.3800	20.4675	20.4889	20.4908	20.4906	20.4805	20.3666	20.0087	19.6290	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9284	0.8946	0.8123	0.6747	0.5066	0.3237	0.2192	0.2468	0.4514	0.7195	0.8849	0.9390	(94)
Useful gains	616.7542	654.3562	662.7445	613.5164	480.3688	312.4086	200.7270	212.4866	355.9841	501.4699	568.3460	595.6609	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	894.1989	869.7259	780.1151	656.2023	489.6376	313.2306	200.8149	212.6482	360.1136	548.8046	740.8152	895.9997	(97)
Space heating kWh	206.4188	144.7284	87.3238	30.7339	6.8960	0.0000	0.0000	0.0000	0.0000	35.2170	124.1778	223.4521	(98a)
Space heating requirement - total per year (kWh/year)												858.9478	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	206.4188	144.7284	87.3238	30.7339	6.8960	0.0000	0.0000	0.0000	0.0000	35.2170	124.1778	223.4521	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												858.9478	
Space heating per m2											(98c) / (4) =	12.0099	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement													
	206.4188	144.7284	87.3238	30.7339	6.8960	0.0000	0.0000	0.0000	0.0000	35.2170	124.1778	223.4521	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	309.6282	217.0926	130.9856	46.1008	10.3441	0.0000	0.0000	0.0000	0.0000	52.8255	186.2667	335.1781	
Space heating requirement													
	309.6282	217.0926	130.9856	46.1008	10.3441	0.0000	0.0000	0.0000	0.0000	52.8255	186.2667	335.1781	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement													
	256.8875	207.7013	178.9419	126.0438	97.9614	77.7608	78.1872	96.0370	125.4340	177.0795	223.4306	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.3312	311.5520	268.4128	189.0656	146.9421	116.6412	117.2807	144.0554	188.1511	265.6193	335.1459	381.5640	
Water heating fuel													
	385.3312	311.5520	268.4128	189.0656	146.9421	116.6412	117.2807	144.0554	188.1511	265.6193	335.1459	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	8.4649	7.6457	8.4649	8.1918	8.4649	8.1918	8.4649	8.4649	8.1918	8.4649	8.1918	8.4649	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.8133	-26.5889	-44.4924	-57.3150	-64.9996	-64.6716	-62.8712	-57.4038	-47.1375	-34.3017	-20.4312	-14.8426	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.1852	-13.3763	-32.7527	-60.2581	-84.2408	-96.4471	-91.6189	-73.8378	-47.2113	-22.6946	-8.5992	-4.6561	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1288.4217	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2849.7616	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	12.8842	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.6671	(331)
Electricity for lighting (calculated in Appendix L)	174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3357.8175	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1288.4217	6.5500	84.3916	(340a)
Space heating total			84.3916	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2849.7616	6.5500	186.6594	(342a)
Water heating total			186.6594	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	28.4300	5.5914	(349)
Pump for solar water heating	80.0000	28.4300	22.7440	(349)
Energy for lighting	174.7141	28.4300	49.6712	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-512.8689	28.4300	-145.8086	
PV Unit electricity exported	-541.8781	5.8100	-31.4831	
Total			-177.2917	(352)
Total energy cost			275.7659	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1103.5155	0.1577	54.1726	(367)
Electrical energy for heat distribution (space & water)	12.8842	0.0000	6.1833	(372)
Overall CO2 factor for heat network			0.0413	(386)
Total CO2 associated with community systems			171.0726	(373)
Space and water heating			171.0726	(376)
Pumps, fans and electric keep-hot	99.6671	0.1387	13.8251	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-512.8689	0.1323	-67.8299	
PV Unit electricity exported	-541.8781	0.1214	-65.7869	
Total			-133.6168	(380)
Total CO2, kg/year			76.4974	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1103.5155	1.5837	544.1155	(467)
Electrical energy for heat distribution (space & water)	12.8842	0.0000	64.2599	(472)
Overall CO2 factor for heat network			0.4296	(486)
Total CO2 associated with community systems			1777.8559	(473)
Space and water heating			1777.8559	(476)
Pumps, fans and electric keep-hot	99.6671	1.5128	150.7765	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-512.8689	1.4887	-763.4867	
PV Unit electricity exported	-541.8781	0.4454	-241.3296	
Total			-1004.8163	(480)
Total Primary energy kWh/year			1191.7985	(483)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.95	**TER**	11.53
Environmental	98 A	**% DER < TER**			83.09
CO_2 Emissions (t/year)	0.11	**DFEE**	26.34	**TFEE**	34.60
Compliance Check	See BREL	**% DFEE < TFEE**			23.88
% DPER < TPER	57.30	**DPER**	25.70	**TPER**	60.19

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.2825 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:		
Store volume		110.0000 (47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)		0.0152 (51)
Volume factor from Table 2a		1.0294 (52)
Temperature factor from Table 2b		0.6000 (53)
Enter (49) or (54) in (55)		1.0327 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
										Total per year (kWh/year) = Sum(64)m =		2597.3645	(64)
12Total per year (kWh/year)												2597	(64)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.6996	119.2388	107.6996	111.2896	107.6996	111.2896	107.6996	107.6996	111.2896	107.6996	111.2896	107.6996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains	515.4281	526.7231	505.4479	488.0289	464.3062	448.3397	432.0236	433.1332	445.7187	460.2911	487.4158	505.3106	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.8900	10.6334	0.6800	0.7000	0.7700	34.6903	(74)
North	2.0370	10.6334	0.6800	0.7000	0.7700	7.1450	(74)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	41.8353	79.9495	135.8537	218.2158	293.9567	314.6894	293.8028	233.0950	163.3401	95.1694	51.6093	34.8760	(83)
Total gains	557.2634	606.6726	641.3016	706.2448	758.2629	763.0291	725.8264	666.2282	609.0588	555.4605	539.0251	540.1866	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9734	0.9581	0.9272	0.8375	0.6781	0.4887	0.3575	0.4060	0.6369	0.8714	0.9535	0.9769	(86)
MIT	20.0533	20.2109	20.4400	20.7347	20.9224	20.9870	20.9977	20.9958	20.9561	20.7204	20.3445	20.0096	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9681	0.9500	0.9133	0.8095	0.6332	0.4327	0.2956	0.3393	0.5763	0.8422	0.9432	0.9723	(89)
MIT 2	19.1305	19.3274	19.6105	19.9591	20.1612	20.2204	20.2280	20.2271	20.1965	19.9504	19.4970	19.0756	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.4440	19.6276	19.8924	20.2226	20.4198	20.4809	20.4896	20.4883	20.4546	20.2120	19.7849	19.3929	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4440	19.6276	19.8924	20.2226	20.4198	20.4809	20.4896	20.4883	20.4546	20.2120	19.7849	19.3929	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9615	0.9426	0.9064	0.8092	0.6447	0.4512	0.3166	0.3619	0.5946	0.8415	0.9362	0.9661	(94)
Useful gains	535.8261	571.8341	581.2604	571.5084	488.8440	344.3005	229.8090	241.0767	362.1579	467.4280	504.6300	521.8869	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	896.8902	872.2262	793.1512	670.5706	516.4219	348.2892	230.3558	242.1240	376.3452	569.2623	751.2543	899.7873	(97)
Space heating kWh													
	268.6317	201.8635	157.6468	71.3248	20.5179	0.0000	0.0000	0.0000	0.0000	75.7647	177.5695	281.1580	(98a)
Space heating requirement - total per year (kWh/year)												1254.4769	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	268.6317	201.8635	157.6468	71.3248	20.5179	0.0000	0.0000	0.0000	0.0000	75.7647	177.5695	281.1580	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1254.4769	
Space heating per m2											(98c) / (4) =	17.5402	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	268.6317	201.8635	157.6468	71.3248	20.5179	0.0000	0.0000	0.0000	0.0000	75.7647	177.5695	281.1580	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	402.9475	302.7953	236.4702	106.9873	30.7769	0.0000	0.0000	0.0000	0.0000	113.6471	266.3542	421.7369	
Space heating requirement													
	402.9475	302.7953	236.4702	106.9873	30.7769	0.0000	0.0000	0.0000	0.0000	113.6471	266.3542	421.7369	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.8619	-24.6522	-41.9801	-54.0165	-62.8534	-60.2005	-59.0498	-53.1061	-43.0156	-30.6311	-17.3392	-12.2904	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.6369	-11.9261	-30.0153	-54.8475	-81.1374	-84.9515	-82.6912	-64.6364	-40.4468	-18.8657	-6.6109	-3.4586	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1881.7154	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3896.0468	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												18.8172	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.6671	(330a)
Total electricity for the above, kWh/year												19.6671	(331)
Electricity for lighting (calculated in Appendix L)												174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5013.9226	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1540.7366	0.1563	78.4235	(367)
Electrical energy for heat distribution (space & water)	18.8172	0.0000	8.4289	(372)
Overall CO2 factor for heat network			0.0404	(386)
Total CO2 associated with community systems			233.1982	(373)
Space and water heating			233.1982	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	0.1320	-62.5726	
PV Unit electricity exported	-484.2242	0.1214	-58.7607	
Total			-121.3332	(380)
Total CO2, kg/year			139.8097	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.9500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1540.7366	1.5786	792.1299	(467)
Electrical energy for heat distribution (space & water)	18.8172	0.0000	88.9578	(472)
Overall CO2 factor for heat network			0.4260	(486)
Total CO2 associated with community systems			2461.1657	(473)
Space and water heating			2461.1657	(476)
Pumps, fans and electric keep-hot	19.6671	1.5128	29.7525	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	1.4877	-705.1878	
PV Unit electricity exported	-484.2242	0.4452	-215.5829	
Total			-920.7707	(480)
Total Primary energy kWh/year			1838.1298	(483)
Dwelling Primary energy Rate (DPER)			25.7000	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b) x	2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c) x	2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3264	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3020	0.3264	0.3509	0.3672	0.3836	(22b)
Effective ac	0.5866	0.5833	0.5800	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			11.9270	1.1450	13.6603			(27)
Heatloss floor			35.7600	0.1300	4.6488			(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.1800	6.3023			(29a)
500mm mineral wool	35.7600		35.7600	0.1100	3.9336			(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5850			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.9097 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.0600	0.0500	0.3530
E3 Sill	3.7400	0.0500	0.1870
E4 Jamb	23.3600	0.0500	1.1680
E5 Ground floor (normal)	11.1200	0.1600	1.7792
E6 Intermediate floor within a dwelling	4.0300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.3800	0.0600	0.3828
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	12.9900	0.0800	1.0392
P2 Party wall - Intermediate floor within a dwelling	15.4400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	15.4400	0.1200	1.8528
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.3500	0.0200	0.0470

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.3690 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 38.9540 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.9203	33.7259	33.5352	32.6398	32.4723	31.6925	31.6925	31.5481	31.9929	32.4723	32.8112	33.1655	(38)
Heat transfer coeff	72.8744	72.6799	72.4893	71.5939	71.4264	70.6465	70.6465	70.5021	70.9469	71.4264	71.7653	72.1196	(39)
Average = Sum(39)m / 12 =												71.5931	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0189	1.0162	1.0136	1.0010	0.9987	0.9878	0.9878	0.9858	0.9920	0.9987	1.0034	1.0084	(40)
HLP (average)												1.0010	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

Hot water usage for mixer showers

62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day) 117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	248.5063	219.7523	233.2621	204.4524	197.7953	177.7872	175.0641	182.2099	184.4398	206.2131	219.9654	245.6941	(62)
WWHRS	-28.5673	-25.2652	-26.4562	-21.9068	-20.4164	-17.4704	-16.3757	-17.4139	-18.0756	-21.3091	-24.1406	-28.0383	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
									Total per year (kWh/year) = Sum(64)m =			2229.7066	(64)
12Total per year (kWh/year)												2230	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	104.4115	92.7427	99.3428	89.0609	87.5501	80.1947	79.9919	82.3679	82.4067	90.3490	94.2189	103.4764	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.8362	116.0686	104.8362	108.3307	104.8362	108.3307	104.8362	104.8362	108.3307	104.8362	108.3307	104.8362	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	140.3380	138.0100	133.5252	123.6956	117.6748	111.3815	107.5160	110.7095	114.4537	121.4368	130.8596	139.0812	(72)
Total internal gains													

	506.2293	517.2176	496.2491	478.7347	455.1075	436.0455	419.8249	420.9345	433.4245	451.0924	478.1216	496.1119	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	11.9270	10.6334	0.6300	0.7000	0.7700	38.7592	(74)

Solar gains	38.7592	74.0708	125.8644	202.1706	272.3423	291.5505	272.1996	215.9557	151.3298	88.1716	47.8145	32.3116	(83)
Total gains	544.9885	591.2884	622.1136	680.9053	727.4497	727.5960	692.0245	636.8902	584.7543	539.2640	525.9361	528.4235	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.9557	48.0840	48.2104	48.8134	48.9279	49.4680	49.4680	49.5693	49.2585	48.9279	48.6968	48.4576	
alpha	4.1970	4.2056	4.2140	4.2542	4.2619	4.2979	4.2979	4.3046	4.2839	4.2619	4.2465	4.2305	
util living area													
	0.9807	0.9711	0.9521	0.8930	0.7715	0.5883	0.4411	0.4951	0.7326	0.9141	0.9677	0.9829	(86)
MIT	19.6210	19.7952	20.0719	20.4759	20.7907	20.9510	20.9887	20.9817	20.8757	20.4926	20.0090	19.5978	(87)
Th 2	20.0676	20.0698	20.0721	20.0825	20.0844	20.0935	20.0935	20.0952	20.0900	20.0844	20.0805	20.0764	(88)
util rest of house													
	0.9765	0.9649	0.9413	0.8690	0.7241	0.5161	0.3539	0.4039	0.6647	0.8896	0.9596	0.9792	(89)
MIT 2	18.4684	18.6896	19.0383	19.5385	19.8965	20.0606	20.0886	20.0866	19.9952	19.5693	18.9695	18.4451	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	18.8600	19.0652	19.3895	19.8570	20.2003	20.3631	20.3944	20.3907	20.2944	19.8830	19.3227	18.8368	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8600	19.0652	19.3895	19.8570	20.2003	20.3631	20.3944	20.3907	20.2944	19.8830	19.3227	18.8368	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9694	0.9562	0.9316	0.8622	0.7305	0.5383	0.3833	0.4343	0.6810	0.8833	0.9510	0.9725	(94)
Useful gains	528.2862	565.4113	579.5564	587.1059	531.4294	391.6383	265.2542	276.6275	398.2342	476.3124	500.1831	513.9056	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1061.0512	1029.5290	934.3479	784.4528	607.1472	407.1430	268.0601	281.3533	439.4726	663.0505	877.1664	1055.5966	(97)
Space heating kWh													
	396.3771	311.8871	263.9649	142.0898	56.3340	0.0000	0.0000	0.0000	0.0000	138.9331	271.4279	403.0181	(98a)
Space heating requirement - total per year (kWh/year)												1984.0320	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	396.3771	311.8871	263.9649	142.0898	56.3340	0.0000	0.0000	0.0000	0.0000	138.9331	271.4279	403.0181	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1984.0320	
Space heating per m2											(98c) / (4) =	27.7409	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	396.3771	311.8871	263.9649	142.0898	56.3340	0.0000	0.0000	0.0000	0.0000	138.9331	271.4279	403.0181	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	429.4443	337.9058	285.9858	153.9434	61.0336	0.0000	0.0000	0.0000	0.0000	150.5234	294.0714	436.6393	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.3643	85.1131	84.6082	83.5043	81.7983	79.8000	79.8000	79.8000	79.8000	83.4276	84.7922	85.4216	(217)
Fuel for water heating, kWh/month													
	257.6475	228.5042	244.4279	218.6062	216.8492	200.8982	198.8576	206.5112	208.4765	221.6342	230.9468	254.8019	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.7829	17.4750	15.7343	11.5277	8.9043	7.2749	8.1228	10.5583	13.7142	17.9938	20.3239	22.3883	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.5568	-47.3592	-68.1531	-76.7310	-82.8400	-77.3720	-76.4273	-72.1080	-64.4904	-54.2111	-36.9141	-29.0069	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-18.8029	-39.5749	-78.6914	-118.2335	-156.3709	-157.1182	-155.2578	-131.4301	-96.3075	-56.5975	-25.1064	-14.8664	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2149.5472	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2688.1615	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	175.8004	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1767.5275	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3331.9815	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2149.5472	0.2100	451.4049	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2688.1615	0.2100	564.5139	(264)
Space and water heating			1015.9188	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	175.8004	0.1443	25.3734	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	0.1346	-96.7689	
PV Unit electricity exported	-1048.3576	0.1259	-131.9744	
Total			-228.7433	(269)
Total CO2, kg/year			824.4782	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.5300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2149.5472	1.1300	2428.9883	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2688.1615	1.1300	3037.6225	(278)
Space and water heating			5466.6107	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	175.8004	1.5338	269.6485	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	1.4973	-1076.8103	
PV Unit electricity exported	-1048.3576	0.4621	-484.4365	
Total			-1561.2467	(283)
Total Primary energy kWh/year			4305.1133	(286)
Target Primary Energy Rate (TPER)			60.1900	(287)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.95	**TER**	11.53
Environmental	98 A	**% DER < TER**			83.09
CO_2 Emissions (t/year)	0.11	**DFEE**	26.34	**TFEE**	34.60
Compliance Check	See BREL	**% DFEE < TFEE**			23.88
% DPER < TPER	57.30	**DPER**	25.70	**TPER**	60.19

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2489	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3174	0.3112	0.3049	0.2738	0.2676	0.2365	0.2365	0.2303	0.2489	0.2676	0.2801	0.2925	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5504	0.5484	0.5465	0.5375	0.5358	0.5280	0.5280	0.5265	0.5310	0.5358	0.5392	0.5428	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.8245	31.7114	31.6006	31.0799	30.9825	30.5289	30.5289	30.4450	30.7036	30.9825	31.1795	31.3856	(38)
Heat transfer coeff	62.1367	62.0236	61.9127	61.3920	61.2946	60.8411	60.8411	60.7571	61.0158	61.2946	61.4917	61.6977	(39)

Average = Sum(39)m / 12 = 61.3916

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8688	0.8672	0.8657	0.8584	0.8570	0.8507	0.8507	0.8495	0.8531	0.8570	0.8598	0.8627	(40)
HLP (average)												0.8584	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day) 59.5787 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.0001	63.2172	61.2706	58.8477	56.6862	54.4399	53.9730	55.9157	57.9081	60.2149	62.6593	64.9088	(44)
Energy conte	102.9443	90.0205	94.1707	80.5595	76.3105	66.9402	65.2757	69.2353	71.4064	81.7111	89.2697	101.6316	(45)

Energy content (annual) Total = Sum(45)m = 989.4754

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(64)

Total per year (kWh/year) = Sum(64)m = 841.0541 (64)

12Total per year (kWh/year) 841 (64)

Electric shower(s)

50.0432	44.5889	48.6894	46.4637	47.3355	45.1535	46.6586	47.3355	46.4637	48.6894	47.7738	50.0432	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 569.2384 (64a)

Heat gains from water heating, kWh/month

34.3865	30.2766	32.1836	28.7348	28.0499	25.5132	25.5357	26.5464	26.7898	29.5359	30.9133	34.1075	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.6996	119.2388	107.6996	111.2896	107.6996	111.2896	107.6996	107.6996	111.2896	107.6996	111.2896	107.6996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	46.2184	45.0544	43.2575	39.9095	37.7014	35.4350	34.3222	35.6806	37.2080	39.6988	42.9351	45.8434	(72)
Total internal gains	411.9730	424.4322	405.8448	394.9074	374.9975	363.0578	349.4944	348.7689	359.1376	369.2178	390.1559	402.7375	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.8900	10.6334	0.6800	0.7000	0.7700	34.6903	(74)
North	2.0370	10.6334	0.6800	0.7000	0.7700	7.1450	(74)

Solar gains	41.8353	79.9495	135.8537	218.2158	293.9567	314.6894	293.8028	233.0950	163.3401	95.1694	51.6093	34.8760	(83)
Total gains	453.8084	504.3817	541.6985	613.1232	668.9542	677.7471	643.2972	581.8639	522.4778	464.3872	441.7652	437.6135	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.2428	56.3453	56.4462	56.9250	57.0154	57.4404	57.4404	57.5198	57.2760	57.0154	56.8327	56.6429	
alpha	4.7495	4.7564	4.7631	4.7950	4.8010	4.8294	4.8294	4.8347	4.8184	4.8010	4.7888	4.7762	
util living area	0.9888	0.9804	0.9622	0.8963	0.7555	0.5570	0.4126	0.4730	0.7285	0.9294	0.9791	0.9905	(86)

MIT	19.7645	19.9421	20.2095	20.5935	20.8640	20.9750	20.9952	20.9910	20.9149	20.5669	20.1122	19.7330	(87)
Th 2	20.1941	20.1955	20.1968	20.2030	20.2042	20.2096	20.2096	20.2106	20.2075	20.2042	20.2018	20.1994	(88)
util rest of house	0.9864	0.9762	0.9538	0.8744	0.7113	0.4943	0.3401	0.3951	0.6666	0.9095	0.9738	0.9885	(89)
MIT 2	19.0614	19.2378	19.5012	19.8711	20.1086	20.1964	20.2079	20.2072	20.1562	19.8542	19.4124	19.0342	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.3003	19.4771	19.7418	20.1165	20.3652	20.4609	20.4754	20.4735	20.4140	20.0964	19.6502	19.2716	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3003	19.4771	19.7418	20.1165	20.3652	20.4609	20.4754	20.4735	20.4140	20.0964	19.6502	19.2716	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9829	0.9715	0.9481	0.8717	0.7207	0.5146	0.3647	0.4214	0.6836	0.9064	0.9692	0.9853	(94)
Useful gains	446.0550	489.9910	513.5863	534.4748	482.1317	348.7993	234.6081	245.1988	357.1731	420.9192	428.1657	431.2005	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	932.0677	904.1252	819.8378	688.6049	531.1327	356.5849	235.7840	247.4952	385.2517	582.0766	771.7298	929.8842	(97)
Space heating kWh	361.5935	278.2982	227.8511	110.9737	36.4567	0.0000	0.0000	0.0000	0.0000	119.9012	247.3662	371.0207	(98a)
Space heating requirement - total per year (kWh/year)												1753.4612	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	361.5935	278.2982	227.8511	110.9737	36.4567	0.0000	0.0000	0.0000	0.0000	119.9012	247.3662	371.0207	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1753.4612	
Space heating per m2											(98c) / (4) =	24.5171	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	571.9062	450.2240	461.7539	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9182	0.9561	0.9322	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	525.0979	430.4686	430.4343	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	746.7606	708.7691	639.1131	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	159.5971	207.0555	155.2570	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	39.8993	51.7639	38.8143	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												130.4774	(107)
Energy for space heating												24.5171	(99)
Energy for space cooling												1.8243	(108)
Total												26.3414	(109)
Fabric Energy Efficiency (DFEE)												26.3	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor		35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3264	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3020	0.3264	0.3509	0.3672	0.3836	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5866	0.5833	0.5800	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			11.9270	1.1450	13.6603			(27)
Heatloss floor			35.7600	0.1300	4.6488			(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.1800	6.3023			(29a)
500mm mineral wool	35.7600		35.7600	0.1100	3.9336			(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5850			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	175.9097	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.0600	0.0500	0.3530
E3 Sill	3.7400	0.0500	0.1870
E4 Jamb	23.3600	0.0500	1.1680
E5 Ground floor (normal)	11.1200	0.1600	1.7792
E6 Intermediate floor within a dwelling	4.0300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.3800	0.0600	0.3828
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	12.9900	0.0800	1.0392
P2 Party wall - Intermediate floor within a dwelling	15.4400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	15.4400	0.1200	1.8528
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.3500	0.0200	0.0470

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.3690	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	38.9540	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.9203	33.7259	33.5352	32.6398	32.4723	31.6925	31.6925	31.5481	31.9929	32.4723	32.8112	33.1655	(38)
Heat transfer coeff													
	72.8744	72.6799	72.4893	71.5939	71.4264	70.6465	70.6465	70.5021	70.9469	71.4264	71.7653	72.1196	(39)
Average = Sum(39)m / 12 =												71.5931	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0189	1.0162	1.0136	1.0010	0.9987	0.9878	0.9878	0.9858	0.9920	0.9987	1.0034	1.0084	(40)
HLP (average)												1.0010	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2825	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses													
	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												59.5787	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	65.0001	63.2172	61.2706	58.8477	56.6862	54.4399	53.9730	55.9157	57.9081	60.2149	62.6593	64.9088	(44)
Energy conte	102.9443	90.0205	94.1707	80.5595	76.3105	66.9402	65.2757	69.2353	71.4064	81.7111	89.2697	101.6316	(45)
Energy content (annual)										Total = Sum(45)m =		989.4754	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(64)
										Total per year (kWh/year) = Sum(64)m =		841.0541	(64)
12Total per year (kWh/year)												841	(64)
Electric shower(s)													
	50.0432	44.5889	48.6894	46.4637	47.3355	45.1535	46.6586	47.3355	46.4637	48.6894	47.7738	50.0432	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		569.2384	(64a)
Heat gains from water heating, kWh/month													
	34.3865	30.2766	32.1836	28.7348	28.0499	25.5132	25.5357	26.5464	26.7898	29.5359	30.9133	34.1075	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	104.8362	116.0686	104.8362	108.3307	104.8362	108.3307	104.8362	104.8362	108.3307	104.8362	108.3307	104.8362 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982 (71)

Water heating gains (Table 5)

	46.2184	45.0544	43.2575	39.9095	37.7014	35.4350	34.3222	35.6806	37.2080	39.6988	42.9351	45.8434 (72)

Total internal gains

	409.1097	421.2621	402.9814	391.9486	372.1341	360.0989	346.6311	345.9056	356.1788	366.3544	387.1971	399.8741 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	11.9270	10.6334	0.6300	0.7000	0.7700	38.7592	(74)

Solar gains	38.7592	74.0708	125.8644	202.1706	272.3423	291.5505	272.1996	215.9557	151.3298	88.1716	47.8145	32.3116 (83)
Total gains	447.8689	495.3329	528.8459	594.1191	644.4763	651.6494	618.8307	561.8612	507.5086	454.5261	435.0116	432.1857 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.9557	48.0840	48.2104	48.8134	48.9279	49.4680	49.4680	49.5693	49.2585	48.9279	48.6968	48.4576	
alpha	4.1970	4.2056	4.2140	4.2542	4.2619	4.2979	4.2979	4.3046	4.2839	4.2619	4.2465	4.2305	
util living area													
	0.9904	0.9843	0.9717	0.9268	0.8220	0.6422	0.4890	0.5530	0.7958	0.9483	0.9832	0.9918	(86)
MIT	19.4374	19.6200	19.9132	20.3594	20.7269	20.9315	20.9832	20.9723	20.8258	20.3668	19.8443	19.4139	(87)
Th 2	20.0676	20.0698	20.0721	20.0825	20.0844	20.0935	20.0935	20.0952	20.0900	20.0844	20.0805	20.0764	(88)
util rest of house													
	0.9882	0.9807	0.9648	0.9084	0.7791	0.5678	0.3942	0.4544	0.7327	0.9315	0.9786	0.9898	(89)
MIT 2	18.6402	18.8228	19.1139	19.5530	19.8880	20.0567	20.0877	20.0846	19.9820	19.5686	19.0545	18.6235	(90)
Living area fraction									fLA = Living area / (4) =			0.3398	(91)
MIT	18.9111	19.0937	19.3855	19.8270	20.1730	20.3539	20.3919	20.3862	20.2687	19.8398	19.3229	18.8921	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9111	19.0937	19.3855	19.8270	20.1730	20.3539	20.3919	20.3862	20.2687	19.8398	19.3229	18.8921	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9845	0.9757	0.9584	0.9024	0.7837	0.5902	0.4261	0.4872	0.7464	0.9261	0.9737	0.9865	(94)
Useful gains	440.9438	483.2978	506.8395	536.1292	505.0456	384.5789	263.6805	273.7317	378.7960	420.9347	423.5647	426.3721	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1064.7723	1031.5946	934.0597	782.3044	605.1954	406.4963	267.8878	281.0365	437.6515	659.9672	877.1768	1059.5866	(97)
Space heating kWh													
	464.1284	368.4555	317.8518	177.2461	74.5114	0.0000	0.0000	0.0000	0.0000	177.8402	326.6007	471.1116	(98a)
Space heating requirement - total per year (kWh/year)												2377.7458	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	464.1284	368.4555	317.8518	177.2461	74.5114	0.0000	0.0000	0.0000	0.0000	177.8402	326.6007	471.1116	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2377.7458	
Space heating per m2											(98c) / (4) =	33.2459	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	664.0772	522.7842	535.8159	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8422	0.9019	0.8649	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	559.3122	471.5112	463.4122	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	719.4646	683.2479	618.7282	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	115.3097	157.5321	115.5551	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	28.8274	39.3830	28.8888	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												97.0992	(107)
Energy for space heating												33.2459	(99)
Energy for space cooling												1.3577	(108)
Total												34.6035	(109)
Fabric Energy Efficiency (TFEE)												34.6	(109)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.95	**TER**	11.53
Environmental	98 A	**% DER < TER**			83.09
CO_2 Emissions (t/year)	0.11	**DFEE**	26.34	**TFEE**	34.60
Compliance Check	See BREL	**% DFEE < TFEE**			23.88
% DPER < TPER	57.30	**DPER**	25.70	**TPER**	60.19

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.2825 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:		
Store volume		110.0000 (47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)		0.0152 (51)
Volume factor from Table 2a		1.0294 (52)
Temperature factor from Table 2b		0.6000 (53)
Enter (49) or (54) in (55)		1.0327 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
										Total per year (kWh/year) = Sum(64)m =		2597.3645	(64)
12Total per year (kWh/year)												2597	(64)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.6996	119.2388	107.6996	111.2896	107.6996	111.2896	107.6996	107.6996	111.2896	107.6996	111.2896	107.6996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains	515.4281	526.7231	505.4479	488.0289	464.3062	448.3397	432.0236	433.1332	445.7187	460.2911	487.4158	505.3106	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.8900	10.6334	0.6800	0.7000	0.7700	34.6903	(74)
North	2.0370	10.6334	0.6800	0.7000	0.7700	7.1450	(74)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	41.8353	79.9495	135.8537	218.2158	293.9567	314.6894	293.8028	233.0950	163.3401	95.1694	51.6093	34.8760	(83)
Total gains	557.2634	606.6726	641.3016	706.2448	758.2629	763.0291	725.8264	666.2282	609.0588	555.4605	539.0251	540.1866	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9734	0.9581	0.9272	0.8375	0.6781	0.4887	0.3575	0.4060	0.6369	0.8714	0.9535	0.9769	(86)
MIT	20.0533	20.2109	20.4400	20.7347	20.9224	20.9870	20.9977	20.9958	20.9561	20.7204	20.3445	20.0096	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9681	0.9500	0.9133	0.8095	0.6332	0.4327	0.2956	0.3393	0.5763	0.8422	0.9432	0.9723	(89)
MIT 2	19.1305	19.3274	19.6105	19.9591	20.1612	20.2204	20.2280	20.2271	20.1965	19.9504	19.4970	19.0756	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.4440	19.6276	19.8924	20.2226	20.4198	20.4809	20.4896	20.4883	20.4546	20.2120	19.7849	19.3929	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4440	19.6276	19.8924	20.2226	20.4198	20.4809	20.4896	20.4883	20.4546	20.2120	19.7849	19.3929	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9615	0.9426	0.9064	0.8092	0.6447	0.4512	0.3166	0.3619	0.5946	0.8415	0.9362	0.9661	(94)
Useful gains	535.8261	571.8341	581.2604	571.5084	488.8440	344.3005	229.8090	241.0767	362.1579	467.4280	504.6300	521.8869	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	896.8902	872.2262	793.1512	670.5706	516.4219	348.2892	230.3558	242.1240	376.3452	569.2623	751.2543	899.7873	(97)
Space heating kWh													
	268.6317	201.8635	157.6468	71.3248	20.5179	0.0000	0.0000	0.0000	0.0000	75.7647	177.5695	281.1580	(98a)
Space heating requirement - total per year (kWh/year)												1254.4769	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	268.6317	201.8635	157.6468	71.3248	20.5179	0.0000	0.0000	0.0000	0.0000	75.7647	177.5695	281.1580	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1254.4769	
Space heating per m2											(98c) / (4) =	17.5402	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	268.6317	201.8635	157.6468	71.3248	20.5179	0.0000	0.0000	0.0000	0.0000	75.7647	177.5695	281.1580	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	402.9475	302.7953	236.4702	106.9873	30.7769	0.0000	0.0000	0.0000	0.0000	113.6471	266.3542	421.7369	
Space heating requirement													
	402.9475	302.7953	236.4702	106.9873	30.7769	0.0000	0.0000	0.0000	0.0000	113.6471	266.3542	421.7369	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.8619	-24.6522	-41.9801	-54.0165	-62.8534	-60.2005	-59.0498	-53.1061	-43.0156	-30.6311	-17.3392	-12.2904	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.6369	-11.9261	-30.0153	-54.8475	-81.1374	-84.9515	-82.6912	-64.6364	-40.4468	-18.8657	-6.6109	-3.4586	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1881.7154	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3896.0468	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												18.8172	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.6671	(330a)
Total electricity for the above, kWh/year												19.6671	(331)
Electricity for lighting (calculated in Appendix L)												174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5013.9226	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1540.7366	0.1563	78.4235	(367)
Electrical energy for heat distribution (space & water)	18.8172	0.0000	8.4289	(372)
Overall CO2 factor for heat network			0.0404	(386)
Total CO2 associated with community systems			233.1982	(373)
Space and water heating			233.1982	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	0.1320	-62.5726	
PV Unit electricity exported	-484.2242	0.1214	-58.7607	
Total			-121.3332	(380)
Total CO2, kg/year			139.8097	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.9500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1540.7366	1.5786	792.1299	(467)
Electrical energy for heat distribution (space & water)	18.8172	0.0000	88.9578	(472)
Overall CO2 factor for heat network			0.4260	(486)
Total CO2 associated with community systems			2461.1657	(473)
Space and water heating			2461.1657	(476)
Pumps, fans and electric keep-hot	19.6671	1.5128	29.7525	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	1.4877	-705.1878	
PV Unit electricity exported	-484.2242	0.4452	-215.5829	
Total			-920.7707	(480)
Total Primary energy kWh/year			1838.1298	(483)
Dwelling Primary energy Rate (DPER)			25.7000	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b) x	2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c) x	2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3264	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3020	0.3264	0.3509	0.3672	0.3836	(22b)
Effective ac	0.5866	0.5833	0.5800	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			11.9270	1.1450	13.6603			(27)
Heatloss floor			35.7600	0.1300	4.6488			(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.1800	6.3023			(29a)
500mm mineral wool	35.7600		35.7600	0.1100	3.9336			(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5850			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.9097 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.0600	0.0500	0.3530
E3 Sill	3.7400	0.0500	0.1870
E4 Jamb	23.3600	0.0500	1.1680
E5 Ground floor (normal)	11.1200	0.1600	1.7792
E6 Intermediate floor within a dwelling	4.0300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.3800	0.0600	0.3828
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	12.9900	0.0800	1.0392
P2 Party wall - Intermediate floor within a dwelling	15.4400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	15.4400	0.1200	1.8528
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.3500	0.0200	0.0470

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.3690 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 38.9540 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.9203	33.7259	33.5352	32.6398	32.4723	31.6925	31.6925	31.5481	31.9929	32.4723	32.8112	33.1655	(38)
Heat transfer coeff	72.8744	72.6799	72.4893	71.5939	71.4264	70.6465	70.6465	70.5021	70.9469	71.4264	71.7653	72.1196	(39)
Average = Sum(39)m / 12 =												71.5931	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0189	1.0162	1.0136	1.0010	0.9987	0.9878	0.9878	0.9858	0.9920	0.9987	1.0034	1.0084	(40)
HLP (average)												1.0010	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

Hot water usage for mixer showers

62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day) 117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	248.5063	219.7523	233.2621	204.4524	197.7953	177.7872	175.0641	182.2099	184.4398	206.2131	219.9654	245.6941	(62)
WWHRS	-28.5673	-25.2652	-26.4562	-21.9068	-20.4164	-17.4704	-16.3757	-17.4139	-18.0756	-21.3091	-24.1406	-28.0383	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
									Total per year (kWh/year) = Sum(64)m =			2229.7066	(64)
12Total per year (kWh/year)												2230	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	104.4115	92.7427	99.3428	89.0609	87.5501	80.1947	79.9919	82.3679	82.4067	90.3490	94.2189	103.4764	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.8362	116.0686	104.8362	108.3307	104.8362	108.3307	104.8362	104.8362	108.3307	104.8362	108.3307	104.8362	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	140.3380	138.0100	133.5252	123.6956	117.6748	111.3815	107.5160	110.7095	114.4537	121.4368	130.8596	139.0812	(72)
Total internal gains													

	506.2293	517.2176	496.2491	478.7347	455.1075	436.0455	419.8249	420.9345	433.4245	451.0924	478.1216	496.1119	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	11.9270	10.6334	0.6300	0.7000	0.7700	38.7592	(74)

Solar gains	38.7592	74.0708	125.8644	202.1706	272.3423	291.5505	272.1996	215.9557	151.3298	88.1716	47.8145	32.3116	(83)
Total gains	544.9885	591.2884	622.1136	680.9053	727.4497	727.5960	692.0245	636.8902	584.7543	539.2640	525.9361	528.4235	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.9557	48.0840	48.2104	48.8134	48.9279	49.4680	49.4680	49.5693	49.2585	48.9279	48.6968	48.4576	
alpha	4.1970	4.2056	4.2140	4.2542	4.2619	4.2979	4.2979	4.3046	4.2839	4.2619	4.2465	4.2305	
util living area													
	0.9807	0.9711	0.9521	0.8930	0.7715	0.5883	0.4411	0.4951	0.7326	0.9141	0.9677	0.9829	(86)
MIT	19.6210	19.7952	20.0719	20.4759	20.7907	20.9510	20.9887	20.9817	20.8757	20.4926	20.0090	19.5978	(87)
Th 2	20.0676	20.0698	20.0721	20.0825	20.0844	20.0935	20.0935	20.0952	20.0900	20.0844	20.0805	20.0764	(88)
util rest of house													
	0.9765	0.9649	0.9413	0.8690	0.7241	0.5161	0.3539	0.4039	0.6647	0.8896	0.9596	0.9792	(89)
MIT 2	18.4684	18.6896	19.0383	19.5385	19.8965	20.0606	20.0886	20.0866	19.9952	19.5693	18.9695	18.4451	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	18.8600	19.0652	19.3895	19.8570	20.2003	20.3631	20.3944	20.3907	20.2944	19.8830	19.3227	18.8368	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8600	19.0652	19.3895	19.8570	20.2003	20.3631	20.3944	20.3907	20.2944	19.8830	19.3227	18.8368	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9694	0.9562	0.9316	0.8622	0.7305	0.5383	0.3833	0.4343	0.6810	0.8833	0.9510	0.9725	(94)
Useful gains	528.2862	565.4113	579.5564	587.1059	531.4294	391.6383	265.2542	276.6275	398.2342	476.3124	500.1831	513.9056	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1061.0512	1029.5290	934.3479	784.4528	607.1472	407.1430	268.0601	281.3533	439.4726	663.0505	877.1664	1055.5966	(97)
Space heating kWh													
	396.3771	311.8871	263.9649	142.0898	56.3340	0.0000	0.0000	0.0000	0.0000	138.9331	271.4279	403.0181	(98a)
Space heating requirement - total per year (kWh/year)												1984.0320	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	396.3771	311.8871	263.9649	142.0898	56.3340	0.0000	0.0000	0.0000	0.0000	138.9331	271.4279	403.0181	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1984.0320	
Space heating per m2											(98c) / (4) =	27.7409	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	396.3771	311.8871	263.9649	142.0898	56.3340	0.0000	0.0000	0.0000	0.0000	138.9331	271.4279	403.0181	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	429.4443	337.9058	285.9858	153.9434	61.0336	0.0000	0.0000	0.0000	0.0000	150.5234	294.0714	436.6393	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.3643	85.1131	84.6082	83.5043	81.7983	79.8000	79.8000	79.8000	79.8000	83.4276	84.7922	85.4216	(217)
Fuel for water heating, kWh/month													
	257.6475	228.5042	244.4279	218.6062	216.8492	200.8982	198.8576	206.5112	208.4765	221.6342	230.9468	254.8019	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.7829	17.4750	15.7343	11.5277	8.9043	7.2749	8.1228	10.5583	13.7142	17.9938	20.3239	22.3883	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.5568	-47.3592	-68.1531	-76.7310	-82.8400	-77.3720	-76.4273	-72.1080	-64.4904	-54.2111	-36.9141	-29.0069	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-18.8029	-39.5749	-78.6914	-118.2335	-156.3709	-157.1182	-155.2578	-131.4301	-96.3075	-56.5975	-25.1064	-14.8664	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2149.5472	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2688.1615	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	175.8004	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1767.5275	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3331.9815	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2149.5472	0.2100	451.4049	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2688.1615	0.2100	564.5139	(264)
Space and water heating			1015.9188	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	175.8004	0.1443	25.3734	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	0.1346	-96.7689	
PV Unit electricity exported	-1048.3576	0.1259	-131.9744	
Total			-228.7433	(269)
Total CO2, kg/year			824.4782	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.5300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2149.5472	1.1300	2428.9883	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2688.1615	1.1300	3037.6225	(278)
Space and water heating			5466.6107	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	175.8004	1.5338	269.6485	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	1.4973	-1076.8103	
PV Unit electricity exported	-1048.3576	0.4621	-484.4365	
Total			-1561.2467	(283)
Total Primary energy kWh/year			4305.1133	(286)
Target Primary Energy Rate (TPER)			60.1900	(287)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.95	**TER**	11.53
Environmental	98 A	**% DER < TER**			83.09
CO_2 Emissions (t/year)	0.11	**DFEE**	26.34	**TFEE**	34.60
Compliance Check	See BREL	**% DFEE < TFEE**			23.88
% DPER < TPER	57.30	**DPER**	25.70	**TPER**	60.19

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												175.9097	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6151	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	30.3121	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
										Total per year (kWh/year) = Sum(64)m =		2597.3645	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains	570.7610	568.7779	552.3532	521.4980	490.9997	463.3358	446.9330	449.7815	465.4657	493.4744	527.3747	556.9668	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.8900	10.6334	0.6800	0.7000	0.7700	34.6903	(74)
North	2.0370	10.6334	0.6800	0.7000	0.7700	7.1450	(74)

Solar gains	41.8353	79.9495	135.8537	218.2158	293.9567	314.6894	293.8028	233.0950	163.3401	95.1694	51.6093	34.8760	(83)
Total gains	612.5964	648.7274	688.2069	739.7138	784.9564	778.0252	740.7357	682.8765	628.8059	588.6438	578.9839	591.8428	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area	0.9620	0.9468	0.9089	0.8180	0.6602	0.4799	0.3505	0.3964	0.6205	0.8497	0.9404	0.9673	(86)
MIT	20.1526	20.2808	20.5056	20.7636	20.9309	20.9880	20.9979	20.9963	20.9608	20.7547	20.4091	20.1044	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house	0.9549	0.9371	0.8926	0.7885	0.6154	0.4247	0.2897	0.3311	0.5604	0.8180	0.9278	0.9610	(89)
MIT 2	19.2541	19.4132	19.6884	19.9905	20.1690	20.2211	20.2281	20.2273	20.2002	19.9877	19.5753	19.1940	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.5594	19.7080	19.9660	20.2532	20.4279	20.4817	20.4897	20.4885	20.4586	20.2483	19.8586	19.5034	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5594	19.7080	19.9660	20.2532	20.4279	20.4817	20.4897	20.4885	20.4586	20.2483	19.8586	19.5034	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9475	0.9294	0.8864	0.7895	0.6273	0.4430	0.3103	0.3532	0.5788	0.8189	0.9209	0.9539	(94)
Useful gains	580.4146	602.9216	610.0295	583.9931	492.3765	344.6548	229.8639	241.2003	363.9423	482.0333	533.1620	564.5873	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	903.7235	876.9877	797.5131	672.3836	516.9014	348.3357	230.3632	242.1405	376.5841	571.4101	755.6164	906.3274	(97)
Space heating kWh	240.5418	184.1724	139.4878	63.6412	18.2466	0.0000	0.0000	0.0000	0.0000	66.4964	160.1672	254.2547	(98a)
Space heating requirement - total per year (kWh/year)												1127.0079	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	240.5418	184.1724	139.4878	63.6412	18.2466	0.0000	0.0000	0.0000	0.0000	66.4964	160.1672	254.2547	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1127.0079	
Space heating per m2										(98c) / (4) =		15.7579	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	240.5418	184.1724	139.4878	63.6412	18.2466	0.0000	0.0000	0.0000	0.0000	66.4964	160.1672	254.2547	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	360.8127	276.2586	209.2317	95.4618	27.3698	0.0000	0.0000	0.0000	0.0000	99.7445	240.2508	381.3820	
Space heating requirement													
	360.8127	276.2586	209.2317	95.4618	27.3698	0.0000	0.0000	0.0000	0.0000	99.7445	240.2508	381.3820	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.8619	-24.6522	-41.9801	-54.0165	-62.8534	-60.2005	-59.0498	-53.1061	-43.0156	-30.6311	-17.3392	-12.2904	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.6369	-11.9261	-30.0153	-54.8475	-81.1374	-84.9515	-82.6912	-64.6364	-40.4468	-18.8657	-6.6109	-3.4586	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1690.5119	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3896.0468	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	16.9051	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(330a)
Total electricity for the above, kWh/year	19.6671	(331)
Electricity for lighting (calculated in Appendix L)	174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4822.7191	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1690.5119	4.4400	75.0587	(340a)
Space heating total			75.0587	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3896.0468	4.4400	172.9845	(342a)
Water heating total			172.9845	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	16.4900	3.2431	(349)
Energy for lighting	174.7141	16.4900	28.8104	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	16.4900	-78.1621	
PV Unit electricity exported	-484.2242	5.5900	-27.0681	
Total			-105.2302	(352)
Total energy cost			266.8665	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.8245	(357)
SAP value	86.6347	
SAP rating (Section 12)	87	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1489.7490	0.1563	70.4796	(367)
Electrical energy for heat distribution (space & water)	16.9051	0.0000	8.1310	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			224.9565	(373)
Space and water heating			224.9565	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	0.1320	-62.5726	
PV Unit electricity exported	-484.2242	0.1214	-58.7607	
Total			-121.3332	(380)
Total CO2, kg/year			131.5680	(383)
CO2 emissions per m2			1.8400	(384)
EI value			98.4869	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b)	x 2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c)	x 2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 71.5200						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =		0.7750	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =		0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
									Total per year (kWh/year) = Sum(64)m =			2597.3645	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)													
	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains													
	570.7610	568.7779	552.3532	521.4980	490.9997	463.3358	446.9330	449.7815	465.4657	493.4744	527.3747	556.9668	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.8900	12.7500	0.6800	0.7000	0.7700	41.5955	(74)
North	2.0370	12.7500	0.6800	0.7000	0.7700	8.5672	(74)

Solar gains	50.1627	86.0527	145.7823	238.1616	308.7569	353.9660	324.5422	263.0226	185.6177	108.6041	61.1331	41.9454	(83)
Total gains	620.9237	654.8307	698.1355	759.6595	799.7566	817.3019	771.4751	712.8041	651.0834	602.0785	588.5078	598.9122	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9573	0.9414	0.8943	0.7911	0.6219	0.4169	0.2988	0.3395	0.5800	0.8203	0.9305	0.9634	(86)
MIT	20.2012	20.3231	20.5658	20.8051	20.9495	20.9941	20.9991	20.9983	20.9719	20.8040	20.4660	20.1517	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9493	0.9306	0.8756	0.7588	0.5751	0.3628	0.2400	0.2762	0.5191	0.7838	0.9160	0.9564	(89)
MIT 2	19.3147	19.4656	19.7607	20.0363	20.1868	20.2255	20.2287	20.2284	20.2093	20.0421	19.6449	19.2533	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.6159	19.7570	20.0342	20.2975	20.4459	20.4867	20.4905	20.4900	20.4684	20.3010	19.9239	19.5586	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6159	19.7570	20.0342	20.2975	20.4459	20.4867	20.4905	20.4900	20.4684	20.3010	19.9239	19.5586	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9418	0.9231	0.8704	0.7618	0.5886	0.3810	0.2600	0.2977	0.5384	0.7875	0.9094	0.9492	(94)
Useful gains	584.7964	604.4421	607.6253	578.7001	470.7361	311.3938	200.6039	212.2316	350.5552	474.1284	535.2142	568.4605	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	889.3042	862.1247	771.9400	651.3172	488.3585	313.0975	200.7979	212.6134	359.3976	544.9196	735.7930	891.8304	(97)
Space heating kWh													
	226.5538	173.1627	122.2502	52.2843	13.1111	0.0000	0.0000	0.0000	0.0000	52.6687	144.4167	240.5873	(98a)
Space heating requirement - total per year (kWh/year)												1025.0346	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	226.5538	173.1627	122.2502	52.2843	13.1111	0.0000	0.0000	0.0000	0.0000	52.6687	144.4167	240.5873	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1025.0346	
Space heating per m2										(98c) / (4) =		14.3321	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	226.5538	173.1627	122.2502	52.2843	13.1111	0.0000	0.0000	0.0000	0.0000	52.6687	144.4167	240.5873	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	339.8307	259.7440	183.3753	78.4264	19.6666	0.0000	0.0000	0.0000	0.0000	79.0030	216.6250	360.8809	
Space heating requirement													
	339.8307	259.7440	183.3753	78.4264	19.6666	0.0000	0.0000	0.0000	0.0000	79.0030	216.6250	360.8809	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.7439	-26.4473	-44.1602	-56.7208	-64.1553	-63.6776	-61.8747	-56.5668	-46.5864	-34.0293	-20.3275	-14.7878	(333a)

Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.2546	-13.5179	-33.0849	-60.8523	-85.0852	-97.4411	-92.6154	-74.6748	-47.7624	-22.9670	-8.7029	-4.7110	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1537.5520	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3896.0468	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	15.3755	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(330a)
Total electricity for the above, kWh/year	19.6671	(331)
Electricity for lighting (calculated in Appendix L)	174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4573.2330	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1537.5520	6.5500	100.7097	(340a)
Space heating total			100.7097	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3896.0468	6.5500	255.1911	(342a)
Water heating total			255.1911	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	28.4300	5.5914	(349)
Energy for lighting	174.7141	28.4300	49.6712	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-507.0777	28.4300	-144.1622	
PV Unit electricity exported	-547.6693	5.8100	-31.8196	
Total			-175.9818	(352)
Total energy cost			339.1816	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1448.9597	0.1568	64.2926	(367)
Electrical energy for heat distribution (space & water)	15.3755	0.0000	7.8989	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			218.5375	(373)
Space and water heating			218.5375	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-507.0777	0.1323	-67.0962	
PV Unit electricity exported	-547.6693	0.1214	-66.4868	
Total			-133.5830	(380)
Total CO2, kg/year			112.8992	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1448.9597	1.5805	648.0334	(467)
Electrical energy for heat distribution (space & water)	15.3755	0.0000	83.5542	(472)
Overall CO2 factor for heat network			0.4254	(486)
Total CO2 associated with community systems			2311.6656	(473)
Space and water heating			2311.6656	(476)
Pumps, fans and electric keep-hot	19.6671	1.5128	29.7525	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-507.0777	1.4889	-754.9866	
PV Unit electricity exported	-547.6693	0.4453	-243.8963	
Total			-998.8829	(480)
Total Primary energy kWh/year			1610.5176	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - North

Current energy efficiency rating: B 87
Current environmental impact rating: A 98

N Solar water heating	Recommended
U Solar photovoltaic panels	Already installed
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.4	-£ 47	-26 kg (22.9%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£47	0.36 kg/m²	B 88	A 99
Total Savings	£47	0.36 kg/m²		

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£55	£78	-£23
Community scheme	£460	£391	£69
Space heating	£210	£233	-£23
Water heating	£255	£187	£69
Lighting	£50	£50	£0
Generated (PV)	-£176	-£177	£1
Total cost of fuels	£339	£292	£47
Total cost of uses	£339	£293	£47
Delivered energy	64 kWh/m²	50 kWh/m²	14 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	2 kg/m²	1 kg/m²	0 kg/m²
Primary energy	23 kWh/m²	18 kWh/m²	4 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120 (1b) - (3b)	
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff													
	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers													
	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths													
	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses													
	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	
Distribution loss (46)m = 0.15 x (45)m													
	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												623.4568	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												623.4568	
Solar input	-0.0000	-16.2208	-58.0195	-79.9223	-105.1350	-97.1484	-96.5940	-84.1560	-57.6291	-28.6318	-0.0000	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	257.1882	211.3732	183.9246	132.9320	101.3423	89.0407	87.1521	106.7357	135.2126	186.2632	228.3672	254.3760	(64)
											Total per year (kWh/year) = Sum(64)m =	1973.9077	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
299.7288 302.8391 295.0013 278.3158 257.2532 237.4574 224.2325 221.1223 228.9600 245.6456 266.7082 286.5040 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 (71)
Water heating gains (Table 5)
149.6734 147.3454 142.8606 133.0310 127.0102 120.7169 116.8514 120.0449 123.7891 130.7722 140.1950 148.4166 (72)
Total internal gains
570.7610 568.7779 552.3532 521.4980 490.9997 463.3358 446.9330 449.7815 465.4657 493.4744 527.3747 556.9668 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.8900	10.6334	0.6800	0.7000	0.7700	34.6903	(74)
North	2.0370	10.6334	0.6800	0.7000	0.7700	7.1450	(74)

Solar gains	41.8353	79.9495	135.8537	218.2158	293.9567	314.6894	293.8028	233.0950	163.3401	95.1694	51.6093	34.8760	(83)
Total gains	612.5964	648.7274	688.2069	739.7138	784.9564	778.0252	740.7357	682.8765	628.8059	588.6438	578.9839	591.8428	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area	0.9620	0.9468	0.9089	0.8180	0.6602	0.4799	0.3505	0.3964	0.6205	0.8497	0.9404	0.9673	(86)
MIT	20.1526	20.2808	20.5056	20.7636	20.9309	20.9880	20.9979	20.9963	20.9608	20.7547	20.4091	20.1044	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house	0.9549	0.9371	0.8926	0.7885	0.6154	0.4247	0.2897	0.3311	0.5604	0.8180	0.9278	0.9610	(89)
MIT 2	19.2541	19.4132	19.6884	19.9905	20.1690	20.2211	20.2281	20.2273	20.2002	19.9877	19.5753	19.1940	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.5594	19.7080	19.9660	20.2532	20.4279	20.4817	20.4897	20.4885	20.4586	20.2483	19.8586	19.5034	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5594	19.7080	19.9660	20.2532	20.4279	20.4817	20.4897	20.4885	20.4586	20.2483	19.8586	19.5034	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9475	0.9294	0.8864	0.7895	0.6273	0.4430	0.3103	0.3532	0.5788	0.8189	0.9209	0.9539	(94)
Useful gains	580.4146	602.9216	610.0295	583.9931	492.3765	344.6548	229.8639	241.2003	363.9423	482.0333	533.1620	564.5873	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	903.7235	876.9877	797.5131	672.3836	516.9014	348.3357	230.3632	242.1405	376.5841	571.4101	755.6164	906.3274	(97)
Space heating kWh	240.5418	184.1724	139.4878	63.6412	18.2466	0.0000	0.0000	0.0000	0.0000	66.4964	160.1672	254.2547	(98a)
Space heating requirement - total per year (kWh/year)												1127.0079	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	240.5418	184.1724	139.4878	63.6412	18.2466	0.0000	0.0000	0.0000	0.0000	66.4964	160.1672	254.2547	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1127.0079	
Space heating per m2											(98c) / (4) =	15.7579	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement
240.5418 184.1724 139.4878 63.6412 18.2466 0.0000 0.0000 0.0000 0.0000 66.4964 160.1672 254.2547 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50
307a 360.8127 276.2586 209.2317 95.4618 27.3698 0.0000 0.0000 0.0000 0.0000 99.7445 240.2508 381.3820
Space heating requirement
360.8127 276.2586 209.2317 95.4618 27.3698 0.0000 0.0000 0.0000 0.0000 99.7445 240.2508 381.3820 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)

Water heating
Annual water heating requirement
257.1882 211.3732 183.9246 132.9320 101.3423 89.0407 87.1521 106.7357 135.2126 186.2632 228.3672 254.3760 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50
310a 385.7824 317.0598 275.8868 199.3980 152.0134 133.5610 130.7281 160.1036 202.8189 279.3948 342.5508 381.5640
Water heating fuel
385.7824 317.0598 275.8868 199.3980 152.0134 133.5610 130.7281 160.1036 202.8189 279.3948 342.5508 381.5640 (310)
Cooling System Energy Efficiency Ratio 0.0000 (314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (315)
Pumps and Fa 8.4649 7.6457 8.4649 8.1918 8.4649 8.1918 8.4649 8.4649 8.1918 8.4649 8.1918 8.4649 (331)
Lighting 21.6483 17.3671 15.6371 11.4564 8.8493 7.2299 8.0726 10.4931 13.6295 17.8826 20.1983 22.2500 (332)
Electricity generated by PVs (Appendix M) (negative quantity)
(333a)m -14.9141 -24.7783 -42.2847 -54.5605 -63.6655 -61.0911 -59.9595 -53.8492 -43.4933 -30.8592 -17.4193 -12.3313 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)

(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5846	-11.8000	-29.7107	-54.3035	-80.3253	-84.0609	-81.7814	-63.8933	-39.9691	-18.6376	-6.5308	-3.4177	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1690.5119	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2960.8616	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	16.9051	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.6671	(331)
Electricity for lighting (calculated in Appendix L)	174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3967.5338	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1690.5119	4.4400	75.0587	(340a)
Space heating total			75.0587	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2960.8616	4.4400	131.4623	(342a)
Water heating total			131.4623	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	16.4900	3.2431	(349)
Pump for solar water heating	80.0000	16.4900	13.1920	(349)
Energy for lighting	174.7141	16.4900	28.8104	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-479.2061	16.4900	-79.0211	
PV Unit electricity exported	-479.0149	5.5900	-26.7769	
Total			-105.7980	(352)
Total energy cost			237.9684	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.7352	(357)
SAP value	88.0820	
SAP rating (Section 12)	88	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1240.3663	0.1563	70.4796	(367)
Electrical energy for heat distribution (space & water)	16.9051	0.0000	6.9383	(372)
Overall CO2 factor for heat network			0.0413	(386)
Total CO2 associated with community systems			191.9603	(373)
Space and water heating			191.9603	(376)
Pumps, fans and electric keep-hot	99.6671	0.1387	13.8251	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-479.2061	0.1320	-63.2320	
PV Unit electricity exported	-479.0149	0.1214	-58.1324	
Total			-121.3643	(380)
Total CO2, kg/year			109.6377	(383)
CO2 emissions per m2			1.5300	(384)
EI value			98.7391	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120 (1b) - (3b)	
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)

Average = Sum(39)m / 12 =	59.2241

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2825 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day)	117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	

Distribution loss (46)m = 0.15 x (45)m

30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:

Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												697.5235	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												697.5235	
Solar input	-0.3007	-19.8927	-63.0021	-86.8105	-108.5158	-108.4282	-105.5589	-94.8548	-67.4076	-37.8155	-4.9366	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	256.8875	207.7013	178.9419	126.0438	97.9614	77.7608	78.1872	96.0370	125.4340	177.0795	223.4306	254.3760	(64)
											Total per year (kWh/year) = Sum(64)m =	1899.8410	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)													
	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains													
	570.7610	568.7779	552.3532	521.4980	490.9997	463.3358	446.9330	449.7815	465.4657	493.4744	527.3747	556.9668	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.8900	12.7500	0.6800	0.7000	0.7700	41.5955	(74)
North	2.0370	12.7500	0.6800	0.7000	0.7700	8.5672	(74)

Solar gains	50.1627	86.0527	145.7823	238.1616	308.7569	353.9660	324.5422	263.0226	185.6177	108.6041	61.1331	41.9454	(83)
Total gains	620.9237	654.8307	698.1355	759.6595	799.7566	817.3019	771.4751	712.8041	651.0834	602.0785	588.5078	598.9122	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9573	0.9414	0.8943	0.7911	0.6219	0.4169	0.2988	0.3395	0.5800	0.8203	0.9305	0.9634	(86)
MIT	20.2012	20.3231	20.5658	20.8051	20.9495	20.9941	20.9991	20.9983	20.9719	20.8040	20.4660	20.1517	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9493	0.9306	0.8756	0.7588	0.5751	0.3628	0.2400	0.2762	0.5191	0.7838	0.9160	0.9564	(89)
MIT 2	19.3147	19.4656	19.7607	20.0363	20.1868	20.2255	20.2287	20.2284	20.2093	20.0421	19.6449	19.2533	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.6159	19.7570	20.0342	20.2975	20.4459	20.4867	20.4905	20.4900	20.4684	20.3010	19.9239	19.5586	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6159	19.7570	20.0342	20.2975	20.4459	20.4867	20.4905	20.4900	20.4684	20.3010	19.9239	19.5586	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9418	0.9231	0.8704	0.7618	0.5886	0.3810	0.2600	0.2977	0.5384	0.7875	0.9094	0.9492	(94)
Useful gains	584.7964	604.4421	607.6253	578.7001	470.7361	311.3938	200.6039	212.2316	350.5552	474.1284	535.2142	568.4605	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	889.3042	862.1247	771.9400	651.3172	488.3585	313.0975	200.7979	212.6134	359.3976	544.9196	735.7930	891.8304	(97)
Space heating kWh	226.5538	173.1627	122.2502	52.2843	13.1111	0.0000	0.0000	0.0000	0.0000	52.6687	144.4167	240.5873	(98a)
Space heating requirement - total per year (kWh/year)												1025.0346	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	226.5538	173.1627	122.2502	52.2843	13.1111	0.0000	0.0000	0.0000	0.0000	52.6687	144.4167	240.5873	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1025.0346	
Space heating per m2											(98c) / (4) =	14.3321	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating:													
Space heating requirement	226.5538	173.1627	122.2502	52.2843	13.1111	0.0000	0.0000	0.0000	0.0000	52.6687	144.4167	240.5873	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	339.8307	259.7440	183.3753	78.4264	19.6666	0.0000	0.0000	0.0000	0.0000	79.0030	216.6250	360.8809	
Space heating requirement	339.8307	259.7440	183.3753	78.4264	19.6666	0.0000	0.0000	0.0000	0.0000	79.0030	216.6250	360.8809	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	256.8875	207.7013	178.9419	126.0438	97.9614	77.7608	78.1872	96.0370	125.4340	177.0795	223.4306	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.3312	311.5520	268.4128	189.0656	146.9421	116.6412	117.2807	144.0554	188.1511	265.6193	335.1459	381.5640	
Water heating fuel	385.3312	311.5520	268.4128	189.0656	146.9421	116.6412	117.2807	144.0554	188.1511	265.6193	335.1459	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	8.4649	7.6457	8.4649	8.1918	8.4649	8.1918	8.4649	8.4649	8.1918	8.4649	8.1918	8.4649	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.8133	-26.5889	-44.4924	-57.3150	-64.9996	-64.6716	-62.8712	-57.4038	-47.1375	-34.3017	-20.4312	-14.8426	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.1852	-13.3763	-32.7527	-60.2581	-84.2408	-96.4471	-91.6189	-73.8378	-47.2113	-22.6946	-8.5992	-4.6561	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1537.5520	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2849.7616	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	15.3755	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.6671	(331)
Electricity for lighting (calculated in Appendix L)	174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3606.9478	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1537.5520	6.5500	100.7097	(340a)
Space heating total			100.7097	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2849.7616	6.5500	186.6594	(342a)
Water heating total			186.6594	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	28.4300	5.5914	(349)
Pump for solar water heating	80.0000	28.4300	22.7440	(349)
Energy for lighting	174.7141	28.4300	49.6712	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-512.8689	28.4300	-145.8086	
PV Unit electricity exported	-541.8781	5.8100	-31.4831	
Total			-177.2917	(352)
Total energy cost			292.0839	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1169.9503	0.1568	64.2926	(367)
Electrical energy for heat distribution (space & water)	15.3755	0.0000	6.5628	(372)
Overall CO2 factor for heat network			0.0414	(386)
Total CO2 associated with community systems			181.5720	(373)
Space and water heating			181.5720	(376)
Pumps, fans and electric keep-hot	99.6671	0.1387	13.8251	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-512.8689	0.1323	-67.8299	
PV Unit electricity exported	-541.8781	0.1214	-65.7869	
Total			-133.6168	(380)
Total CO2, kg/year			86.9969	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1169.9503	1.5805	648.0334	(467)
Electrical energy for heat distribution (space & water)	15.3755	0.0000	68.1568	(472)
Overall CO2 factor for heat network			0.4298	(486)
Total CO2 associated with community systems			1885.6708	(473)
Space and water heating			1885.6708	(476)
Pumps, fans and electric keep-hot	99.6671	1.5128	150.7765	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-512.8689	1.4887	-763.4867	
PV Unit electricity exported	-541.8781	0.4454	-241.3296	
Total			-1004.8163	(480)
Total Primary energy kWh/year			1299.6134	(483)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.92	**TER**	11.38
Environmental	99 A	**% DER < TER**			83.13
CO_2 Emissions (t/year)	0.11	**DFEE**	26.07	**TFEE**	34.16
Compliance Check	See BREL	**% DFEE < TFEE**			23.68
% DPER < TPER	57.32	**DPER**	25.35	**TPER**	59.39

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.2825 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day)		117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:		
Store volume		110.0000 (47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)		0.0152 (51)
Volume factor from Table 2a		1.0294 (52)
Temperature factor from Table 2b		0.6000 (53)
Enter (49) or (54) in (55)		1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
										Total per year (kWh/year) = Sum(64)m =		2597.3645	(64)
12Total per year (kWh/year)												2597	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)

Heat gains from water heating, kWh/month

111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.6996	119.2388	107.6996	111.2896	107.6996	111.2896	107.6996	107.6996	111.2896	107.6996	111.2896	107.6996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains	515.4281	526.7231	505.4479	488.0289	464.3062	448.3397	432.0236	433.1332	445.7187	460.2911	487.4158	505.3106	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.8900	11.2829	0.6800	0.7000	0.7700	36.8094	(75)
Northeast	2.0370	11.2829	0.6800	0.7000	0.7700	7.5815	(75)

Solar gains	44.3909	90.3589	162.7980	267.3611	359.3858	383.1433	358.4227	285.7387	198.3719	110.4258	55.8552	36.2518	(83)
Total gains	559.8189	617.0821	668.2459	755.3901	823.6920	831.4830	790.4463	718.8720	644.0906	570.7169	543.2710	541.5624	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9729	0.9554	0.9169	0.8088	0.6352	0.4507	0.3287	0.3770	0.6081	0.8615	0.9522	0.9767	(86)
MIT	20.0580	20.2285	20.4784	20.7761	20.9415	20.9908	20.9984	20.9970	20.9640	20.7366	20.3515	20.0122	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9676	0.9470	0.9016	0.7787	0.5908	0.3983	0.2716	0.3147	0.5485	0.8312	0.9417	0.9721	(89)
MIT 2	19.1364	19.3491	19.6563	20.0040	20.1787	20.2231	20.2284	20.2276	20.2027	19.9682	19.5056	19.0788	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.4495	19.6479	19.9356	20.2663	20.4379	20.4839	20.4900	20.4890	20.4614	20.2293	19.7930	19.3959	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4495	19.6479	19.9356	20.2663	20.4379	20.4839	20.4900	20.4890	20.4614	20.2293	19.7930	19.3959	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9609	0.9394	0.8951	0.7802	0.6031	0.4157	0.2910	0.3358	0.5670	0.8312	0.9346	0.9658	(94)
Useful gains	537.9484	579.7058	598.1240	589.3871	496.7614	345.6823	230.0101	241.4200	365.1743	474.3580	507.7584	523.0548	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	897.2152	873.4325	795.7116	673.1617	517.4930	348.4703	230.3829	242.1699	376.7486	570.2842	751.7331	899.9660	(97)
Space heating kWh													
	267.2945	197.3844	147.0052	60.3177	15.4243	0.0000	0.0000	0.0000	0.0000	71.3691	175.6618	280.4219	(98a)
Space heating requirement - total per year (kWh/year)												1214.8790	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	267.2945	197.3844	147.0052	60.3177	15.4243	0.0000	0.0000	0.0000	0.0000	71.3691	175.6618	280.4219	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1214.8790	
Space heating per m2											(98c) / (4) =	16.9866	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	267.2945	197.3844	147.0052	60.3177	15.4243	0.0000	0.0000	0.0000	0.0000	71.3691	175.6618	280.4219	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	400.9418	296.0766	220.5078	90.4765	23.1365	0.0000	0.0000	0.0000	0.0000	107.0536	263.4927	420.6329	
Space heating requirement													
	400.9418	296.0766	220.5078	90.4765	23.1365	0.0000	0.0000	0.0000	0.0000	107.0536	263.4927	420.6329	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.8619	-24.6522	-41.9801	-54.0165	-62.8534	-60.2005	-59.0498	-53.1061	-43.0156	-30.6311	-17.3392	-12.2904	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.6369	-11.9261	-30.0153	-54.8475	-81.1374	-84.9515	-82.6912	-64.6364	-40.4468	-18.8657	-6.6109	-3.4586	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1822.3184	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3896.0468	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												18.2232	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.6671	(330a)
Total electricity for the above, kWh/year												19.6671	(331)
Electricity for lighting (calculated in Appendix L)												174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4954.5256	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1524.8974	0.1566	76.0975	(367)
Electrical energy for heat distribution (space & water)	18.2232	0.0000	8.3416	(372)
Overall CO2 factor for heat network			0.0404	(386)
Total CO2 associated with community systems			230.7850	(373)
Space and water heating			230.7850	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	0.1320	-62.5726	
PV Unit electricity exported	-484.2242	0.1214	-58.7607	
Total			-121.3332	(380)
Total CO2, kg/year			137.3965	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.9200	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1524.8974	1.5797	767.6729	(467)
Electrical energy for heat distribution (space & water)	18.2232	0.0000	88.0407	(472)
Overall CO2 factor for heat network			0.4260	(486)
Total CO2 associated with community systems			2435.7916	(473)
Space and water heating			2435.7916	(476)
Pumps, fans and electric keep-hot	19.6671	1.5128	29.7525	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	1.4877	-705.1878	
PV Unit electricity exported	-484.2242	0.4452	-215.5829	
Total			-920.7707	(480)
Total Primary energy kWh/year			1812.7558	(483)
Dwelling Primary energy Rate (DPER)			25.3500	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b) x	2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c) x	2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3264	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3020	0.3264	0.3509	0.3672	0.3836	(22b)
Effective ac	0.5866	0.5833	0.5800	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			11.9270	1.1450	13.6603			(27)
Heatloss floor			35.7600	0.1300	4.6488			(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.1800	6.3023			(29a)
500mm mineral wool	35.7600		35.7600	0.1100	3.9336			(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5850			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.9097 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.0600	0.0500	0.3530
E3 Sill	3.7400	0.0500	0.1870
E4 Jamb	23.3600	0.0500	1.1680
E5 Ground floor (normal)	11.1200	0.1600	1.7792
E6 Intermediate floor within a dwelling	4.0300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.3800	0.0600	0.3828
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	12.9900	0.0800	1.0392
P2 Party wall - Intermediate floor within a dwelling	15.4400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	15.4400	0.1200	1.8528
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.3500	0.0200	0.0470

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.3690 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 38.9540 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.9203	33.7259	33.5352	32.6398	32.4723	31.6925	31.6925	31.5481	31.9929	32.4723	32.8112	33.1655	(38)
Heat transfer coeff	72.8744	72.6799	72.4893	71.5939	71.4264	70.6465	70.6465	70.5021	70.9469	71.4264	71.7653	72.1196	(39)
Average = Sum(39)m / 12 =												71.5931	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0189	1.0162	1.0136	1.0010	0.9987	0.9878	0.9878	0.9858	0.9920	0.9987	1.0034	1.0084	(40)
HLP (average)												1.0010	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

Hot water usage for mixer showers

62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day) 117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	248.5063	219.7523	233.2621	204.4524	197.7953	177.7872	175.0641	182.2099	184.4398	206.2131	219.9654	245.6941	(62)
WWHRS	-28.5673	-25.2652	-26.4562	-21.9068	-20.4164	-17.4704	-16.3757	-17.4139	-18.0756	-21.3091	-24.1406	-28.0383	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
									Total per year (kWh/year) = Sum(64)m =			2229.7066	(64)
12Total per year (kWh/year)												2230	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	104.4115	92.7427	99.3428	89.0609	87.5501	80.1947	79.9919	82.3679	82.4067	90.3490	94.2189	103.4764	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.8362	116.0686	104.8362	108.3307	104.8362	108.3307	104.8362	104.8362	108.3307	104.8362	108.3307	104.8362	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	140.3380	138.0100	133.5252	123.6956	117.6748	111.3815	107.5160	110.7095	114.4537	121.4368	130.8596	139.0812	(72)
Total internal gains													

	506.2293	517.2176	496.2491	478.7347	455.1075	436.0455	419.8249	420.9345	433.4245	451.0924	478.1216	496.1119	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	11.9270	11.2829	0.6300	0.7000	0.7700	41.1268	(75)

Solar gains	41.1268	83.7149	150.8276	247.7022	332.9604	354.9710	332.0681	264.7285	183.7858	102.3062	51.7482	33.5862	(83)
Total gains	547.3562	600.9325	647.0767	726.4370	788.0679	791.0165	751.8930	685.6630	617.2102	553.3986	529.8698	529.6981	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.9557	48.0840	48.2104	48.8134	48.9279	49.4680	49.4680	49.5693	49.2585	48.9279	48.6968	48.4576	
alpha	4.1970	4.2056	4.2140	4.2542	4.2619	4.2979	4.2979	4.3046	4.2839	4.2619	4.2465	4.2305	
util living area													
	0.9805	0.9695	0.9459	0.8735	0.7351	0.5483	0.4079	0.4629	0.7070	0.9077	0.9669	0.9828	(86)
MIT	19.6254	19.8122	20.1118	20.5297	20.8276	20.9624	20.9916	20.9859	20.8919	20.5116	20.0159	19.6002	(87)
Th 2	20.0676	20.0698	20.0721	20.0825	20.0844	20.0935	20.0935	20.0952	20.0900	20.0844	20.0805	20.0764	(88)
util rest of house													
	0.9762	0.9630	0.9340	0.8468	0.6858	0.4786	0.3264	0.3763	0.6382	0.8819	0.9586	0.9790	(89)
MIT 2	18.4739	18.7108	19.0870	19.5996	19.9323	20.0687	20.0899	20.0886	20.0089	19.5910	18.9780	18.4481	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	18.8651	19.0850	19.4352	19.9156	20.2365	20.3724	20.3963	20.3935	20.3089	19.9038	19.3306	18.8396	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8651	19.0850	19.4352	19.9156	20.2365	20.3724	20.3963	20.3935	20.3089	19.9038	19.3306	18.8396	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9689	0.9541	0.9241	0.8414	0.6945	0.5006	0.3539	0.4053	0.6558	0.8760	0.9500	0.9723	(94)
Useful gains	530.3589	573.3784	597.9685	611.2161	547.3191	395.9897	266.1298	277.9186	404.7543	484.7729	503.3660	515.0360	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1061.4240	1030.9653	937.6637	788.6529	609.7287	407.7990	268.1929	281.5480	440.5030	664.5350	877.7347	1055.7980	(97)
Space heating kWh													
	395.1124	307.4984	252.7333	127.7545	46.4327	0.0000	0.0000	0.0000	0.0000	133.7430	269.5454	402.3269	(98a)
Space heating requirement - total per year (kWh/year)												1935.1466	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	395.1124	307.4984	252.7333	127.7545	46.4327	0.0000	0.0000	0.0000	0.0000	133.7430	269.5454	402.3269	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1935.1466	
Space heating per m2											(98c) / (4) =	27.0574	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	395.1124	307.4984	252.7333	127.7545	46.4327	0.0000	0.0000	0.0000	0.0000	133.7430	269.5454	402.3269	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	428.0742	333.1510	273.8172	138.4122	50.3063	0.0000	0.0000	0.0000	0.0000	144.9003	292.0319	435.8905	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.3575	85.0823	84.5107	83.2749	81.5140	79.8000	79.8000	79.8000	79.8000	83.3455	84.7767	85.4180	(217)
Fuel for water heating, kWh/month													
	257.6680	228.5871	244.7099	219.2085	217.6056	200.8982	198.8576	206.5112	208.4765	221.8526	230.9889	254.8127	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.7829	17.4750	15.7343	11.5277	8.9043	7.2749	8.1228	10.5583	13.7142	17.9938	20.3239	22.3883	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.5568	-47.3592	-68.1531	-76.7310	-82.8400	-77.3720	-76.4273	-72.1080	-64.4904	-54.2111	-36.9141	-29.0069	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-18.8029	-39.5749	-78.6914	-118.2335	-156.3709	-157.1182	-155.2578	-131.4301	-96.3075	-56.5975	-25.1064	-14.8664	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2096.5836	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2690.1770	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	175.8004	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1767.5275	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3281.0335	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2096.5836	0.2100	440.2826	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2690.1770	0.2100	564.9372	(264)
Space and water heating			1005.2197	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	175.8004	0.1443	25.3734	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	0.1346	-96.7689	
PV Unit electricity exported	-1048.3576	0.1259	-131.9744	
Total			-228.7433	(269)
Total CO2, kg/year			813.7791	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.3800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2096.5836	1.1300	2369.1394	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2690.1770	1.1300	3039.9000	(278)
Space and water heating			5409.0394	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	175.8004	1.5338	269.6485	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	1.4973	-1076.8103	
PV Unit electricity exported	-1048.3576	0.4621	-484.4365	
Total			-1561.2467	(283)
Total Primary energy kWh/year			4247.5420	(286)
Target Primary Energy Rate (TPER)			59.3900	(287)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.92	**TER**	11.38
Environmental	99 A	**% DER < TER**			83.13
CO_2 Emissions (t/year)	0.11	**DFEE**	26.07	**TFEE**	34.16
Compliance Check	See BREL	**% DFEE < TFEE**			23.68
% DPER < TPER	57.32	**DPER**	25.35	**TPER**	59.39

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2489	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3174	0.3112	0.3049	0.2738	0.2676	0.2365	0.2365	0.2303	0.2489	0.2676	0.2801	0.2925	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5504	0.5484	0.5465	0.5375	0.5358	0.5280	0.5280	0.5265	0.5310	0.5358	0.5392	0.5428	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			12581.0601	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							175.9097	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							3.6151	(36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.8245	31.7114	31.6006	31.0799	30.9825	30.5289	30.5289	30.4450	30.7036	30.9825	31.1795	31.3856	(38)
Heat transfer coeff	62.1367	62.0236	61.9127	61.3920	61.2946	60.8411	60.8411	60.7571	61.0158	61.2946	61.4917	61.6977	(39)

Average = Sum(39)m / 12 = 61.3916

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8688	0.8672	0.8657	0.8584	0.8570	0.8507	0.8507	0.8495	0.8531	0.8570	0.8598	0.8627	(40)
HLP (average)												0.8584	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day) 59.5787 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.0001	63.2172	61.2706	58.8477	56.6862	54.4399	53.9730	55.9157	57.9081	60.2149	62.6593	64.9088	(44)
Energy conte	102.9443	90.0205	94.1707	80.5595	76.3105	66.9402	65.2757	69.2353	71.4064	81.7111	89.2697	101.6316	(45)

Energy content (annual) Total = Sum(45)m = 989.4754

Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(64)

Total per year (kWh/year) = Sum(64)m = 841.0541 (64)

12Total per year (kWh/year) 841 (64)

Electric shower(s)	50.0432	44.5889	48.6894	46.4637	47.3355	45.1535	46.6586	47.3355	46.4637	48.6894	47.7738	50.0432	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 569.2384 (64a)

Heat gains from water heating, kWh/month	34.3865	30.2766	32.1836	28.7348	28.0499	25.5132	25.5357	26.5464	26.7898	29.5359	30.9133	34.1075	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.6996	119.2388	107.6996	111.2896	107.6996	111.2896	107.6996	107.6996	111.2896	107.6996	111.2896	107.6996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	46.2184	45.0544	43.2575	39.9095	37.7014	35.4350	34.3222	35.6806	37.2080	39.6988	42.9351	45.8434	(72)
Total internal gains	411.9730	424.4322	405.8448	394.9074	374.9975	363.0578	349.4944	348.7689	359.1376	369.2178	390.1559	402.7375	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.8900	11.2829	0.6800	0.7000	0.7700	36.8094	(75)
Northeast	2.0370	11.2829	0.6800	0.7000	0.7700	7.5815	(75)

Solar gains	44.3909	90.3589	162.7980	267.3611	359.3858	383.1433	358.4227	285.7387	198.3719	110.4258	55.8552	36.2518	(83)
Total gains	456.3639	514.7911	568.6428	662.2685	734.3833	746.2011	707.9171	634.5077	557.5096	479.6435	446.0111	438.9893	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.2428	56.3453	56.4462	56.9250	57.0154	57.4404	57.4404	57.5198	57.2760	57.0154	56.8327	56.6429	
alpha	4.7495	4.7564	4.7631	4.7950	4.8010	4.8294	4.8294	4.8347	4.8184	4.8010	4.7888	4.7762	
util living area	0.9886	0.9788	0.9551	0.8713	0.7094	0.5108	0.3760	0.4358	0.6958	0.9218	0.9783	0.9904	(86)

MIT	19.7696	19.9618	20.2555	20.6512	20.8967	20.9826	20.9968	20.9937	20.9303	20.5890	20.1202	19.7357	(87)
Th 2	20.1941	20.1955	20.1968	20.2030	20.2042	20.2096	20.2096	20.2106	20.2075	20.2042	20.2018	20.1994	(88)
util rest of house													
	0.9861	0.9743	0.9454	0.8462	0.6638	0.4516	0.3095	0.3631	0.6332	0.9004	0.9728	0.9883	(89)
MIT 2	19.0664	19.2571	19.5451	19.9222	20.1331	20.2006	20.2085	20.2083	20.1662	19.8742	19.4201	19.0369	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.3053	19.4965	19.7865	20.1699	20.3925	20.4663	20.4763	20.4751	20.4258	20.1171	19.6580	19.2743	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3053	19.4965	19.7865	20.1699	20.3925	20.4663	20.4763	20.4751	20.4258	20.1171	19.6580	19.2743	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9826	0.9694	0.9396	0.8450	0.6750	0.4711	0.3320	0.3877	0.6513	0.8977	0.9682	0.9852	(94)
Useful gains	448.4050	499.0322	534.3092	559.6303	495.7003	351.5534	235.0603	245.9897	363.0875	430.5570	431.8217	432.4804	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	932.3794	905.3292	822.6039	691.8799	532.8040	356.9126	235.8402	247.5922	385.9741	583.3447	772.2136	930.0528	(97)
Space heating kWh													
	360.0769	273.0316	214.4912	95.2197	27.6051	0.0000	0.0000	0.0000	0.0000	113.6740	245.0822	370.1938	(98a)
Space heating requirement - total per year (kWh/year)												1699.3746	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	360.0769	273.0316	214.4912	95.2197	27.6051	0.0000	0.0000	0.0000	0.0000	113.6740	245.0822	370.1938	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1699.3746	
Space heating per m2											(98c) / (4) =	23.7608	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	571.9062	450.2240	461.7539	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9411	0.9696	0.9502	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	538.2446	436.5439	438.7649	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	826.7717	784.2989	700.6447	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	207.7395	258.7297	194.8386	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	51.9349	64.6824	48.7096	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												165.3269	(107)
Energy for space heating												23.7608	(99)
Energy for space cooling												2.3116	(108)
Total												26.0725	(109)
Fabric Energy Efficiency (DFEE)												26.1	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor		35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3264	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3020	0.3264	0.3509	0.3672	0.3836	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5866	0.5833	0.5800	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			11.9270	1.1450	13.6603			(27)
Heatloss floor			35.7600	0.1300	4.6488			(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.1800	6.3023			(29a)
500mm mineral wool	35.7600		35.7600	0.1100	3.9336			(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5850			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	175.9097	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.0600	0.0500	0.3530
E3 Sill	3.7400	0.0500	0.1870
E4 Jamb	23.3600	0.0500	1.1680
E5 Ground floor (normal)	11.1200	0.1600	1.7792
E6 Intermediate floor within a dwelling	4.0300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.3800	0.0600	0.3828
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	12.9900	0.0800	1.0392
P2 Party wall - Intermediate floor within a dwelling	15.4400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	15.4400	0.1200	1.8528
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.3500	0.0200	0.0470

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.3690	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	38.9540	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.9203	33.7259	33.5352	32.6398	32.4723	31.6925	31.6925	31.5481	31.9929	32.4723	32.8112	33.1655	(38)
Heat transfer coeff													
	72.8744	72.6799	72.4893	71.5939	71.4264	70.6465	70.6465	70.5021	70.9469	71.4264	71.7653	72.1196	(39)
Average = Sum(39)m / 12 =												71.5931	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0189	1.0162	1.0136	1.0010	0.9987	0.9878	0.9878	0.9858	0.9920	0.9987	1.0034	1.0084	(40)
HLP (average)												1.0010	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2825	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses													
	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												59.5787	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	65.0001	63.2172	61.2706	58.8477	56.6862	54.4399	53.9730	55.9157	57.9081	60.2149	62.6593	64.9088	(44)
Energy conte	102.9443	90.0205	94.1707	80.5595	76.3105	66.9402	65.2757	69.2353	71.4064	81.7111	89.2697	101.6316	(45)
Energy content (annual)										Total = Sum(45)m =		989.4754	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(64)
										Total per year (kWh/year) = Sum(64)m =		841.0541	(64)
12Total per year (kWh/year)												841	(64)
Electric shower(s)													
	50.0432	44.5889	48.6894	46.4637	47.3355	45.1535	46.6586	47.3355	46.4637	48.6894	47.7738	50.0432	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		569.2384	(64a)
Heat gains from water heating, kWh/month													
	34.3865	30.2766	32.1836	28.7348	28.0499	25.5132	25.5357	26.5464	26.7898	29.5359	30.9133	34.1075	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	104.8362	116.0686	104.8362	108.3307	104.8362	108.3307	104.8362	104.8362	108.3307	104.8362	108.3307	104.8362 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982 (71)

Water heating gains (Table 5)

	46.2184	45.0544	43.2575	39.9095	37.7014	35.4350	34.3222	35.6806	37.2080	39.6988	42.9351	45.8434 (72)

Total internal gains

	409.1097	421.2621	402.9814	391.9486	372.1341	360.0989	346.6311	345.9056	356.1788	366.3544	387.1971	399.8741 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	11.9270	11.2829	0.6300	0.7000	0.7700	41.1268	(75)

Solar gains	41.1268	83.7149	150.8276	247.7022	332.9604	354.9710	332.0681	264.7285	183.7858	102.3062	51.7482	33.5862 (83)
Total gains	450.2365	504.9769	553.8090	639.6508	705.0945	715.0700	678.6992	610.6341	539.9646	468.6606	438.9453	433.4604 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.9557	48.0840	48.2104	48.8134	48.9279	49.4680	49.4680	49.5693	49.2585	48.9279	48.6968	48.4576	
alpha	4.1970	4.2056	4.2140	4.2542	4.2619	4.2979	4.2979	4.3046	4.2839	4.2619	4.2465	4.2305	
util living area	0.9902	0.9832	0.9670	0.9096	0.7850	0.5967	0.4492	0.5142	0.7690	0.9431	0.9826	0.9917	(86)
MIT	19.4419	19.6380	19.9570	20.4228	20.7752	20.9482	20.9878	20.9789	20.8489	20.3892	19.8516	19.4164	(87)
Th 2	20.0676	20.0698	20.0721	20.0825	20.0844	20.0935	20.0935	20.0952	20.0900	20.0844	20.0805	20.0764	(88)
util rest of house	0.9880	0.9793	0.9592	0.8883	0.7387	0.5241	0.3606	0.4203	0.7033	0.9251	0.9779	0.9897	(89)
MIT 2	18.6447	18.8406	19.1563	19.6108	19.9260	20.0663	20.0894	20.0873	19.9981	19.5892	19.0617	18.6260	(90)
Living area fraction									fLA = Living area / (4) =			0.3398	(91)
MIT	18.9156	19.1115	19.4284	19.8867	20.2145	20.3660	20.3946	20.3903	20.2872	19.8610	19.3301	18.8945	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9156	19.1115	19.4284	19.8867	20.2145	20.3660	20.3946	20.3903	20.2872	19.8610	19.3301	18.8945	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9843	0.9742	0.9524	0.8830	0.7458	0.5467	0.3905	0.4517	0.7188	0.9198	0.9729	0.9864	(94)
Useful gains	443.1519	491.9348	527.4258	564.8269	525.8403	390.8998	265.0624	275.8356	388.1277	431.0763	427.0606	427.5712	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1065.1030	1032.8929	937.1678	786.5803	608.1595	407.3454	268.0780	281.3231	438.9605	661.4816	877.6976	1059.7645	(97)
Space heating kWh	462.7317	363.5238	304.8480	159.6624	61.2455	0.0000	0.0000	0.0000	0.0000	171.4215	324.4586	470.3518	(98a)
Space heating requirement - total per year (kWh/year)												2318.2434	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	462.7317	363.5238	304.8480	159.6624	61.2455	0.0000	0.0000	0.0000	0.0000	171.4215	324.4586	470.3518	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2318.2434	
Space heating per m2											(98c) / (4) =	32.4139	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	664.0772	522.7842	535.8159	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8758	0.9256	0.8923	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	581.5866	483.8737	478.0869	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	793.5925	753.2241	675.7355	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	152.6443	200.3967	147.0506	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	38.1611	50.0992	36.7626	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												125.0229	(107)
Energy for space heating												32.4139	(99)
Energy for space cooling												1.7481	(108)
Total												34.1620	(109)
Fabric Energy Efficiency (TFEE)												34.2	(109)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.92	**TER**	11.38
Environmental	99 A	**% DER < TER**			83.13
CO_2 Emissions (t/year)	0.11	**DFEE**	26.07	**TFEE**	34.16
Compliance Check	See BREL	**% DFEE < TFEE**			23.68
% DPER < TPER	57.32	**DPER**	25.35	**TPER**	59.39

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.2825 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day)		117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:		
Store volume		110.0000 (47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)		0.0152 (51)
Volume factor from Table 2a		1.0294 (52)
Temperature factor from Table 2b		0.6000 (53)
Enter (49) or (54) in (55)		1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
										Total per year (kWh/year) = Sum(64)m =		2597.3645	(64)
12Total per year (kWh/year)												2597	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)

Heat gains from water heating, kWh/month

111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.6996	119.2388	107.6996	111.2896	107.6996	111.2896	107.6996	107.6996	111.2896	107.6996	111.2896	107.6996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains	515.4281	526.7231	505.4479	488.0289	464.3062	448.3397	432.0236	433.1332	445.7187	460.2911	487.4158	505.3106	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.8900	11.2829	0.6800	0.7000	0.7700	36.8094	(75)
Northeast	2.0370	11.2829	0.6800	0.7000	0.7700	7.5815	(75)

Solar gains	44.3909	90.3589	162.7980	267.3611	359.3858	383.1433	358.4227	285.7387	198.3719	110.4258	55.8552	36.2518	(83)
Total gains	559.8189	617.0821	668.2459	755.3901	823.6920	831.4830	790.4463	718.8720	644.0906	570.7169	543.2710	541.5624	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9729	0.9554	0.9169	0.8088	0.6352	0.4507	0.3287	0.3770	0.6081	0.8615	0.9522	0.9767	(86)
MIT	20.0580	20.2285	20.4784	20.7761	20.9415	20.9908	20.9984	20.9970	20.9640	20.7366	20.3515	20.0122	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9676	0.9470	0.9016	0.7787	0.5908	0.3983	0.2716	0.3147	0.5485	0.8312	0.9417	0.9721	(89)
MIT 2	19.1364	19.3491	19.6563	20.0040	20.1787	20.2231	20.2284	20.2276	20.2027	19.9682	19.5056	19.0788	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.4495	19.6479	19.9356	20.2663	20.4379	20.4839	20.4900	20.4890	20.4614	20.2293	19.7930	19.3959	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4495	19.6479	19.9356	20.2663	20.4379	20.4839	20.4900	20.4890	20.4614	20.2293	19.7930	19.3959	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9609	0.9394	0.8951	0.7802	0.6031	0.4157	0.2910	0.3358	0.5670	0.8312	0.9346	0.9658	(94)
Useful gains	537.9484	579.7058	598.1240	589.3871	496.7614	345.6823	230.0101	241.4200	365.1743	474.3580	507.7584	523.0548	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	897.2152	873.4325	795.7116	673.1617	517.4930	348.4703	230.3829	242.1699	376.7486	570.2842	751.7331	899.9660	(97)
Space heating kWh													
	267.2945	197.3844	147.0052	60.3177	15.4243	0.0000	0.0000	0.0000	0.0000	71.3691	175.6618	280.4219	(98a)
Space heating requirement - total per year (kWh/year)												1214.8790	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	267.2945	197.3844	147.0052	60.3177	15.4243	0.0000	0.0000	0.0000	0.0000	71.3691	175.6618	280.4219	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1214.8790	
Space heating per m2											(98c) / (4) =	16.9866	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	267.2945	197.3844	147.0052	60.3177	15.4243	0.0000	0.0000	0.0000	0.0000	71.3691	175.6618	280.4219	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	400.9418	296.0766	220.5078	90.4765	23.1365	0.0000	0.0000	0.0000	0.0000	107.0536	263.4927	420.6329	
Space heating requirement													
	400.9418	296.0766	220.5078	90.4765	23.1365	0.0000	0.0000	0.0000	0.0000	107.0536	263.4927	420.6329	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.8619	-24.6522	-41.9801	-54.0165	-62.8534	-60.2005	-59.0498	-53.1061	-43.0156	-30.6311	-17.3392	-12.2904	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.6369	-11.9261	-30.0153	-54.8475	-81.1374	-84.9515	-82.6912	-64.6364	-40.4468	-18.8657	-6.6109	-3.4586	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1822.3184	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3896.0468	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												18.2232	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.6671	(330a)
Total electricity for the above, kWh/year												19.6671	(331)
Electricity for lighting (calculated in Appendix L)												174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4954.5256	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1524.8974	0.1566	76.0975	(367)
Electrical energy for heat distribution (space & water)	18.2232	0.0000	8.3416	(372)
Overall CO2 factor for heat network			0.0404	(386)
Total CO2 associated with community systems			230.7850	(373)
Space and water heating			230.7850	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	0.1320	-62.5726	
PV Unit electricity exported	-484.2242	0.1214	-58.7607	
Total			-121.3332	(380)
Total CO2, kg/year			137.3965	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.9200	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1524.8974	1.5797	767.6729	(467)
Electrical energy for heat distribution (space & water)	18.2232	0.0000	88.0407	(472)
Overall CO2 factor for heat network			0.4260	(486)
Total CO2 associated with community systems			2435.7916	(473)
Space and water heating			2435.7916	(476)
Pumps, fans and electric keep-hot	19.6671	1.5128	29.7525	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	1.4877	-705.1878	
PV Unit electricity exported	-484.2242	0.4452	-215.5829	
Total			-920.7707	(480)
Total Primary energy kWh/year			1812.7558	(483)
Dwelling Primary energy Rate (DPER)			25.3500	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b) x	2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c) x	2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3264	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3020	0.3264	0.3509	0.3672	0.3836	(22b)
Effective ac	0.5866	0.5833	0.5800	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			11.9270	1.1450	13.6603			(27)
Heatloss floor			35.7600	0.1300	4.6488			(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.1800	6.3023			(29a)
500mm mineral wool	35.7600		35.7600	0.1100	3.9336			(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5850			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.9097 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.0600	0.0500	0.3530
E3 Sill	3.7400	0.0500	0.1870
E4 Jamb	23.3600	0.0500	1.1680
E5 Ground floor (normal)	11.1200	0.1600	1.7792
E6 Intermediate floor within a dwelling	4.0300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.3800	0.0600	0.3828
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	12.9900	0.0800	1.0392
P2 Party wall - Intermediate floor within a dwelling	15.4400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	15.4400	0.1200	1.8528
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.3500	0.0200	0.0470

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.3690 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 38.9540 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.9203	33.7259	33.5352	32.6398	32.4723	31.6925	31.6925	31.5481	31.9929	32.4723	32.8112	33.1655	(38)
Heat transfer coeff	72.8744	72.6799	72.4893	71.5939	71.4264	70.6465	70.6465	70.5021	70.9469	71.4264	71.7653	72.1196	(39)
Average = Sum(39)m / 12 =												71.5931	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0189	1.0162	1.0136	1.0010	0.9987	0.9878	0.9878	0.9858	0.9920	0.9987	1.0034	1.0084	(40)
HLP (average)												1.0010	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

Hot water usage for mixer showers

62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day) 117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	248.5063	219.7523	233.2621	204.4524	197.7953	177.7872	175.0641	182.2099	184.4398	206.2131	219.9654	245.6941	(62)
WWHRS	-28.5673	-25.2652	-26.4562	-21.9068	-20.4164	-17.4704	-16.3757	-17.4139	-18.0756	-21.3091	-24.1406	-28.0383	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
									Total per year (kWh/year) = Sum(64)m =			2229.7066	(64)
12Total per year (kWh/year)												2230	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	104.4115	92.7427	99.3428	89.0609	87.5501	80.1947	79.9919	82.3679	82.4067	90.3490	94.2189	103.4764	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.8362	116.0686	104.8362	108.3307	104.8362	108.3307	104.8362	104.8362	108.3307	104.8362	108.3307	104.8362	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	140.3380	138.0100	133.5252	123.6956	117.6748	111.3815	107.5160	110.7095	114.4537	121.4368	130.8596	139.0812	(72)
Total internal gains													

	506.2293	517.2176	496.2491	478.7347	455.1075	436.0455	419.8249	420.9345	433.4245	451.0924	478.1216	496.1119	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	11.9270	11.2829	0.6300	0.7000	0.7700	41.1268	(75)

Solar gains	41.1268	83.7149	150.8276	247.7022	332.9604	354.9710	332.0681	264.7285	183.7858	102.3062	51.7482	33.5862	(83)
Total gains	547.3562	600.9325	647.0767	726.4370	788.0679	791.0165	751.8930	685.6630	617.2102	553.3986	529.8698	529.6981	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.9557	48.0840	48.2104	48.8134	48.9279	49.4680	49.4680	49.5693	49.2585	48.9279	48.6968	48.4576	
alpha	4.1970	4.2056	4.2140	4.2542	4.2619	4.2979	4.2979	4.3046	4.2839	4.2619	4.2465	4.2305	
util living area													
	0.9805	0.9695	0.9459	0.8735	0.7351	0.5483	0.4079	0.4629	0.7070	0.9077	0.9669	0.9828	(86)
MIT	19.6254	19.8122	20.1118	20.5297	20.8276	20.9624	20.9916	20.9859	20.8919	20.5116	20.0159	19.6002	(87)
Th 2	20.0676	20.0698	20.0721	20.0825	20.0844	20.0935	20.0935	20.0952	20.0900	20.0844	20.0805	20.0764	(88)
util rest of house													
	0.9762	0.9630	0.9340	0.8468	0.6858	0.4786	0.3264	0.3763	0.6382	0.8819	0.9586	0.9790	(89)
MIT 2	18.4739	18.7108	19.0870	19.5996	19.9323	20.0687	20.0899	20.0886	20.0089	19.5910	18.9780	18.4481	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	18.8651	19.0850	19.4352	19.9156	20.2365	20.3724	20.3963	20.3935	20.3089	19.9038	19.3306	18.8396	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8651	19.0850	19.4352	19.9156	20.2365	20.3724	20.3963	20.3935	20.3089	19.9038	19.3306	18.8396	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9689	0.9541	0.9241	0.8414	0.6945	0.5006	0.3539	0.4053	0.6558	0.8760	0.9500	0.9723	(94)
Useful gains	530.3589	573.3784	597.9685	611.2161	547.3191	395.9897	266.1298	277.9186	404.7543	484.7729	503.3660	515.0360	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1061.4240	1030.9653	937.6637	788.6529	609.7287	407.7990	268.1929	281.5480	440.5030	664.5350	877.7347	1055.7980	(97)
Space heating kWh													
	395.1124	307.4984	252.7333	127.7545	46.4327	0.0000	0.0000	0.0000	0.0000	133.7430	269.5454	402.3269	(98a)
Space heating requirement - total per year (kWh/year)												1935.1466	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	395.1124	307.4984	252.7333	127.7545	46.4327	0.0000	0.0000	0.0000	0.0000	133.7430	269.5454	402.3269	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1935.1466	
Space heating per m2											(98c) / (4) =	27.0574	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	395.1124	307.4984	252.7333	127.7545	46.4327	0.0000	0.0000	0.0000	0.0000	133.7430	269.5454	402.3269	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	428.0742	333.1510	273.8172	138.4122	50.3063	0.0000	0.0000	0.0000	0.0000	144.9003	292.0319	435.8905	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.3575	85.0823	84.5107	83.2749	81.5140	79.8000	79.8000	79.8000	79.8000	83.3455	84.7767	85.4180	(217)
Fuel for water heating, kWh/month													
	257.6680	228.5871	244.7099	219.2085	217.6056	200.8982	198.8576	206.5112	208.4765	221.8526	230.9889	254.8127	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.7829	17.4750	15.7343	11.5277	8.9043	7.2749	8.1228	10.5583	13.7142	17.9938	20.3239	22.3883	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.5568	-47.3592	-68.1531	-76.7310	-82.8400	-77.3720	-76.4273	-72.1080	-64.4904	-54.2111	-36.9141	-29.0069	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-18.8029	-39.5749	-78.6914	-118.2335	-156.3709	-157.1182	-155.2578	-131.4301	-96.3075	-56.5975	-25.1064	-14.8664	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2096.5836	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2690.1770	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	175.8004	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1767.5275	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3281.0335	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2096.5836	0.2100	440.2826	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2690.1770	0.2100	564.9372	(264)
Space and water heating			1005.2197	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	175.8004	0.1443	25.3734	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	0.1346	-96.7689	
PV Unit electricity exported	-1048.3576	0.1259	-131.9744	
Total			-228.7433	(269)
Total CO2, kg/year			813.7791	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.3800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2096.5836	1.1300	2369.1394	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2690.1770	1.1300	3039.9000	(278)
Space and water heating			5409.0394	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	175.8004	1.5338	269.6485	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	1.4973	-1076.8103	
PV Unit electricity exported	-1048.3576	0.4621	-484.4365	
Total			-1561.2467	(283)
Total Primary energy kWh/year			4247.5420	(286)
Target Primary Energy Rate (TPER)			59.3900	(287)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.92	**TER**	11.38
Environmental	99 A	**% DER < TER**			83.13
CO_2 Emissions (t/year)	0.11	**DFEE**	26.07	**TFEE**	34.16
Compliance Check	See BREL	**% DFEE < TFEE**			23.68
% DPER < TPER	57.32	**DPER**	25.35	**TPER**	59.39

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												175.9097	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6151	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	30.3121	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
										Total per year (kWh/year) = Sum(64)m =		2597.3645	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains	570.7610	568.7779	552.3532	521.4980	490.9997	463.3358	446.9330	449.7815	465.4657	493.4744	527.3747	556.9668	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.8900	11.2829	0.6800	0.7000	0.7700	36.8094	(75)
Northeast	2.0370	11.2829	0.6800	0.7000	0.7700	7.5815	(75)

Solar gains	44.3909	90.3589	162.7980	267.3611	359.3858	383.1433	358.4227	285.7387	198.3719	110.4258	55.8552	36.2518	(83)
Total gains	615.1519	659.1369	715.1512	788.8591	850.3855	846.4792	805.3557	735.5203	663.8376	603.9002	583.2299	593.2186	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area	0.9614	0.9438	0.8976	0.7892	0.6187	0.4430	0.3227	0.3687	0.5927	0.8396	0.9389	0.9670	(86)
MIT	20.1571	20.2974	20.5404	20.8006	20.9478	20.9915	20.9986	20.9973	20.9678	20.7691	20.4157	20.1069	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house	0.9542	0.9336	0.8801	0.7579	0.5747	0.3914	0.2666	0.3077	0.5338	0.8068	0.9261	0.9607	(89)
MIT 2	19.2596	19.4335	19.7293	20.0303	20.1843	20.2235	20.2284	20.2278	20.2057	20.0032	19.5833	19.1971	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.5645	19.7271	20.0049	20.2920	20.4437	20.4844	20.4901	20.4892	20.4646	20.2634	19.8661	19.5062	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5645	19.7271	20.0049	20.2920	20.4437	20.4844	20.4901	20.4892	20.4646	20.2634	19.8661	19.5062	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9468	0.9259	0.8744	0.7606	0.5872	0.4087	0.2856	0.3283	0.5522	0.8084	0.9191	0.9536	(94)
Useful gains	582.4026	610.3194	625.3134	599.9981	499.3438	345.9159	230.0451	241.5035	366.5959	488.1806	536.0729	565.6911	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	904.0283	878.1194	799.8168	674.6823	517.8395	348.5009	230.3876	242.1810	376.9378	572.3072	756.0606	906.4966	(97)
Space heating kWh	239.2895	179.9616	129.8305	53.7726	13.7608	0.0000	0.0000	0.0000	0.0000	62.5902	158.3912	253.5593	(98a)
Space heating requirement - total per year (kWh/year)												1091.1558	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	239.2895	179.9616	129.8305	53.7726	13.7608	0.0000	0.0000	0.0000	0.0000	62.5902	158.3912	253.5593	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1091.1558	
Space heating per m2											(98c) / (4) =	15.2567	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

239.2895	179.9616	129.8305	53.7726	13.7608	0.0000	0.0000	0.0000	0.0000	62.5902	158.3912	253.5593	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a 358.9343	269.9425	194.7458	80.6589	20.6412	0.0000	0.0000	0.0000	0.0000	93.8853	237.5868	380.3390	
Space heating requirement												
358.9343	269.9425	194.7458	80.6589	20.6412	0.0000	0.0000	0.0000	0.0000	93.8853	237.5868	380.3390	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement

257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a 385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel												
385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)

Cooling System Energy Efficiency Ratio	0.0000	(314)

Space coolin 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa 1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting 21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m -14.8619	-24.6522	-41.9801	-54.0165	-62.8534	-60.2005	-59.0498	-53.1061	-43.0156	-30.6311	-17.3392	-12.2904	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m -4.6369	-11.9261	-30.0153	-54.8475	-81.1374	-84.9515	-82.6912	-64.6364	-40.4468	-18.8657	-6.6109	-3.4586	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1636.7337	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3896.0468	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	16.3673	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(330a)
Total electricity for the above, kWh/year	19.6671	(331)
Electricity for lighting (calculated in Appendix L)	174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4768.9409	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1636.7337	4.4400	72.6710	(340a)
Space heating total			72.6710	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3896.0468	4.4400	172.9845	(342a)
Water heating total			172.9845	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	16.4900	3.2431	(349)
Energy for lighting	174.7141	16.4900	28.8104	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	16.4900	-78.1621	
PV Unit electricity exported	-484.2242	5.5900	-27.0681	
Total			-105.2302	(352)
Total energy cost			264.4787	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.8171	(357)
SAP value	86.7543	
SAP rating (Section 12)	87	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1475.4081	0.1566	68.3710	(367)
Electrical energy for heat distribution (space & water)	16.3673	0.0000	8.0519	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			222.7688	(373)
Space and water heating			222.7688	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	0.1320	-62.5726	
PV Unit electricity exported	-484.2242	0.1214	-58.7607	
Total			-121.3332	(380)
Total CO2, kg/year			129.3803	(383)
CO2 emissions per m2			1.8100	(384)
EI value			98.5121	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b) x	2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c) x	2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 71.5200						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	0 * 10 = 0.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	3	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
									Total per year (kWh/year) = Sum(64)m =			2597.3645	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)													
	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains													
	570.7610	568.7779	552.3532	521.4980	490.9997	463.3358	446.9330	449.7815	465.4657	493.4744	527.3747	556.9668	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.8900	13.7758	0.6800	0.7000	0.7700	44.9420	(75)
Northeast	2.0370	13.7758	0.6800	0.7000	0.7700	9.2565	(75)

Solar gains	54.1985	98.6378	175.8875	291.9762	376.7764	429.9382	395.0527	322.1943	226.3141	127.4643	67.3061	44.4293	(83)
Total gains	624.9595	667.4157	728.2407	813.4741	867.7761	893.2740	841.9857	771.9758	691.7798	620.9387	594.6807	601.3961	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9563	0.9375	0.8805	0.7586	0.5802	0.3824	0.2740	0.3138	0.5498	0.8068	0.9281	0.9629	(86)
MIT	20.2080	20.3427	20.6017	20.8393	20.9625	20.9960	20.9994	20.9988	20.9777	20.8190	20.4752	20.1560	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9482	0.9262	0.8604	0.7248	0.5349	0.3324	0.2200	0.2552	0.4908	0.7692	0.9132	0.9558	(89)
MIT 2	19.3232	19.4894	19.8022	20.0722	20.1981	20.2267	20.2288	20.2286	20.2136	20.0577	19.6557	19.2587	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.6238	19.7793	20.0738	20.3328	20.4578	20.4881	20.4906	20.4903	20.4732	20.3163	19.9342	19.5636	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6238	19.7793	20.0738	20.3328	20.4578	20.4881	20.4906	20.4903	20.4732	20.3163	19.9342	19.5636	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9406	0.9186	0.8559	0.7295	0.5486	0.3493	0.2383	0.2751	0.5098	0.7738	0.9067	0.9485	(94)
Useful gains	587.8513	613.1046	623.3052	593.4590	476.0255	312.0232	200.6784	212.3656	352.6845	480.4644	539.2146	570.4080	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	889.7724	863.4479	774.2864	653.4090	489.0636	313.1801	200.8082	212.6317	359.6794	545.8299	736.4014	892.1290	(97)
Space heating kWh													
	224.6293	168.2307	112.3300	43.1640	9.7003	0.0000	0.0000	0.0000	0.0000	48.6319	141.9745	239.3604	(98a)
Space heating requirement - total per year (kWh/year)												988.0212	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	224.6293	168.2307	112.3300	43.1640	9.7003	0.0000	0.0000	0.0000	0.0000	48.6319	141.9745	239.3604	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												988.0212	
Space heating per m2											(98c) / (4) =	13.8146	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	224.6293	168.2307	112.3300	43.1640	9.7003	0.0000	0.0000	0.0000	0.0000	48.6319	141.9745	239.3604	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	336.9440	252.3460	168.4950	64.7460	14.5505	0.0000	0.0000	0.0000	0.0000	72.9479	212.9618	359.0406	
Space heating requirement													
	336.9440	252.3460	168.4950	64.7460	14.5505	0.0000	0.0000	0.0000	0.0000	72.9479	212.9618	359.0406	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.7439	-26.4473	-44.1602	-56.7208	-64.1553	-63.6776	-61.8747	-56.5668	-46.5864	-34.0293	-20.3275	-14.7878	(333a)

Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.2546	-13.5179	-33.0849	-60.8523	-85.0852	-97.4411	-92.6154	-74.6748	-47.7624	-22.9670	-8.7029	-4.7110	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1482.0318	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3896.0468	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	14.8203	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(330a)
Total electricity for the above, kWh/year	19.6671	(331)
Electricity for lighting (calculated in Appendix L)	174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4517.7128	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1482.0318	6.5500	97.0731	(340a)
Space heating total			97.0731	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3896.0468	6.5500	255.1911	(342a)
Water heating total			255.1911	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	28.4300	5.5914	(349)
Energy for lighting	174.7141	28.4300	49.6712	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-507.0777	28.4300	-144.1622	
PV Unit electricity exported	-547.6693	5.8100	-31.8196	
Total			-175.9818	(352)
Total energy cost			335.5450	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1434.1543	0.1571	62.0955	(367)
Electrical energy for heat distribution (space & water)	14.8203	0.0000	7.8166	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			216.2580	(373)
Space and water heating			216.2580	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-507.0777	0.1323	-67.0962	
PV Unit electricity exported	-547.6693	0.1214	-66.4868	
Total			-133.5830	(380)
Total CO2, kg/year			110.6197	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1434.1543	1.5817	625.0877	(467)
Electrical energy for heat distribution (space & water)	14.8203	0.0000	82.6937	(472)
Overall CO2 factor for heat network			0.4254	(486)
Total CO2 associated with community systems			2287.8594	(473)
Space and water heating			2287.8594	(476)
Pumps, fans and electric keep-hot	19.6671	1.5128	29.7525	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-507.0777	1.4889	-754.9866	
PV Unit electricity exported	-547.6693	0.4453	-243.8963	
Total			-998.8829	(480)
Total Primary energy kWh/year			1586.7114	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Northeast

Current energy efficiency rating: B 87
Current environmental impact rating: A 99

N Solar water heating	Recommended
U Solar photovoltaic panels	Already installed
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.4	-£ 47	-26 kg (23.4%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£47	0.36 kg/m²	B 88	A 99
Total Savings	£47	0.36 kg/m²		

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£55	£78	-£23
Community scheme	£456	£388	£69
Space heating	£207	£229	-£23
Water heating	£255	£187	£69
Lighting	£50	£50	£0
Generated (PV)	-£176	-£177	£1
Total cost of fuels	£335	£289	£47
Total cost of uses	£336	£289	£47
Delivered energy	63 kWh/m²	50 kWh/m²	14 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	2 kg/m²	1 kg/m²	0 kg/m²
Primary energy	22 kWh/m²	18 kWh/m²	4 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120 (1b) - (3b)	
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff													
	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers													
	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths													
	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses													
	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	
Distribution loss (46)m = 0.15 x (45)m													
	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												623.4568	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												623.4568	
Solar input	-0.0000	-16.2208	-58.0195	-79.9223	-105.1350	-97.1484	-96.5940	-84.1560	-57.6291	-28.6318	-0.0000	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	257.1882	211.3732	183.9246	132.9320	101.3423	89.0407	87.1521	106.7357	135.2126	186.2632	228.3672	254.3760	(64)
											Total per year (kWh/year) = Sum(64)m =	1973.9077	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
299.7288 302.8391 295.0013 278.3158 257.2532 237.4574 224.2325 221.1223 228.9600 245.6456 266.7082 286.5040 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 (71)
Water heating gains (Table 5)
149.6734 147.3454 142.8606 133.0310 127.0102 120.7169 116.8514 120.0449 123.7891 130.7722 140.1950 148.4166 (72)
Total internal gains
570.7610 568.7779 552.3532 521.4980 490.9997 463.3358 446.9330 449.7815 465.4657 493.4744 527.3747 556.9668 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.8900	11.2829	0.6800	0.7000	0.7700	36.8094	(75)
Northeast	2.0370	11.2829	0.6800	0.7000	0.7700	7.5815	(75)

Solar gains 44.3909 90.3589 162.7980 267.3611 359.3858 383.1433 358.4227 285.7387 198.3719 110.4258 55.8552 36.2518 (83)
Total gains 615.1519 659.1369 715.1512 788.8591 850.3855 846.4792 805.3557 735.5203 663.8376 603.9002 583.2299 593.2186 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area	0.9614	0.9438	0.8976	0.7892	0.6187	0.4430	0.3227	0.3687	0.5927	0.8396	0.9389	0.9670	(86)
MIT	20.1571	20.2974	20.5404	20.8006	20.9478	20.9915	20.9986	20.9973	20.9678	20.7691	20.4157	20.1069	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house	0.9542	0.9336	0.8801	0.7579	0.5747	0.3914	0.2666	0.3077	0.5338	0.8068	0.9261	0.9607	(89)
MIT 2	19.2596	19.4335	19.7293	20.0303	20.1843	20.2235	20.2284	20.2278	20.2057	20.0032	19.5833	19.1971	(90)
Living area fraction									fLA = Living area / (4) =			0.3398	(91)
MIT	19.5645	19.7271	20.0049	20.2920	20.4437	20.4844	20.4901	20.4892	20.4646	20.2634	19.8661	19.5062	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5645	19.7271	20.0049	20.2920	20.4437	20.4844	20.4901	20.4892	20.4646	20.2634	19.8661	19.5062	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9468	0.9259	0.8744	0.7606	0.5872	0.4087	0.2856	0.3283	0.5522	0.8084	0.9191	0.9536	(94)
Useful gains	582.4026	610.3194	625.3134	599.9981	499.3438	345.9159	230.0451	241.5035	366.5959	488.1806	536.0729	565.6911	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	904.0283	878.1194	799.8168	674.6823	517.8395	348.5009	230.3876	242.1810	376.9378	572.3072	756.0606	906.4966	(97)
Space heating kWh	239.2895	179.9616	129.8305	53.7726	13.7608	0.0000	0.0000	0.0000	0.0000	62.5902	158.3912	253.5593	(98a)
Space heating requirement - total per year (kWh/year)												1091.1558	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	239.2895	179.9616	129.8305	53.7726	13.7608	0.0000	0.0000	0.0000	0.0000	62.5902	158.3912	253.5593	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1091.1558	
Space heating per m2											(98c) / (4) =	15.2567	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement
239.2895 179.9616 129.8305 53.7726 13.7608 0.0000 0.0000 0.0000 0.0000 62.5902 158.3912 253.5593 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50
307a 358.9343 269.9425 194.7458 80.6589 20.6412 0.0000 0.0000 0.0000 0.0000 93.8853 237.5868 380.3390
Space heating requirement
358.9343 269.9425 194.7458 80.6589 20.6412 0.0000 0.0000 0.0000 0.0000 93.8853 237.5868 380.3390 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)

Water heating
Annual water heating requirement
257.1882 211.3732 183.9246 132.9320 101.3423 89.0407 87.1521 106.7357 135.2126 186.2632 228.3672 254.3760 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50
310a 385.7824 317.0598 275.8868 199.3980 152.0134 133.5610 130.7281 160.1036 202.8189 279.3948 342.5508 381.5640
Water heating fuel
385.7824 317.0598 275.8868 199.3980 152.0134 133.5610 130.7281 160.1036 202.8189 279.3948 342.5508 381.5640 (310)
Cooling System Energy Efficiency Ratio 0.0000 (314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (315)
Pumps and Fa 8.4649 7.6457 8.4649 8.1918 8.4649 8.1918 8.4649 8.4649 8.1918 8.4649 8.1918 8.4649 (331)
Lighting 21.6483 17.3671 15.6371 11.4564 8.8493 7.2299 8.0726 10.4931 13.6295 17.8826 20.1983 22.2500 (332)
Electricity generated by PVs (Appendix M) (negative quantity)
(333a)m -14.9141 -24.7783 -42.2847 -54.5605 -63.6655 -61.0911 -59.9595 -53.8492 -43.4933 -30.8592 -17.4193 -12.3313 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)

(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5846	-11.8000	-29.7107	-54.3035	-80.3253	-84.0609	-81.7814	-63.8933	-39.9691	-18.6376	-6.5308	-3.4177	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1636.7337	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2960.8616	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	16.3673	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.6671	(331)
Electricity for lighting (calculated in Appendix L)	174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3913.7557	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1636.7337	4.4400	72.6710	(340a)
Space heating total			72.6710	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2960.8616	4.4400	131.4623	(342a)
Water heating total			131.4623	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	16.4900	3.2431	(349)
Pump for solar water heating	80.0000	16.4900	13.1920	(349)
Energy for lighting	174.7141	16.4900	28.8104	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-479.2061	16.4900	-79.0211	
PV Unit electricity exported	-479.0149	5.5900	-26.7769	
Total			-105.7980	(352)
Total energy cost			235.5807	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.7278	(357)
SAP value	88.2016	
SAP rating (Section 12)	88	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1226.0254	0.1566	68.3710	(367)
Electrical energy for heat distribution (space & water)	16.3673	0.0000	6.8593	(372)
Overall CO2 factor for heat network			0.0413	(386)
Total CO2 associated with community systems			189.7726	(373)
Space and water heating			189.7726	(376)
Pumps, fans and electric keep-hot	99.6671	0.1387	13.8251	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-479.2061	0.1320	-63.2320	
PV Unit electricity exported	-479.0149	0.1214	-58.1324	
Total			-121.3643	(380)
Total CO2, kg/year			107.4500	(383)
CO2 emissions per m2			1.5000	(384)
EI value			98.7643	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120 (1b) - (3b)	
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)

Average = Sum(39)m / 12 =	59.2241

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2825 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day)	117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	

Distribution loss (46)m = 0.15 x (45)m

30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:
Store volume 110.0000 (47)
  b) If manufacturer declared loss factor is not known :
  Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
  Volume factor from Table 2a 1.0294 (52)
  Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 (56)
If cylinder contains dedicated solar storage
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 (57)
Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120 23.2624 (59)
Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)
Total heat required for water heating calculated for each month
257.1882 227.5940 241.9440 212.8542 206.4772 186.1891 183.7460 190.8918 192.8417 214.8950 228.3672 254.3760 (62)
WWHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63a)
PV diverter -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 (63b)
Aperture area of solar collector 3.0000 (H1)
Zero-loss collector efficiency 0.8000 (H2)
Collector linear heat loss coefficient 1.8000 (H3)
Collector 2nd order heat loss coefficient 0.0000 (H4)
Collector loop efficiency 0.9000 (H5)
Incidence angle modifier 1.0000 (H6)
Overshading factor 0.8000 (H8)
Overall heat loss coefficient of system 6.5000 (H10)
Heat loss coefficient of collector loop 3.9667 (H11)
Dedicated solar storage volume 75.0000 (H12)
Effective solar volume 75.0000 (H14)
Reference volume 225.0000 (H15)
Storage tank correction coefficient 1.3161 (H16)
Heat delivered to hot water 697.5235 (H24)
Heat delivered to space heating 0.0000 (H29)
Solar input 697.5235
Solar input -0.3007 -19.8927 -63.0021 -86.8105 -108.5158 -108.4282 -105.5589 -94.8548 -67.4076 -37.8155 -4.9366 -0.0000 (63c)
FGHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63d)
Output from w/h
256.8875 207.7013 178.9419 126.0438 97.9614 77.7608 78.1872 96.0370 125.4340 177.0795 223.4306 254.3760 (64)
Total per year (kWh/year) = Sum(64)m = 1899.8410 (64)
Electric shower(s)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month
111.3570 99.0161 106.2883 95.7823 94.4956 86.9162 86.9375 89.3134 89.1281 97.2945 100.9404 110.4219 (65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)

Water heating gains (Table 5)

	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)

Total internal gains

	570.7610	568.7779	552.3532	521.4980	490.9997	463.3358	446.9330	449.7815	465.4657	493.4744	527.3747	556.9668	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.8900	13.7758	0.6800	0.7000	0.7700	44.9420	(75)
Northeast	2.0370	13.7758	0.6800	0.7000	0.7700	9.2565	(75)

Solar gains	54.1985	98.6378	175.8875	291.9762	376.7764	429.9382	395.0527	322.1943	226.3141	127.4643	67.3061	44.4293	(83)
Total gains	624.9595	667.4157	728.2407	813.4741	867.7761	893.2740	841.9857	771.9758	691.7798	620.9387	594.6807	601.3961	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9563	0.9375	0.8805	0.7586	0.5802	0.3824	0.2740	0.3138	0.5498	0.8068	0.9281	0.9629	(86)
MIT	20.2080	20.3427	20.6017	20.8393	20.9625	20.9960	20.9994	20.9988	20.9777	20.8190	20.4752	20.1560	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9482	0.9262	0.8604	0.7248	0.5349	0.3324	0.2200	0.2552	0.4908	0.7692	0.9132	0.9558	(89)
MIT 2	19.3232	19.4894	19.8022	20.0722	20.1981	20.2267	20.2288	20.2286	20.2136	20.0577	19.6557	19.2587	(90)
Living area fraction									fLA = Living area / (4) =			0.3398	(91)
MIT	19.6238	19.7793	20.0738	20.3328	20.4578	20.4881	20.4906	20.4903	20.4732	20.3163	19.9342	19.5636	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6238	19.7793	20.0738	20.3328	20.4578	20.4881	20.4906	20.4903	20.4732	20.3163	19.9342	19.5636	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9406	0.9186	0.8559	0.7295	0.5486	0.3493	0.2383	0.2751	0.5098	0.7738	0.9067	0.9485	(94)
Useful gains	587.8513	613.1046	623.3052	593.4590	476.0255	312.0232	200.6784	212.3656	352.6845	480.4644	539.2146	570.4080	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	889.7724	863.4479	774.2864	653.4090	489.0636	313.1801	200.8082	212.6317	359.6794	545.8299	736.4014	892.1290	(97)
Space heating kWh													
	224.6293	168.2307	112.3300	43.1640	9.7003	0.0000	0.0000	0.0000	0.0000	48.6319	141.9745	239.3604	(98a)
Space heating requirement - total per year (kWh/year)												988.0212	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	224.6293	168.2307	112.3300	43.1640	9.7003	0.0000	0.0000	0.0000	0.0000	48.6319	141.9745	239.3604	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												988.0212	
Space heating per m2											(98c) / (4) =	13.8146	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement													
	224.6293	168.2307	112.3300	43.1640	9.7003	0.0000	0.0000	0.0000	0.0000	48.6319	141.9745	239.3604	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	336.9440	252.3460	168.4950	64.7460	14.5505	0.0000	0.0000	0.0000	0.0000	72.9479	212.9618	359.0406	
Space heating requirement													
	336.9440	252.3460	168.4950	64.7460	14.5505	0.0000	0.0000	0.0000	0.0000	72.9479	212.9618	359.0406	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement													
	256.8875	207.7013	178.9419	126.0438	97.9614	77.7608	78.1872	96.0370	125.4340	177.0795	223.4306	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.3312	311.5520	268.4128	189.0656	146.9421	116.6412	117.2807	144.0554	188.1511	265.6193	335.1459	381.5640	
Water heating fuel													
	385.3312	311.5520	268.4128	189.0656	146.9421	116.6412	117.2807	144.0554	188.1511	265.6193	335.1459	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	8.4649	7.6457	8.4649	8.1918	8.4649	8.1918	8.4649	8.4649	8.1918	8.4649	8.1918	8.4649	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.8133	-26.5889	-44.4924	-57.3150	-64.9996	-64.6716	-62.8712	-57.4038	-47.1375	-34.3017	-20.4312	-14.8426	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.1852	-13.3763	-32.7527	-60.2581	-84.2408	-96.4471	-91.6189	-73.8378	-47.2113	-22.6946	-8.5992	-4.6561	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1482.0318	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2849.7616	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	14.8203	(313)
Space cooling fuel	0.0000	(321)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.6671	(331)
Electricity for lighting (calculated in Appendix L)	174.7141	(332)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3551.4276	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1482.0318	6.5500	97.0731	(340a)
Space heating total			97.0731	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2849.7616	6.5500	186.6594	(342a)
Water heating total			186.6594	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	28.4300	5.5914	(349)
Pump for solar water heating	80.0000	28.4300	22.7440	(349)
Energy for lighting	174.7141	28.4300	49.6712	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-512.8689	28.4300	-145.8086	
PV Unit electricity exported	-541.8781	5.8100	-31.4831	
Total			-177.2917	(352)
Total energy cost			288.4473	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1155.1449	0.1571	62.0955	(367)
Electrical energy for heat distribution (space & water)	14.8203	0.0000	6.4805	(372)
Overall CO2 factor for heat network			0.0414	(386)
Total CO2 associated with community systems			179.2925	(373)
Space and water heating			179.2925	(376)
Pumps, fans and electric keep-hot	99.6671	0.1387	13.8251	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-512.8689	0.1323	-67.8299	
PV Unit electricity exported	-541.8781	0.1214	-65.7869	
Total			-133.6168	(380)
Total CO2, kg/year			84.7174	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1155.1449	1.5817	625.0877	(467)
Electrical energy for heat distribution (space & water)	14.8203	0.0000	67.2963	(472)
Overall CO2 factor for heat network			0.4298	(486)
Total CO2 associated with community systems			1861.8646	(473)
Space and water heating			1861.8646	(476)
Pumps, fans and electric keep-hot	99.6671	1.5128	150.7765	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-512.8689	1.4887	-763.4867	
PV Unit electricity exported	-541.8781	0.4454	-241.3296	
Total			-1004.8163	(480)
Total Primary energy kWh/year			1275.8072	(483)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.92	**TER**	11.38
Environmental	99 A	**% DER < TER**			83.13
CO_2 Emissions (t/year)	0.11	**DFEE**	26.07	**TFEE**	34.16
Compliance Check	See BREL	**% DFEE < TFEE**			23.68
% DPER < TPER	57.32	**DPER**	25.35	**TPER**	59.39

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				3	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.2825 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day)		117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:		
Store volume		110.0000 (47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)		0.0152 (51)
Volume factor from Table 2a		1.0294 (52)
Temperature factor from Table 2b		0.6000 (53)
Enter (49) or (54) in (55)		1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
										Total per year (kWh/year) = Sum(64)m =		2597.3645	(64)
12Total per year (kWh/year)												2597	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)

Heat gains from water heating, kWh/month

111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.6996	119.2388	107.6996	111.2896	107.6996	111.2896	107.6996	107.6996	111.2896	107.6996	111.2896	107.6996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains	515.4281	526.7231	505.4479	488.0289	464.3062	448.3397	432.0236	433.1332	445.7187	460.2911	487.4158	505.3106	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	9.8900	11.2829	0.6800	0.7000	0.7700	36.8094	(81)
Northwest	2.0370	11.2829	0.6800	0.7000	0.7700	7.5815	(81)

Solar gains	44.3909	90.3589	162.7980	267.3611	359.3858	383.1433	358.4227	285.7387	198.3719	110.4258	55.8552	36.2518	(83)
Total gains	559.8189	617.0821	668.2459	755.3901	823.6920	831.4830	790.4463	718.8720	644.0906	570.7169	543.2710	541.5624	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9729	0.9554	0.9169	0.8088	0.6352	0.4507	0.3287	0.3770	0.6081	0.8615	0.9522	0.9767	(86)
MIT	20.0580	20.2285	20.4784	20.7761	20.9415	20.9908	20.9984	20.9970	20.9640	20.7366	20.3515	20.0122	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9676	0.9470	0.9016	0.7787	0.5908	0.3983	0.2716	0.3147	0.5485	0.8312	0.9417	0.9721	(89)
MIT 2	19.1364	19.3491	19.6563	20.0040	20.1787	20.2231	20.2284	20.2276	20.2027	19.9682	19.5056	19.0788	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.4495	19.6479	19.9356	20.2663	20.4379	20.4839	20.4900	20.4890	20.4614	20.2293	19.7930	19.3959	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4495	19.6479	19.9356	20.2663	20.4379	20.4839	20.4900	20.4890	20.4614	20.2293	19.7930	19.3959	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9609	0.9394	0.8951	0.7802	0.6031	0.4157	0.2910	0.3358	0.5670	0.8312	0.9346	0.9658	(94)
Useful gains	537.9484	579.7058	598.1240	589.3871	496.7614	345.6823	230.0101	241.4200	365.1743	474.3580	507.7584	523.0548	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	897.2152	873.4325	795.7116	673.1617	517.4930	348.4703	230.3829	242.1699	376.7486	570.2842	751.7331	899.9660	(97)
Space heating kWh													
	267.2945	197.3844	147.0052	60.3177	15.4243	0.0000	0.0000	0.0000	0.0000	71.3691	175.6618	280.4219	(98a)
Space heating requirement - total per year (kWh/year)												1214.8790	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	267.2945	197.3844	147.0052	60.3177	15.4243	0.0000	0.0000	0.0000	0.0000	71.3691	175.6618	280.4219	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1214.8790	
Space heating per m2											(98c) / (4) =	16.9866	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	267.2945	197.3844	147.0052	60.3177	15.4243	0.0000	0.0000	0.0000	0.0000	71.3691	175.6618	280.4219	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	400.9418	296.0766	220.5078	90.4765	23.1365	0.0000	0.0000	0.0000	0.0000	107.0536	263.4927	420.6329	
Space heating requirement													
	400.9418	296.0766	220.5078	90.4765	23.1365	0.0000	0.0000	0.0000	0.0000	107.0536	263.4927	420.6329	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.8619	-24.6522	-41.9801	-54.0165	-62.8534	-60.2005	-59.0498	-53.1061	-43.0156	-30.6311	-17.3392	-12.2904	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.6369	-11.9261	-30.0153	-54.8475	-81.1374	-84.9515	-82.6912	-64.6364	-40.4468	-18.8657	-6.6109	-3.4586	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1822.3184	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3896.0468	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												18.2232	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.6671	(330a)
Total electricity for the above, kWh/year												19.6671	(331)
Electricity for lighting (calculated in Appendix L)												174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4954.5256	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1524.8974	0.1566	76.0975	(367)
Electrical energy for heat distribution (space & water)	18.2232	0.0000	8.3416	(372)
Overall CO2 factor for heat network			0.0404	(386)
Total CO2 associated with community systems			230.7850	(373)
Space and water heating			230.7850	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	0.1320	-62.5726	
PV Unit electricity exported	-484.2242	0.1214	-58.7607	
Total			-121.3332	(380)
Total CO2, kg/year			137.3965	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.9200	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1524.8974	1.5797	767.6729	(467)
Electrical energy for heat distribution (space & water)	18.2232	0.0000	88.0407	(472)
Overall CO2 factor for heat network			0.4260	(486)
Total CO2 associated with community systems			2435.7916	(473)
Space and water heating			2435.7916	(476)
Pumps, fans and electric keep-hot	19.6671	1.5128	29.7525	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	1.4877	-705.1878	
PV Unit electricity exported	-484.2242	0.4452	-215.5829	
Total			-920.7707	(480)
Total Primary energy kWh/year			1812.7558	(483)
Dwelling Primary energy Rate (DPER)			25.3500	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b) x	2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c) x	2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3264	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3020	0.3264	0.3509	0.3672	0.3836	(22b)
Effective ac	0.5866	0.5833	0.5800	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			11.9270	1.1450	13.6603			(27)
Heatloss floor			35.7600	0.1300	4.6488			(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.1800	6.3023			(29a)
500mm mineral wool	35.7600		35.7600	0.1100	3.9336			(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5850			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.9097 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.0600	0.0500	0.3530
E3 Sill	3.7400	0.0500	0.1870
E4 Jamb	23.3600	0.0500	1.1680
E5 Ground floor (normal)	11.1200	0.1600	1.7792
E6 Intermediate floor within a dwelling	4.0300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.3800	0.0600	0.3828
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	12.9900	0.0800	1.0392
P2 Party wall - Intermediate floor within a dwelling	15.4400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	15.4400	0.1200	1.8528
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.3500	0.0200	0.0470

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.3690 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 38.9540 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.9203	33.7259	33.5352	32.6398	32.4723	31.6925	31.6925	31.5481	31.9929	32.4723	32.8112	33.1655	(38)
Heat transfer coeff	72.8744	72.6799	72.4893	71.5939	71.4264	70.6465	70.6465	70.5021	70.9469	71.4264	71.7653	72.1196	(39)
Average = Sum(39)m / 12 =												71.5931	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0189	1.0162	1.0136	1.0010	0.9987	0.9878	0.9878	0.9858	0.9920	0.9987	1.0034	1.0084	(40)
HLP (average)												1.0010	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

Hot water usage for mixer showers

62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day) 117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	248.5063	219.7523	233.2621	204.4524	197.7953	177.7872	175.0641	182.2099	184.4398	206.2131	219.9654	245.6941	(62)
WWHRS	-28.5673	-25.2652	-26.4562	-21.9068	-20.4164	-17.4704	-16.3757	-17.4139	-18.0756	-21.3091	-24.1406	-28.0383	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
									Total per year (kWh/year) = Sum(64)m =			2229.7066	(64)
12Total per year (kWh/year)												2230	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	104.4115	92.7427	99.3428	89.0609	87.5501	80.1947	79.9919	82.3679	82.4067	90.3490	94.2189	103.4764	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.8362	116.0686	104.8362	108.3307	104.8362	108.3307	104.8362	104.8362	108.3307	104.8362	108.3307	104.8362	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	140.3380	138.0100	133.5252	123.6956	117.6748	111.3815	107.5160	110.7095	114.4537	121.4368	130.8596	139.0812	(72)
Total internal gains													

	506.2293	517.2176	496.2491	478.7347	455.1075	436.0455	419.8249	420.9345	433.4245	451.0924	478.1216	496.1119	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	11.9270	11.2829	0.6300	0.7000	0.7700	41.1268	(81)

Solar gains	41.1268	83.7149	150.8276	247.7022	332.9604	354.9710	332.0681	264.7285	183.7858	102.3062	51.7482	33.5862	(83)
Total gains	547.3562	600.9325	647.0767	726.4370	788.0679	791.0165	751.8930	685.6630	617.2102	553.3986	529.8698	529.6981	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.9557	48.0840	48.2104	48.8134	48.9279	49.4680	49.4680	49.5693	49.2585	48.9279	48.6968	48.4576	
alpha	4.1970	4.2056	4.2140	4.2542	4.2619	4.2979	4.2979	4.3046	4.2839	4.2619	4.2465	4.2305	
util living area													
	0.9805	0.9695	0.9459	0.8735	0.7351	0.5483	0.4079	0.4629	0.7070	0.9077	0.9669	0.9828	(86)
MIT	19.6254	19.8122	20.1118	20.5297	20.8276	20.9624	20.9916	20.9859	20.8919	20.5116	20.0159	19.6002	(87)
Th 2	20.0676	20.0698	20.0721	20.0825	20.0844	20.0935	20.0935	20.0952	20.0900	20.0844	20.0805	20.0764	(88)
util rest of house													
	0.9762	0.9630	0.9340	0.8468	0.6858	0.4786	0.3264	0.3763	0.6382	0.8819	0.9586	0.9790	(89)
MIT 2	18.4739	18.7108	19.0870	19.5996	19.9323	20.0687	20.0899	20.0886	20.0089	19.5910	18.9780	18.4481	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	18.8651	19.0850	19.4352	19.9156	20.2365	20.3724	20.3963	20.3935	20.3089	19.9038	19.3306	18.8396	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8651	19.0850	19.4352	19.9156	20.2365	20.3724	20.3963	20.3935	20.3089	19.9038	19.3306	18.8396	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9689	0.9541	0.9241	0.8414	0.6945	0.5006	0.3539	0.4053	0.6558	0.8760	0.9500	0.9723	(94)
Useful gains	530.3589	573.3784	597.9685	611.2161	547.3191	395.9897	266.1298	277.9186	404.7543	484.7729	503.3660	515.0360	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1061.4240	1030.9653	937.6637	788.6529	609.7287	407.7990	268.1929	281.5480	440.5030	664.5350	877.7347	1055.7980	(97)
Space heating kWh													
	395.1124	307.4984	252.7333	127.7545	46.4327	0.0000	0.0000	0.0000	0.0000	133.7430	269.5454	402.3269	(98a)
Space heating requirement - total per year (kWh/year)												1935.1466	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	395.1124	307.4984	252.7333	127.7545	46.4327	0.0000	0.0000	0.0000	0.0000	133.7430	269.5454	402.3269	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1935.1466	
Space heating per m2											(98c) / (4) =	27.0574	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	395.1124	307.4984	252.7333	127.7545	46.4327	0.0000	0.0000	0.0000	0.0000	133.7430	269.5454	402.3269	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	428.0742	333.1510	273.8172	138.4122	50.3063	0.0000	0.0000	0.0000	0.0000	144.9003	292.0319	435.8905	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.3575	85.0823	84.5107	83.2749	81.5140	79.8000	79.8000	79.8000	79.8000	83.3455	84.7767	85.4180	(217)
Fuel for water heating, kWh/month													
	257.6680	228.5871	244.7099	219.2085	217.6056	200.8982	198.8576	206.5112	208.4765	221.8526	230.9889	254.8127	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.7829	17.4750	15.7343	11.5277	8.9043	7.2749	8.1228	10.5583	13.7142	17.9938	20.3239	22.3883	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.5568	-47.3592	-68.1531	-76.7310	-82.8400	-77.3720	-76.4273	-72.1080	-64.4904	-54.2111	-36.9141	-29.0069	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-18.8029	-39.5749	-78.6914	-118.2335	-156.3709	-157.1182	-155.2578	-131.4301	-96.3075	-56.5975	-25.1064	-14.8664	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2096.5836	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2690.1770	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	175.8004	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1767.5275	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3281.0335	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2096.5836	0.2100	440.2826	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2690.1770	0.2100	564.9372	(264)
Space and water heating			1005.2197	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	175.8004	0.1443	25.3734	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	0.1346	-96.7689	
PV Unit electricity exported	-1048.3576	0.1259	-131.9744	
Total			-228.7433	(269)
Total CO2, kg/year			813.7791	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.3800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2096.5836	1.1300	2369.1394	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2690.1770	1.1300	3039.9000	(278)
Space and water heating			5409.0394	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	175.8004	1.5338	269.6485	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	1.4973	-1076.8103	
PV Unit electricity exported	-1048.3576	0.4621	-484.4365	
Total			-1561.2467	(283)
Total Primary energy kWh/year			4247.5420	(286)
Target Primary Energy Rate (TPER)			59.3900	(287)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.92	**TER**	11.38
Environmental	99 A	**% DER < TER**			83.13
CO_2 Emissions (t/year)	0.11	**DFEE**	26.07	**TFEE**	34.16
Compliance Check	See BREL	**% DFEE < TFEE**			23.68
% DPER < TPER	57.32	**DPER**	25.35	**TPER**	59.39

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2489	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3174	0.3112	0.3049	0.2738	0.2676	0.2365	0.2365	0.2303	0.2489	0.2676	0.2801	0.2925	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5504	0.5484	0.5465	0.5375	0.5358	0.5280	0.5280	0.5265	0.5310	0.5358	0.5392	0.5428	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			12581.0601	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							175.9097	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							3.6151	(36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.8245	31.7114	31.6006	31.0799	30.9825	30.5289	30.5289	30.4450	30.7036	30.9825	31.1795	31.3856	(38)
Heat transfer coeff	62.1367	62.0236	61.9127	61.3920	61.2946	60.8411	60.8411	60.7571	61.0158	61.2946	61.4917	61.6977	(39)
Average = Sum(39)m / 12 =												61.3916	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8688	0.8672	0.8657	0.8584	0.8570	0.8507	0.8507	0.8495	0.8531	0.8570	0.8598	0.8627	(40)
HLP (average)												0.8584	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												59.5787	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.0001	63.2172	61.2706	58.8477	56.6862	54.4399	53.9730	55.9157	57.9081	60.2149	62.6593	64.9088	(44)
Energy conte	102.9443	90.0205	94.1707	80.5595	76.3105	66.9402	65.2757	69.2353	71.4064	81.7111	89.2697	101.6316	(45)
Energy content (annual)										Total = Sum(45)m =		989.4754	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(64)
										Total per year (kWh/year) = Sum(64)m =		841.0541	(64)
12Total per year (kWh/year)												841	(64)
Electric shower(s)	50.0432	44.5889	48.6894	46.4637	47.3355	45.1535	46.6586	47.3355	46.4637	48.6894	47.7738	50.0432	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		569.2384	(64a)
Heat gains from water heating, kWh/month	34.3865	30.2766	32.1836	28.7348	28.0499	25.5132	25.5357	26.5464	26.7898	29.5359	30.9133	34.1075	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.6996	119.2388	107.6996	111.2896	107.6996	111.2896	107.6996	107.6996	111.2896	107.6996	111.2896	107.6996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	46.2184	45.0544	43.2575	39.9095	37.7014	35.4350	34.3222	35.6806	37.2080	39.6988	42.9351	45.8434	(72)
Total internal gains	411.9730	424.4322	405.8448	394.9074	374.9975	363.0578	349.4944	348.7689	359.1376	369.2178	390.1559	402.7375	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	9.8900	11.2829	0.6800	0.7000	0.7700	36.8094	(81)
Northwest	2.0370	11.2829	0.6800	0.7000	0.7700	7.5815	(81)

Solar gains	44.3909	90.3589	162.7980	267.3611	359.3858	383.1433	358.4227	285.7387	198.3719	110.4258	55.8552	36.2518	(83)
Total gains	456.3639	514.7911	568.6428	662.2685	734.3833	746.2011	707.9171	634.5077	557.5096	479.6435	446.0111	438.9893	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.2428	56.3453	56.4462	56.9250	57.0154	57.4404	57.4404	57.5198	57.2760	57.0154	56.8327	56.6429	
alpha	4.7495	4.7564	4.7631	4.7950	4.8010	4.8294	4.8294	4.8347	4.8184	4.8010	4.7888	4.7762	
util living area	0.9886	0.9788	0.9551	0.8713	0.7094	0.5108	0.3760	0.4358	0.6958	0.9218	0.9783	0.9904	(86)

MIT	19.7696	19.9618	20.2555	20.6512	20.8967	20.9826	20.9968	20.9937	20.9303	20.5890	20.1202	19.7357	(87)
Th 2	20.1941	20.1955	20.1968	20.2030	20.2042	20.2096	20.2096	20.2106	20.2075	20.2042	20.2018	20.1994	(88)
util rest of house													
	0.9861	0.9743	0.9454	0.8462	0.6638	0.4516	0.3095	0.3631	0.6332	0.9004	0.9728	0.9883	(89)
MIT 2	19.0664	19.2571	19.5451	19.9222	20.1331	20.2006	20.2085	20.2083	20.1662	19.8742	19.4201	19.0369	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.3053	19.4965	19.7865	20.1699	20.3925	20.4663	20.4763	20.4751	20.4258	20.1171	19.6580	19.2743	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3053	19.4965	19.7865	20.1699	20.3925	20.4663	20.4763	20.4751	20.4258	20.1171	19.6580	19.2743	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9826	0.9694	0.9396	0.8450	0.6750	0.4711	0.3320	0.3877	0.6513	0.8977	0.9682	0.9852	(94)
Useful gains	448.4050	499.0322	534.3092	559.6303	495.7003	351.5534	235.0603	245.9897	363.0875	430.5570	431.8217	432.4804	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	932.3794	905.3292	822.6039	691.8799	532.8040	356.9126	235.8402	247.5922	385.9741	583.3447	772.2136	930.0528	(97)
Space heating kWh													
	360.0769	273.0316	214.4912	95.2197	27.6051	0.0000	0.0000	0.0000	0.0000	113.6740	245.0822	370.1938	(98a)
Space heating requirement - total per year (kWh/year)												1699.3746	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	360.0769	273.0316	214.4912	95.2197	27.6051	0.0000	0.0000	0.0000	0.0000	113.6740	245.0822	370.1938	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1699.3746	
Space heating per m2											(98c) / (4) =	23.7608	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	571.9062	450.2240	461.7539	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9411	0.9696	0.9502	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	538.2446	436.5439	438.7649	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	826.7717	784.2989	700.6447	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	207.7395	258.7297	194.8386	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	51.9349	64.6824	48.7096	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												165.3269	(107)
Energy for space heating												23.7608	(99)
Energy for space cooling												2.3116	(108)
Total												26.0725	(109)
Fabric Energy Efficiency (DFEE)												26.1	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor		35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3264	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3020	0.3264	0.3509	0.3672	0.3836	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5866	0.5833	0.5800	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			11.9270	1.1450	13.6603			(27)
Heatloss floor			35.7600	0.1300	4.6488			(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.1800	6.3023			(29a)
500mm mineral wool	35.7600		35.7600	0.1100	3.9336			(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5850			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	175.9097	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.0600	0.0500	0.3530
E3 Sill	3.7400	0.0500	0.1870
E4 Jamb	23.3600	0.0500	1.1680
E5 Ground floor (normal)	11.1200	0.1600	1.7792
E6 Intermediate floor within a dwelling	4.0300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.3800	0.0600	0.3828
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	12.9900	0.0800	1.0392
P2 Party wall - Intermediate floor within a dwelling	15.4400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	15.4400	0.1200	1.8528
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.3500	0.0200	0.0470

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.3690	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	38.9540	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.9203	33.7259	33.5352	32.6398	32.4723	31.6925	31.6925	31.5481	31.9929	32.4723	32.8112	33.1655	(38)
Heat transfer coeff													
	72.8744	72.6799	72.4893	71.5939	71.4264	70.6465	70.6465	70.5021	70.9469	71.4264	71.7653	72.1196	(39)
Average = Sum(39)m / 12 =												71.5931	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0189	1.0162	1.0136	1.0010	0.9987	0.9878	0.9878	0.9858	0.9920	0.9987	1.0034	1.0084	(40)
HLP (average)												1.0010	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2825	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses													
	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												59.5787	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	65.0001	63.2172	61.2706	58.8477	56.6862	54.4399	53.9730	55.9157	57.9081	60.2149	62.6593	64.9088	(44)
Energy conte	102.9443	90.0205	94.1707	80.5595	76.3105	66.9402	65.2757	69.2353	71.4064	81.7111	89.2697	101.6316	(45)
Energy content (annual)										Total = Sum(45)m =		989.4754	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(64)
										Total per year (kWh/year) = Sum(64)m =		841.0541	(64)
12Total per year (kWh/year)												841	(64)
Electric shower(s)													
	50.0432	44.5889	48.6894	46.4637	47.3355	45.1535	46.6586	47.3355	46.4637	48.6894	47.7738	50.0432	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		569.2384	(64a)
Heat gains from water heating, kWh/month													
	34.3865	30.2766	32.1836	28.7348	28.0499	25.5132	25.5357	26.5464	26.7898	29.5359	30.9133	34.1075	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	104.8362	116.0686	104.8362	108.3307	104.8362	108.3307	104.8362	104.8362	108.3307	104.8362	108.3307	104.8362 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982 (71)

Water heating gains (Table 5)

	46.2184	45.0544	43.2575	39.9095	37.7014	35.4350	34.3222	35.6806	37.2080	39.6988	42.9351	45.8434 (72)

Total internal gains

	409.1097	421.2621	402.9814	391.9486	372.1341	360.0989	346.6311	345.9056	356.1788	366.3544	387.1971	399.8741 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	11.9270	11.2829	0.6300	0.7000	0.7700	41.1268	(81)

Solar gains	41.1268	83.7149	150.8276	247.7022	332.9604	354.9710	332.0681	264.7285	183.7858	102.3062	51.7482	33.5862	(83)
Total gains	450.2365	504.9769	553.8090	639.6508	705.0945	715.0700	678.6992	610.6341	539.9646	468.6606	438.9453	433.4604	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.9557	48.0840	48.2104	48.8134	48.9279	49.4680	49.4680	49.5693	49.2585	48.9279	48.6968	48.4576	
alpha	4.1970	4.2056	4.2140	4.2542	4.2619	4.2979	4.2979	4.3046	4.2839	4.2619	4.2465	4.2305	
util living area	0.9902	0.9832	0.9670	0.9096	0.7850	0.5967	0.4492	0.5142	0.7690	0.9431	0.9826	0.9917	(86)
MIT	19.4419	19.6380	19.9570	20.4228	20.7752	20.9482	20.9878	20.9789	20.8489	20.3892	19.8516	19.4164	(87)
Th 2	20.0676	20.0698	20.0721	20.0825	20.0844	20.0935	20.0935	20.0952	20.0900	20.0844	20.0805	20.0764	(88)
util rest of house	0.9880	0.9793	0.9592	0.8883	0.7387	0.5241	0.3606	0.4203	0.7033	0.9251	0.9779	0.9897	(89)
MIT 2	18.6447	18.8406	19.1563	19.6108	19.9260	20.0663	20.0894	20.0873	19.9981	19.5892	19.0617	18.6260	(90)
Living area fraction									fLA = Living area / (4) =			0.3398	(91)
MIT	18.9156	19.1115	19.4284	19.8867	20.2145	20.3660	20.3946	20.3903	20.2872	19.8610	19.3301	18.8945	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9156	19.1115	19.4284	19.8867	20.2145	20.3660	20.3946	20.3903	20.2872	19.8610	19.3301	18.8945	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9843	0.9742	0.9524	0.8830	0.7458	0.5467	0.3905	0.4517	0.7188	0.9198	0.9729	0.9864	(94)
Useful gains	443.1519	491.9348	527.4258	564.8269	525.8403	390.8998	265.0624	275.8356	388.1277	431.0763	427.0606	427.5712	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1065.1030	1032.8929	937.1678	786.5803	608.1595	407.3454	268.0780	281.3231	438.9605	661.4816	877.6976	1059.7645	(97)
Space heating kWh	462.7317	363.5238	304.8480	159.6624	61.2455	0.0000	0.0000	0.0000	0.0000	171.4215	324.4586	470.3518	(98a)
Space heating requirement - total per year (kWh/year)												2318.2434	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	462.7317	363.5238	304.8480	159.6624	61.2455	0.0000	0.0000	0.0000	0.0000	171.4215	324.4586	470.3518	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2318.2434	
Space heating per m2											(98c) / (4) =	32.4139	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	664.0772	522.7842	535.8159	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8758	0.9256	0.8923	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	581.5866	483.8737	478.0869	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	793.5925	753.2241	675.7355	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	152.6443	200.3967	147.0506	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	38.1611	50.0992	36.7626	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												125.0229	(107)
Energy for space heating												32.4139	(99)
Energy for space cooling												1.7481	(108)
Total												34.1620	(109)
Fabric Energy Efficiency (TFEE)												34.2	(109)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.92	**TER**	11.38
Environmental	99 A	**% DER < TER**			83.13
CO_2 Emissions (t/year)	0.11	**DFEE**	26.07	**TFEE**	34.16
Compliance Check	See BREL	**% DFEE < TFEE**			23.68
% DPER < TPER	57.32	**DPER**	25.35	**TPER**	59.39

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				3	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.2825 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day)		117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:		
Store volume		110.0000 (47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)		0.0152 (51)
Volume factor from Table 2a		1.0294 (52)
Temperature factor from Table 2b		0.6000 (53)
Enter (49) or (54) in (55)		1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
										Total per year (kWh/year) = Sum(64)m =		2597.3645	(64)
12Total per year (kWh/year)												2597	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)

Heat gains from water heating, kWh/month

111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.6996	119.2388	107.6996	111.2896	107.6996	111.2896	107.6996	107.6996	111.2896	107.6996	111.2896	107.6996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains	515.4281	526.7231	505.4479	488.0289	464.3062	448.3397	432.0236	433.1332	445.7187	460.2911	487.4158	505.3106	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	9.8900	11.2829	0.6800	0.7000	0.7700	36.8094	(81)
Northwest	2.0370	11.2829	0.6800	0.7000	0.7700	7.5815	(81)

Solar gains	44.3909	90.3589	162.7980	267.3611	359.3858	383.1433	358.4227	285.7387	198.3719	110.4258	55.8552	36.2518	(83)
Total gains	559.8189	617.0821	668.2459	755.3901	823.6920	831.4830	790.4463	718.8720	644.0906	570.7169	543.2710	541.5624	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9729	0.9554	0.9169	0.8088	0.6352	0.4507	0.3287	0.3770	0.6081	0.8615	0.9522	0.9767	(86)
MIT	20.0580	20.2285	20.4784	20.7761	20.9415	20.9908	20.9984	20.9970	20.9640	20.7366	20.3515	20.0122	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9676	0.9470	0.9016	0.7787	0.5908	0.3983	0.2716	0.3147	0.5485	0.8312	0.9417	0.9721	(89)
MIT 2	19.1364	19.3491	19.6563	20.0040	20.1787	20.2231	20.2284	20.2276	20.2027	19.9682	19.5056	19.0788	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.4495	19.6479	19.9356	20.2663	20.4379	20.4839	20.4900	20.4890	20.4614	20.2293	19.7930	19.3959	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4495	19.6479	19.9356	20.2663	20.4379	20.4839	20.4900	20.4890	20.4614	20.2293	19.7930	19.3959	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9609	0.9394	0.8951	0.7802	0.6031	0.4157	0.2910	0.3358	0.5670	0.8312	0.9346	0.9658	(94)
Useful gains	537.9484	579.7058	598.1240	589.3871	496.7614	345.6823	230.0101	241.4200	365.1743	474.3580	507.7584	523.0548	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	897.2152	873.4325	795.7116	673.1617	517.4930	348.4703	230.3829	242.1699	376.7486	570.2842	751.7331	899.9660	(97)
Space heating kWh													
	267.2945	197.3844	147.0052	60.3177	15.4243	0.0000	0.0000	0.0000	0.0000	71.3691	175.6618	280.4219	(98a)
Space heating requirement - total per year (kWh/year)												1214.8790	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	267.2945	197.3844	147.0052	60.3177	15.4243	0.0000	0.0000	0.0000	0.0000	71.3691	175.6618	280.4219	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1214.8790	
Space heating per m2											(98c) / (4) =	16.9866	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	267.2945	197.3844	147.0052	60.3177	15.4243	0.0000	0.0000	0.0000	0.0000	71.3691	175.6618	280.4219	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	400.9418	296.0766	220.5078	90.4765	23.1365	0.0000	0.0000	0.0000	0.0000	107.0536	263.4927	420.6329	
Space heating requirement													
	400.9418	296.0766	220.5078	90.4765	23.1365	0.0000	0.0000	0.0000	0.0000	107.0536	263.4927	420.6329	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.8619	-24.6522	-41.9801	-54.0165	-62.8534	-60.2005	-59.0498	-53.1061	-43.0156	-30.6311	-17.3392	-12.2904	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.6369	-11.9261	-30.0153	-54.8475	-81.1374	-84.9515	-82.6912	-64.6364	-40.4468	-18.8657	-6.6109	-3.4586	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1822.3184	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3896.0468	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												18.2232	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.6671	(330a)
Total electricity for the above, kWh/year												19.6671	(331)
Electricity for lighting (calculated in Appendix L)												174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4954.5256	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1524.8974	0.1566	76.0975	(367)
Electrical energy for heat distribution (space & water)	18.2232	0.0000	8.3416	(372)
Overall CO2 factor for heat network			0.0404	(386)
Total CO2 associated with community systems			230.7850	(373)
Space and water heating			230.7850	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	0.1320	-62.5726	
PV Unit electricity exported	-484.2242	0.1214	-58.7607	
Total			-121.3332	(380)
Total CO2, kg/year			137.3965	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.9200	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1524.8974	1.5797	767.6729	(467)
Electrical energy for heat distribution (space & water)	18.2232	0.0000	88.0407	(472)
Overall CO2 factor for heat network			0.4260	(486)
Total CO2 associated with community systems			2435.7916	(473)
Space and water heating			2435.7916	(476)
Pumps, fans and electric keep-hot	19.6671	1.5128	29.7525	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	1.4877	-705.1878	
PV Unit electricity exported	-484.2242	0.4452	-215.5829	
Total			-920.7707	(480)
Total Primary energy kWh/year			1812.7558	(483)
Dwelling Primary energy Rate (DPER)			25.3500	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b) x	2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c) x	2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3264	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3020	0.3264	0.3509	0.3672	0.3836	(22b)
Effective ac	0.5866	0.5833	0.5800	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			11.9270	1.1450	13.6603			(27)
Heatloss floor			35.7600	0.1300	4.6488			(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.1800	6.3023			(29a)
500mm mineral wool	35.7600		35.7600	0.1100	3.9336			(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5850			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.9097 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.0600	0.0500	0.3530
E3 Sill	3.7400	0.0500	0.1870
E4 Jamb	23.3600	0.0500	1.1680
E5 Ground floor (normal)	11.1200	0.1600	1.7792
E6 Intermediate floor within a dwelling	4.0300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.3800	0.0600	0.3828
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	12.9900	0.0800	1.0392
P2 Party wall - Intermediate floor within a dwelling	15.4400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	15.4400	0.1200	1.8528
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.3500	0.0200	0.0470

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.3690 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 38.9540 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.9203	33.7259	33.5352	32.6398	32.4723	31.6925	31.6925	31.5481	31.9929	32.4723	32.8112	33.1655	(38)
Heat transfer coeff	72.8744	72.6799	72.4893	71.5939	71.4264	70.6465	70.6465	70.5021	70.9469	71.4264	71.7653	72.1196	(39)
Average = Sum(39)m / 12 =												71.5931	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0189	1.0162	1.0136	1.0010	0.9987	0.9878	0.9878	0.9858	0.9920	0.9987	1.0034	1.0084	(40)
HLP (average)												1.0010	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

Hot water usage for mixer showers

62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day) 117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	248.5063	219.7523	233.2621	204.4524	197.7953	177.7872	175.0641	182.2099	184.4398	206.2131	219.9654	245.6941	(62)
WWHRS	-28.5673	-25.2652	-26.4562	-21.9068	-20.4164	-17.4704	-16.3757	-17.4139	-18.0756	-21.3091	-24.1406	-28.0383	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
									Total per year (kWh/year) = Sum(64)m =			2229.7066	(64)
12Total per year (kWh/year)												2230	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	104.4115	92.7427	99.3428	89.0609	87.5501	80.1947	79.9919	82.3679	82.4067	90.3490	94.2189	103.4764	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.8362	116.0686	104.8362	108.3307	104.8362	108.3307	104.8362	104.8362	108.3307	104.8362	108.3307	104.8362	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	140.3380	138.0100	133.5252	123.6956	117.6748	111.3815	107.5160	110.7095	114.4537	121.4368	130.8596	139.0812	(72)
Total internal gains													

	506.2293	517.2176	496.2491	478.7347	455.1075	436.0455	419.8249	420.9345	433.4245	451.0924	478.1216	496.1119	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	11.9270	11.2829	0.6300	0.7000	0.7700	41.1268	(81)

Solar gains	41.1268	83.7149	150.8276	247.7022	332.9604	354.9710	332.0681	264.7285	183.7858	102.3062	51.7482	33.5862	(83)
Total gains	547.3562	600.9325	647.0767	726.4370	788.0679	791.0165	751.8930	685.6630	617.2102	553.3986	529.8698	529.6981	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.9557	48.0840	48.2104	48.8134	48.9279	49.4680	49.4680	49.5693	49.2585	48.9279	48.6968	48.4576	
alpha	4.1970	4.2056	4.2140	4.2542	4.2619	4.2979	4.2979	4.3046	4.2839	4.2619	4.2465	4.2305	
util living area													
	0.9805	0.9695	0.9459	0.8735	0.7351	0.5483	0.4079	0.4629	0.7070	0.9077	0.9669	0.9828	(86)
MIT	19.6254	19.8122	20.1118	20.5297	20.8276	20.9624	20.9916	20.9859	20.8919	20.5116	20.0159	19.6002	(87)
Th 2	20.0676	20.0698	20.0721	20.0825	20.0844	20.0935	20.0935	20.0952	20.0900	20.0844	20.0805	20.0764	(88)
util rest of house													
	0.9762	0.9630	0.9340	0.8468	0.6858	0.4786	0.3264	0.3763	0.6382	0.8819	0.9586	0.9790	(89)
MIT 2	18.4739	18.7108	19.0870	19.5996	19.9323	20.0687	20.0899	20.0886	20.0089	19.5910	18.9780	18.4481	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	18.8651	19.0850	19.4352	19.9156	20.2365	20.3724	20.3963	20.3935	20.3089	19.9038	19.3306	18.8396	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8651	19.0850	19.4352	19.9156	20.2365	20.3724	20.3963	20.3935	20.3089	19.9038	19.3306	18.8396	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9689	0.9541	0.9241	0.8414	0.6945	0.5006	0.3539	0.4053	0.6558	0.8760	0.9500	0.9723	(94)
Useful gains	530.3589	573.3784	597.9685	611.2161	547.3191	395.9897	266.1298	277.9186	404.7543	484.7729	503.3660	515.0360	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1061.4240	1030.9653	937.6637	788.6529	609.7287	407.7990	268.1929	281.5480	440.5030	664.5350	877.7347	1055.7980	(97)
Space heating kWh													
	395.1124	307.4984	252.7333	127.7545	46.4327	0.0000	0.0000	0.0000	0.0000	133.7430	269.5454	402.3269	(98a)
Space heating requirement - total per year (kWh/year)												1935.1466	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	395.1124	307.4984	252.7333	127.7545	46.4327	0.0000	0.0000	0.0000	0.0000	133.7430	269.5454	402.3269	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1935.1466	
Space heating per m2											(98c) / (4) =	27.0574	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	395.1124	307.4984	252.7333	127.7545	46.4327	0.0000	0.0000	0.0000	0.0000	133.7430	269.5454	402.3269	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	428.0742	333.1510	273.8172	138.4122	50.3063	0.0000	0.0000	0.0000	0.0000	144.9003	292.0319	435.8905	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.3575	85.0823	84.5107	83.2749	81.5140	79.8000	79.8000	79.8000	79.8000	83.3455	84.7767	85.4180	(217)
Fuel for water heating, kWh/month													
	257.6680	228.5871	244.7099	219.2085	217.6056	200.8982	198.8576	206.5112	208.4765	221.8526	230.9889	254.8127	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.7829	17.4750	15.7343	11.5277	8.9043	7.2749	8.1228	10.5583	13.7142	17.9938	20.3239	22.3883	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.5568	-47.3592	-68.1531	-76.7310	-82.8400	-77.3720	-76.4273	-72.1080	-64.4904	-54.2111	-36.9141	-29.0069	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-18.8029	-39.5749	-78.6914	-118.2335	-156.3709	-157.1182	-155.2578	-131.4301	-96.3075	-56.5975	-25.1064	-14.8664	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2096.5836	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2690.1770	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	175.8004	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1767.5275	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3281.0335	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2096.5836	0.2100	440.2826	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2690.1770	0.2100	564.9372	(264)
Space and water heating			1005.2197	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	175.8004	0.1443	25.3734	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	0.1346	-96.7689	
PV Unit electricity exported	-1048.3576	0.1259	-131.9744	
Total			-228.7433	(269)
Total CO2, kg/year			813.7791	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.3800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2096.5836	1.1300	2369.1394	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2690.1770	1.1300	3039.9000	(278)
Space and water heating			5409.0394	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	175.8004	1.5338	269.6485	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	1.4973	-1076.8103	
PV Unit electricity exported	-1048.3576	0.4621	-484.4365	
Total			-1561.2467	(283)
Total Primary energy kWh/year			4247.5420	(286)
Target Primary Energy Rate (TPER)			59.3900	(287)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.92	**TER**	11.38
Environmental	99 A	**% DER < TER**			83.13
CO_2 Emissions (t/year)	0.11	**DFEE**	26.07	**TFEE**	34.16
Compliance Check	See BREL	**% DFEE < TFEE**			23.68
% DPER < TPER	57.32	**DPER**	25.35	**TPER**	59.39

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												175.9097	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6151	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	30.3121	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
										Total per year (kWh/year) = Sum(64)m =		2597.3645	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains	570.7610	568.7779	552.3532	521.4980	490.9997	463.3358	446.9330	449.7815	465.4657	493.4744	527.3747	556.9668	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	9.8900	11.2829	0.6800	0.7000	0.7700	36.8094	(81)
Northwest	2.0370	11.2829	0.6800	0.7000	0.7700	7.5815	(81)

Solar gains	44.3909	90.3589	162.7980	267.3611	359.3858	383.1433	358.4227	285.7387	198.3719	110.4258	55.8552	36.2518	(83)
Total gains	615.1519	659.1369	715.1512	788.8591	850.3855	846.4792	805.3557	735.5203	663.8376	603.9002	583.2299	593.2186	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area	0.9614	0.9438	0.8976	0.7892	0.6187	0.4430	0.3227	0.3687	0.5927	0.8396	0.9389	0.9670	(86)
MIT	20.1571	20.2974	20.5404	20.8006	20.9478	20.9915	20.9986	20.9973	20.9678	20.7691	20.4157	20.1069	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house	0.9542	0.9336	0.8801	0.7579	0.5747	0.3914	0.2666	0.3077	0.5338	0.8068	0.9261	0.9607	(89)
MIT 2	19.2596	19.4335	19.7293	20.0303	20.1843	20.2235	20.2284	20.2278	20.2057	20.0032	19.5833	19.1971	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.5645	19.7271	20.0049	20.2920	20.4437	20.4844	20.4901	20.4892	20.4646	20.2634	19.8661	19.5062	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5645	19.7271	20.0049	20.2920	20.4437	20.4844	20.4901	20.4892	20.4646	20.2634	19.8661	19.5062	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9468	0.9259	0.8744	0.7606	0.5872	0.4087	0.2856	0.3283	0.5522	0.8084	0.9191	0.9536	(94)
Useful gains	582.4026	610.3194	625.3134	599.9981	499.3438	345.9159	230.0451	241.5035	366.5959	488.1806	536.0729	565.6911	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	904.0283	878.1194	799.8168	674.6823	517.8395	348.5009	230.3876	242.1810	376.9378	572.3072	756.0606	906.4966	(97)
Space heating kWh	239.2895	179.9616	129.8305	53.7726	13.7608	0.0000	0.0000	0.0000	0.0000	62.5902	158.3912	253.5593	(98a)
Space heating requirement - total per year (kWh/year)												1091.1558	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	239.2895	179.9616	129.8305	53.7726	13.7608	0.0000	0.0000	0.0000	0.0000	62.5902	158.3912	253.5593	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1091.1558	
Space heating per m2											(98c) / (4) =	15.2567	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

239.2895	179.9616	129.8305	53.7726	13.7608	0.0000	0.0000	0.0000	0.0000	62.5902	158.3912	253.5593	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a 358.9343	269.9425	194.7458	80.6589	20.6412	0.0000	0.0000	0.0000	0.0000	93.8853	237.5868	380.3390	
Space heating requirement												
358.9343	269.9425	194.7458	80.6589	20.6412	0.0000	0.0000	0.0000	0.0000	93.8853	237.5868	380.3390	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement

257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a 385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel												
385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)

Cooling System Energy Efficiency Ratio	0.0000	(314)

Space coolin 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa 1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting 21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m -14.8619	-24.6522	-41.9801	-54.0165	-62.8534	-60.2005	-59.0498	-53.1061	-43.0156	-30.6311	-17.3392	-12.2904	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m -4.6369	-11.9261	-30.0153	-54.8475	-81.1374	-84.9515	-82.6912	-64.6364	-40.4468	-18.8657	-6.6109	-3.4586	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1636.7337	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3896.0468	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	16.3673	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(330a)
Total electricity for the above, kWh/year	19.6671	(331)
Electricity for lighting (calculated in Appendix L)	174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4768.9409	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1636.7337	4.4400	72.6710	(340a)
Space heating total			72.6710	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3896.0468	4.4400	172.9845	(342a)
Water heating total			172.9845	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	16.4900	3.2431	(349)
Energy for lighting	174.7141	16.4900	28.8104	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	16.4900	-78.1621	
PV Unit electricity exported	-484.2242	5.5900	-27.0681	
Total			-105.2302	(352)
Total energy cost			264.4787	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.8171	(357)
SAP value	86.7543	
SAP rating (Section 12)	87	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1475.4081	0.1566	68.3710	(367)
Electrical energy for heat distribution (space & water)	16.3673	0.0000	8.0519	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			222.7688	(373)
Space and water heating			222.7688	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	0.1320	-62.5726	
PV Unit electricity exported	-484.2242	0.1214	-58.7607	
Total			-121.3332	(380)
Total CO2, kg/year			129.3803	(383)
CO2 emissions per m2			1.8100	(384)
EI value			98.5121	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b) x	2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c) x	2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 71.5200						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	0 * 10 = 0.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	3	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
									Total per year (kWh/year) = Sum(64)m =			2597.3645	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)													
	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains													
	570.7610	568.7779	552.3532	521.4980	490.9997	463.3358	446.9330	449.7815	465.4657	493.4744	527.3747	556.9668	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	9.8900	13.7758	0.6800	0.7000	0.7700	44.9420	(81)
Northwest	2.0370	13.7758	0.6800	0.7000	0.7700	9.2565	(81)

Solar gains	54.1985	98.6378	175.8875	291.9762	376.7764	429.9382	395.0527	322.1943	226.3141	127.4643	67.3061	44.4293	(83)
Total gains	624.9595	667.4157	728.2407	813.4741	867.7761	893.2740	841.9857	771.9758	691.7798	620.9387	594.6807	601.3961	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9563	0.9375	0.8805	0.7586	0.5802	0.3824	0.2740	0.3138	0.5498	0.8068	0.9281	0.9629	(86)
MIT	20.2080	20.3427	20.6017	20.8393	20.9625	20.9960	20.9994	20.9988	20.9777	20.8190	20.4752	20.1560	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9482	0.9262	0.8604	0.7248	0.5349	0.3324	0.2200	0.2552	0.4908	0.7692	0.9132	0.9558	(89)
MIT 2	19.3232	19.4894	19.8022	20.0722	20.1981	20.2267	20.2288	20.2286	20.2136	20.0577	19.6557	19.2587	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.6238	19.7793	20.0738	20.3328	20.4578	20.4881	20.4906	20.4903	20.4732	20.3163	19.9342	19.5636	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6238	19.7793	20.0738	20.3328	20.4578	20.4881	20.4906	20.4903	20.4732	20.3163	19.9342	19.5636	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9406	0.9186	0.8559	0.7295	0.5486	0.3493	0.2383	0.2751	0.5098	0.7738	0.9067	0.9485	(94)
Useful gains	587.8513	613.1046	623.3052	593.4590	476.0255	312.0232	200.6784	212.3656	352.6845	480.4644	539.2146	570.4080	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	889.7724	863.4479	774.2864	653.4090	489.0636	313.1801	200.8082	212.6317	359.6794	545.8299	736.4014	892.1290	(97)
Space heating kWh													
	224.6293	168.2307	112.3300	43.1640	9.7003	0.0000	0.0000	0.0000	0.0000	48.6319	141.9745	239.3604	(98a)
Space heating requirement - total per year (kWh/year)												988.0212	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	224.6293	168.2307	112.3300	43.1640	9.7003	0.0000	0.0000	0.0000	0.0000	48.6319	141.9745	239.3604	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												988.0212	
Space heating per m2											(98c) / (4) =	13.8146	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	224.6293	168.2307	112.3300	43.1640	9.7003	0.0000	0.0000	0.0000	0.0000	48.6319	141.9745	239.3604	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	336.9440	252.3460	168.4950	64.7460	14.5505	0.0000	0.0000	0.0000	0.0000	72.9479	212.9618	359.0406	
Space heating requirement													
	336.9440	252.3460	168.4950	64.7460	14.5505	0.0000	0.0000	0.0000	0.0000	72.9479	212.9618	359.0406	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.7439	-26.4473	-44.1602	-56.7208	-64.1553	-63.6776	-61.8747	-56.5668	-46.5864	-34.0293	-20.3275	-14.7878	(333a)

Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.2546	-13.5179	-33.0849	-60.8523	-85.0852	-97.4411	-92.6154	-74.6748	-47.7624	-22.9670	-8.7029	-4.7110	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1482.0318	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3896.0468	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	14.8203	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(330a)
Total electricity for the above, kWh/year	19.6671	(331)
Electricity for lighting (calculated in Appendix L)	174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4517.7128	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1482.0318	6.5500	97.0731	(340a)
Space heating total			97.0731	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3896.0468	6.5500	255.1911	(342a)
Water heating total			255.1911	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	28.4300	5.5914	(349)
Energy for lighting	174.7141	28.4300	49.6712	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-507.0777	28.4300	-144.1622	
PV Unit electricity exported	-547.6693	5.8100	-31.8196	
Total			-175.9818	(352)
Total energy cost			335.5450	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1434.1543	0.1571	62.0955	(367)
Electrical energy for heat distribution (space & water)	14.8203	0.0000	7.8166	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			216.2580	(373)
Space and water heating			216.2580	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-507.0777	0.1323	-67.0962	
PV Unit electricity exported	-547.6693	0.1214	-66.4868	
Total			-133.5830	(380)
Total CO2, kg/year			110.6197	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1434.1543	1.5817	625.0877	(467)
Electrical energy for heat distribution (space & water)	14.8203	0.0000	82.6937	(472)
Overall CO2 factor for heat network			0.4254	(486)
Total CO2 associated with community systems			2287.8594	(473)
Space and water heating			2287.8594	(476)
Pumps, fans and electric keep-hot	19.6671	1.5128	29.7525	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-507.0777	1.4889	-754.9866	
PV Unit electricity exported	-547.6693	0.4453	-243.8963	
Total			-998.8829	(480)
Total Primary energy kWh/year			1586.7114	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Northwest

Current energy efficiency rating: B 87
Current environmental impact rating: A 99

N Solar water heating	Recommended
U Solar photovoltaic panels	Already installed
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.4	-£ 47	-26 kg (23.4%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£47	0.36 kg/m²	B 88	A 99
Total Savings	£47	0.36 kg/m²		

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£55	£78	-£23
Community scheme	£456	£388	£69
Space heating	£207	£229	-£23
Water heating	£255	£187	£69
Lighting	£50	£50	£0
Generated (PV)	-£176	-£177	£1
Total cost of fuels	£335	£289	£47
Total cost of uses	£336	£289	£47
Delivered energy	63 kWh/m²	50 kWh/m²	14 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	2 kg/m²	1 kg/m²	0 kg/m²
Primary energy	22 kWh/m²	18 kWh/m²	4 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120 (1b) - (3b)	
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff													
	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers													
	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths													
	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses													
	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	
Distribution loss (46)m = 0.15 x (45)m													
	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												623.4568	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												623.4568	
Solar input	-0.0000	-16.2208	-58.0195	-79.9223	-105.1350	-97.1484	-96.5940	-84.1560	-57.6291	-28.6318	-0.0000	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	257.1882	211.3732	183.9246	132.9320	101.3423	89.0407	87.1521	106.7357	135.2126	186.2632	228.3672	254.3760	(64)
											Total per year (kWh/year) = Sum(64)m =	1973.9077	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
299.7288 302.8391 295.0013 278.3158 257.2532 237.4574 224.2325 221.1223 228.9600 245.6456 266.7082 286.5040 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 (71)
Water heating gains (Table 5)
149.6734 147.3454 142.8606 133.0310 127.0102 120.7169 116.8514 120.0449 123.7891 130.7722 140.1950 148.4166 (72)
Total internal gains
570.7610 568.7779 552.3532 521.4980 490.9997 463.3358 446.9330 449.7815 465.4657 493.4744 527.3747 556.9668 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	9.8900	11.2829	0.6800	0.7000	0.7700	36.8094	(81)
Northwest	2.0370	11.2829	0.6800	0.7000	0.7700	7.5815	(81)

Solar gains	44.3909	90.3589	162.7980	267.3611	359.3858	383.1433	358.4227	285.7387	198.3719	110.4258	55.8552	36.2518 (83)
Total gains	615.1519	659.1369	715.1512	788.8591	850.3855	846.4792	805.3557	735.5203	663.8376	603.9002	583.2299	593.2186 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area	0.9614	0.9438	0.8976	0.7892	0.6187	0.4430	0.3227	0.3687	0.5927	0.8396	0.9389	0.9670	(86)
MIT	20.1571	20.2974	20.5404	20.8006	20.9478	20.9915	20.9986	20.9973	20.9678	20.7691	20.4157	20.1069	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house	0.9542	0.9336	0.8801	0.7579	0.5747	0.3914	0.2666	0.3077	0.5338	0.8068	0.9261	0.9607	(89)
MIT 2	19.2596	19.4335	19.7293	20.0303	20.1843	20.2235	20.2284	20.2278	20.2057	20.0032	19.5833	19.1971	(90)
Living area fraction									fLA = Living area / (4) =			0.3398	(91)
MIT	19.5645	19.7271	20.0049	20.2920	20.4437	20.4844	20.4901	20.4892	20.4646	20.2634	19.8661	19.5062	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5645	19.7271	20.0049	20.2920	20.4437	20.4844	20.4901	20.4892	20.4646	20.2634	19.8661	19.5062	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9468	0.9259	0.8744	0.7606	0.5872	0.4087	0.2856	0.3283	0.5522	0.8084	0.9191	0.9536	(94)
Useful gains	582.4026	610.3194	625.3134	599.9981	499.3438	345.9159	230.0451	241.5035	366.5959	488.1806	536.0729	565.6911	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	904.0283	878.1194	799.8168	674.6823	517.8395	348.5009	230.3876	242.1810	376.9378	572.3072	756.0606	906.4966	(97)
Space heating kWh	239.2895	179.9616	129.8305	53.7726	13.7608	0.0000	0.0000	0.0000	0.0000	62.5902	158.3912	253.5593	(98a)
Space heating requirement - total per year (kWh/year)												1091.1558	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	239.2895	179.9616	129.8305	53.7726	13.7608	0.0000	0.0000	0.0000	0.0000	62.5902	158.3912	253.5593	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1091.1558	
Space heating per m2											(98c) / (4) =	15.2567	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement
239.2895 179.9616 129.8305 53.7726 13.7608 0.0000 0.0000 0.0000 0.0000 62.5902 158.3912 253.5593 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50
307a 358.9343 269.9425 194.7458 80.6589 20.6412 0.0000 0.0000 0.0000 0.0000 93.8853 237.5868 380.3390
Space heating requirement
358.9343 269.9425 194.7458 80.6589 20.6412 0.0000 0.0000 0.0000 0.0000 93.8853 237.5868 380.3390 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)

Water heating
Annual water heating requirement
257.1882 211.3732 183.9246 132.9320 101.3423 89.0407 87.1521 106.7357 135.2126 186.2632 228.3672 254.3760 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50
310a 385.7824 317.0598 275.8868 199.3980 152.0134 133.5610 130.7281 160.1036 202.8189 279.3948 342.5508 381.5640
Water heating fuel
385.7824 317.0598 275.8868 199.3980 152.0134 133.5610 130.7281 160.1036 202.8189 279.3948 342.5508 381.5640 (310)
Cooling System Energy Efficiency Ratio 0.0000 (314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (315)
Pumps and Fa 8.4649 7.6457 8.4649 8.1918 8.4649 8.1918 8.4649 8.4649 8.1918 8.4649 8.1918 8.4649 (331)
Lighting 21.6483 17.3671 15.6371 11.4564 8.8493 7.2299 8.0726 10.4931 13.6295 17.8826 20.1983 22.2500 (332)
Electricity generated by PVs (Appendix M) (negative quantity)
(333a)m -14.9141 -24.7783 -42.2847 -54.5605 -63.6655 -61.0911 -59.9595 -53.8492 -43.4933 -30.8592 -17.4193 -12.3313 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)

(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5846	-11.8000	-29.7107	-54.3035	-80.3253	-84.0609	-81.7814	-63.8933	-39.9691	-18.6376	-6.5308	-3.4177	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1636.7337	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2960.8616	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	16.3673	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.6671	(331)
Electricity for lighting (calculated in Appendix L)	174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3913.7557	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1636.7337	4.4400	72.6710	(340a)
Space heating total			72.6710	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2960.8616	4.4400	131.4623	(342a)
Water heating total			131.4623	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	16.4900	3.2431	(349)
Pump for solar water heating	80.0000	16.4900	13.1920	(349)
Energy for lighting	174.7141	16.4900	28.8104	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-479.2061	16.4900	-79.0211	
PV Unit electricity exported	-479.0149	5.5900	-26.7769	
Total			-105.7980	(352)
Total energy cost			235.5807	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.7278	(357)
SAP value	88.2016	
SAP rating (Section 12)	88	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1226.0254	0.1566	68.3710	(367)
Electrical energy for heat distribution (space & water)	16.3673	0.0000	6.8593	(372)
Overall CO2 factor for heat network			0.0413	(386)
Total CO2 associated with community systems			189.7726	(373)
Space and water heating			189.7726	(376)
Pumps, fans and electric keep-hot	99.6671	0.1387	13.8251	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-479.2061	0.1320	-63.2320	
PV Unit electricity exported	-479.0149	0.1214	-58.1324	
Total			-121.3643	(380)
Total CO2, kg/year			107.4500	(383)
CO2 emissions per m2			1.5000	(384)
EI value			98.7643	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120 (1b) - (3b)	
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)

Average = Sum(39)m / 12 =	59.2241

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2825 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day)	117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	

Distribution loss (46)m = 0.15 x (45)m

30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:

Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												697.5235	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												697.5235	
Solar input	-0.3007	-19.8927	-63.0021	-86.8105	-108.5158	-108.4282	-105.5589	-94.8548	-67.4076	-37.8155	-4.9366	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	256.8875	207.7013	178.9419	126.0438	97.9614	77.7608	78.1872	96.0370	125.4340	177.0795	223.4306	254.3760	(64)
											Total per year (kWh/year) = Sum(64)m =	1899.8410	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)													
	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains													
	570.7610	568.7779	552.3532	521.4980	490.9997	463.3358	446.9330	449.7815	465.4657	493.4744	527.3747	556.9668	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	9.8900	13.7758	0.6800	0.7000	0.7700	44.9420	(81)
Northwest	2.0370	13.7758	0.6800	0.7000	0.7700	9.2565	(81)

Solar gains	54.1985	98.6378	175.8875	291.9762	376.7764	429.9382	395.0527	322.1943	226.3141	127.4643	67.3061	44.4293	(83)
Total gains	624.9595	667.4157	728.2407	813.4741	867.7761	893.2740	841.9857	771.9758	691.7798	620.9387	594.6807	601.3961	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9563	0.9375	0.8805	0.7586	0.5802	0.3824	0.2740	0.3138	0.5498	0.8068	0.9281	0.9629	(86)
MIT	20.2080	20.3427	20.6017	20.8393	20.9625	20.9960	20.9994	20.9988	20.9777	20.8190	20.4752	20.1560	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9482	0.9262	0.8604	0.7248	0.5349	0.3324	0.2200	0.2552	0.4908	0.7692	0.9132	0.9558	(89)
MIT 2	19.3232	19.4894	19.8022	20.0722	20.1981	20.2267	20.2288	20.2286	20.2136	20.0577	19.6557	19.2587	(90)
Living area fraction											fLA = Living area / (4) =	0.3398	(91)
MIT	19.6238	19.7793	20.0738	20.3328	20.4578	20.4881	20.4906	20.4903	20.4732	20.3163	19.9342	19.5636	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6238	19.7793	20.0738	20.3328	20.4578	20.4881	20.4906	20.4903	20.4732	20.3163	19.9342	19.5636	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9406	0.9186	0.8559	0.7295	0.5486	0.3493	0.2383	0.2751	0.5098	0.7738	0.9067	0.9485	(94)
Useful gains	587.8513	613.1046	623.3052	593.4590	476.0255	312.0232	200.6784	212.3656	352.6845	480.4644	539.2146	570.4080	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	889.7724	863.4479	774.2864	653.4090	489.0636	313.1801	200.8082	212.6317	359.6794	545.8299	736.4014	892.1290	(97)
Space heating kWh													
	224.6293	168.2307	112.3300	43.1640	9.7003	0.0000	0.0000	0.0000	0.0000	48.6319	141.9745	239.3604	(98a)
Space heating requirement - total per year (kWh/year)												988.0212	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	224.6293	168.2307	112.3300	43.1640	9.7003	0.0000	0.0000	0.0000	0.0000	48.6319	141.9745	239.3604	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												988.0212	
Space heating per m2											(98c) / (4) =	13.8146	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement													
	224.6293	168.2307	112.3300	43.1640	9.7003	0.0000	0.0000	0.0000	0.0000	48.6319	141.9745	239.3604	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	336.9440	252.3460	168.4950	64.7460	14.5505	0.0000	0.0000	0.0000	0.0000	72.9479	212.9618	359.0406	
Space heating requirement													
	336.9440	252.3460	168.4950	64.7460	14.5505	0.0000	0.0000	0.0000	0.0000	72.9479	212.9618	359.0406	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement													
	256.8875	207.7013	178.9419	126.0438	97.9614	77.7608	78.1872	96.0370	125.4340	177.0795	223.4306	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.3312	311.5520	268.4128	189.0656	146.9421	116.6412	117.2807	144.0554	188.1511	265.6193	335.1459	381.5640	
Water heating fuel													
	385.3312	311.5520	268.4128	189.0656	146.9421	116.6412	117.2807	144.0554	188.1511	265.6193	335.1459	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	8.4649	7.6457	8.4649	8.1918	8.4649	8.1918	8.4649	8.4649	8.1918	8.4649	8.1918	8.4649	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.8133	-26.5889	-44.4924	-57.3150	-64.9996	-64.6716	-62.8712	-57.4038	-47.1375	-34.3017	-20.4312	-14.8426	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.1852	-13.3763	-32.7527	-60.2581	-84.2408	-96.4471	-91.6189	-73.8378	-47.2113	-22.6946	-8.5992	-4.6561	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1482.0318	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2849.7616	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	14.8203	(313)
Space cooling fuel	0.0000	(321)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.6671	(331)
Electricity for lighting (calculated in Appendix L)	174.7141	(332)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3551.4276	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1482.0318	6.5500	97.0731	(340a)
Space heating total			97.0731	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2849.7616	6.5500	186.6594	(342a)
Water heating total			186.6594	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	28.4300	5.5914	(349)
Pump for solar water heating	80.0000	28.4300	22.7440	(349)
Energy for lighting	174.7141	28.4300	49.6712	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-512.8689	28.4300	-145.8086	
PV Unit electricity exported	-541.8781	5.8100	-31.4831	
Total			-177.2917	(352)
Total energy cost			288.4473	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1155.1449	0.1571	62.0955	(367)
Electrical energy for heat distribution (space & water)	14.8203	0.0000	6.4805	(372)
Overall CO2 factor for heat network			0.0414	(386)
Total CO2 associated with community systems			179.2925	(373)
Space and water heating			179.2925	(376)
Pumps, fans and electric keep-hot	99.6671	0.1387	13.8251	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-512.8689	0.1323	-67.8299	
PV Unit electricity exported	-541.8781	0.1214	-65.7869	
Total			-133.6168	(380)
Total CO2, kg/year			84.7174	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1155.1449	1.5817	625.0877	(467)
Electrical energy for heat distribution (space & water)	14.8203	0.0000	67.2963	(472)
Overall CO2 factor for heat network			0.4298	(486)
Total CO2 associated with community systems			1861.8646	(473)
Space and water heating			1861.8646	(476)
Pumps, fans and electric keep-hot	99.6671	1.5128	150.7765	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-512.8689	1.4887	-763.4867	
PV Unit electricity exported	-541.8781	0.4454	-241.3296	
Total			-1004.8163	(480)
Total Primary energy kWh/year			1275.8072	(483)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.56	**TER**	9.97
Environmental	99 A	**% DER < TER**			84.35
CO_2 Emissions (t/year)	0.09	**DFEE**	19.48	**TFEE**	27.24
Compliance Check	See BREL	**% DFEE < TFEE**			28.49
% DPER < TPER	58.21	**DPER**	21.64	**TPER**	51.80

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				3	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												175.9097	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6151	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	30.3121	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
										Total per year (kWh/year) = Sum(64)m =		2597.3645	(64)
12Total per year (kWh/year)												2597	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.6996	119.2388	107.6996	111.2896	107.6996	111.2896	107.6996	107.6996	111.2896	107.6996	111.2896	107.6996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains	515.4281	526.7231	505.4479	488.0289	464.3062	448.3397	432.0236	433.1332	445.7187	460.2911	487.4158	505.3106	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	9.8900	46.7521	0.6800	0.7000	0.7700	152.5237	(78)
South	2.0370	46.7521	0.6800	0.7000	0.7700	31.4146	(78)

Solar gains	183.9383	301.2436	383.7309	433.6992	451.9414	434.9321	424.9551	412.6903	400.8522	324.9194	218.0296	158.9396	(83)
Total gains	699.3664	827.9667	889.1787	921.7281	916.2476	883.2718	856.9787	845.8235	846.5709	785.2106	705.4454	664.2503	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9393	0.8844	0.8167	0.7130	0.5807	0.4253	0.3035	0.3213	0.4757	0.7176	0.8887	0.9502	(86)
MIT	20.2959	20.5309	20.7190	20.8741	20.9603	20.9929	20.9989	20.9985	20.9875	20.8887	20.5839	20.2288	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9289	0.8673	0.7922	0.6792	0.5378	0.3755	0.2506	0.2678	0.4250	0.6780	0.8692	0.9414	(89)
MIT 2	19.4300	19.7130	19.9335	20.1069	20.1954	20.2244	20.2286	20.2284	20.2204	20.1260	19.7820	19.3478	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.7242	19.9909	20.2004	20.3675	20.4553	20.4855	20.4903	20.4901	20.4810	20.3851	20.0544	19.6471	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7242	19.9909	20.2004	20.3675	20.4553	20.4855	20.4903	20.4901	20.4810	20.3851	20.0544	19.6471	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9211	0.8616	0.7913	0.6855	0.5506	0.3922	0.2686	0.2860	0.4417	0.6863	0.8644	0.9336	(94)
Useful gains	644.1645	713.3746	703.5898	631.8147	504.4789	346.4092	230.1425	241.8679	373.9653	538.9021	609.7612	620.1469	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	913.4861	893.7454	811.3940	679.1548	518.5241	348.5654	230.4007	242.2298	377.9098	579.5157	767.2148	914.8431	(97)
Space heating kWh													
	200.3752	121.2091	80.2064	34.0849	10.4497	0.0000	0.0000	0.0000	0.0000	30.2165	113.3666	219.2540	(98a)
Space heating requirement - total per year (kWh/year)												809.1624	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	200.3752	121.2091	80.2064	34.0849	10.4497	0.0000	0.0000	0.0000	0.0000	30.2165	113.3666	219.2540	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												809.1624	
Space heating per m2											(98c) / (4) =	11.3138	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	200.3752	121.2091	80.2064	34.0849	10.4497	0.0000	0.0000	0.0000	0.0000	30.2165	113.3666	219.2540	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	300.5629	181.8137	120.3096	51.1273	15.6745	0.0000	0.0000	0.0000	0.0000	45.3248	170.0498	328.8810	
Space heating requirement													
	300.5629	181.8137	120.3096	51.1273	15.6745	0.0000	0.0000	0.0000	0.0000	45.3248	170.0498	328.8810	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.8619	-24.6522	-41.9801	-54.0165	-62.8534	-60.2005	-59.0498	-53.1061	-43.0156	-30.6311	-17.3392	-12.2904	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.6369	-11.9261	-30.0153	-54.8475	-81.1374	-84.9515	-82.6912	-64.6364	-40.4468	-18.8657	-6.6109	-3.4586	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1213.7435	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3896.0468	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												12.1374	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.6671	(330a)
Total electricity for the above, kWh/year												19.6671	(331)
Electricity for lighting (calculated in Appendix L)												174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4345.9507	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1362.6108	0.1576	51.0184	(367)
Electrical energy for heat distribution (space & water)	12.1374	0.0000	7.4012	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			204.7655	(373)
Space and water heating			204.7655	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	0.1320	-62.5726	
PV Unit electricity exported	-484.2242	0.1214	-58.7607	
Total			-121.3332	(380)
Total CO2, kg/year			111.3769	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.5600	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1362.6108	1.5835	512.5174	(467)
Electrical energy for heat distribution (space & water)	12.1374	0.0000	78.4723	(472)
Overall CO2 factor for heat network			0.4249	(486)
Total CO2 associated with community systems			2171.0678	(473)
Space and water heating			2171.0678	(476)
Pumps, fans and electric keep-hot	19.6671	1.5128	29.7525	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	1.4877	-705.1878	
PV Unit electricity exported	-484.2242	0.4452	-215.5829	
Total			-920.7707	(480)
Total Primary energy kWh/year			1548.0319	(483)
Dwelling Primary energy Rate (DPER)			21.6400	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b) x	2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c) x	2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3264	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3020	0.3264	0.3509	0.3672	0.3836	(22b)
Effective ac	0.5866	0.5833	0.5800	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			11.9270	1.1450	13.6603			(27)
Heatloss floor			35.7600	0.1300	4.6488			(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.1800	6.3023			(29a)
500mm mineral wool	35.7600		35.7600	0.1100	3.9336			(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5850			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.9097 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.0600	0.0500	0.3530
E3 Sill	3.7400	0.0500	0.1870
E4 Jamb	23.3600	0.0500	1.1680
E5 Ground floor (normal)	11.1200	0.1600	1.7792
E6 Intermediate floor within a dwelling	4.0300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.3800	0.0600	0.3828
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	12.9900	0.0800	1.0392
P2 Party wall - Intermediate floor within a dwelling	15.4400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	15.4400	0.1200	1.8528
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.3500	0.0200	0.0470

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.3690 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 38.9540 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.9203	33.7259	33.5352	32.6398	32.4723	31.6925	31.6925	31.5481	31.9929	32.4723	32.8112	33.1655	(38)
Heat transfer coeff	72.8744	72.6799	72.4893	71.5939	71.4264	70.6465	70.6465	70.5021	70.9469	71.4264	71.7653	72.1196	(39)
Average = Sum(39)m / 12 =												71.5931	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0189	1.0162	1.0136	1.0010	0.9987	0.9878	0.9878	0.9858	0.9920	0.9987	1.0034	1.0084	(40)
HLP (average)												1.0010	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

Hot water usage for mixer showers

62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day) 117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	248.5063	219.7523	233.2621	204.4524	197.7953	177.7872	175.0641	182.2099	184.4398	206.2131	219.9654	245.6941	(62)
WWHRS	-28.5673	-25.2652	-26.4562	-21.9068	-20.4164	-17.4704	-16.3757	-17.4139	-18.0756	-21.3091	-24.1406	-28.0383	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
									Total per year (kWh/year) = Sum(64)m =			2229.7066	(64)
12Total per year (kWh/year)												2230	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	104.4115	92.7427	99.3428	89.0609	87.5501	80.1947	79.9919	82.3679	82.4067	90.3490	94.2189	103.4764	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.8362	116.0686	104.8362	108.3307	104.8362	108.3307	104.8362	104.8362	108.3307	104.8362	108.3307	104.8362	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	140.3380	138.0100	133.5252	123.6956	117.6748	111.3815	107.5160	110.7095	114.4537	121.4368	130.8596	139.0812	(72)
Total internal gains													

	506.2293	517.2176	496.2491	478.7347	455.1075	436.0455	419.8249	420.9345	433.4245	451.0924	478.1216	496.1119	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	11.9270	46.7521	0.6300	0.7000	0.7700	170.4134	(78)

Solar gains	170.4134	279.0933	355.5154	401.8095	418.7104	402.9518	393.7084	382.3454	371.3778	301.0283	201.9980	147.2529	(83)
Total gains	676.6428	796.3109	851.7645	880.5443	873.8179	838.9973	813.5333	803.2799	804.8022	752.1207	680.1197	643.3648	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.9557	48.0840	48.2104	48.8134	48.9279	49.4680	49.4680	49.5693	49.2585	48.9279	48.6968	48.4576	
alpha	4.1970	4.2056	4.2140	4.2542	4.2619	4.2979	4.2979	4.3046	4.2839	4.2619	4.2465	4.2305	
util living area	0.9603	0.9268	0.8826	0.8030	0.6860	0.5208	0.3783	0.3988	0.5777	0.8049	0.9277	0.9666	(86)
MIT	19.8540	20.1264	20.3944	20.6769	20.8684	20.9691	20.9937	20.9920	20.9500	20.7209	20.2566	19.8053	(87)
Th 2	20.0676	20.0698	20.0721	20.0825	20.0844	20.0935	20.0935	20.0952	20.0900	20.0844	20.0805	20.0764	(88)
util rest of house	0.9524	0.9134	0.8616	0.7693	0.6354	0.4534	0.3021	0.3226	0.5113	0.7654	0.9122	0.9598	(89)
MIT 2	18.7594	19.0965	19.4232	19.7616	19.9707	20.0734	20.0909	20.0916	20.0549	19.8192	19.2707	18.7052	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.1313	19.4464	19.7532	20.0726	20.2757	20.3777	20.3976	20.3975	20.3590	20.1256	19.6057	19.0790	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1313	19.4464	19.7532	20.0726	20.2757	20.3777	20.3976	20.3975	20.3590	20.1256	19.6057	19.0790	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9426	0.9028	0.8535	0.7689	0.6465	0.4750	0.3279	0.3483	0.5315	0.7673	0.9027	0.9506	(94)
Useful gains	637.7936	718.9467	726.9798	677.0500	564.8898	398.4864	266.7552	279.8104	427.7714	577.1027	613.9363	611.5893	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1080.8207	1057.2301	960.7136	799.8918	612.5325	408.1730	268.2878	281.8332	444.0571	680.3772	897.4714	1073.0667	(97)
Space heating kWh	329.6122	227.3264	173.8979	88.4461	35.4461	0.0000	0.0000	0.0000	0.0000	76.8362	204.1453	343.3392	(98a)
Space heating requirement - total per year (kWh/year)												1479.0495	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	329.6122	227.3264	173.8979	88.4461	35.4461	0.0000	0.0000	0.0000	0.0000	76.8362	204.1453	343.3392	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1479.0495	
Space heating per m2											(98c) / (4) =	20.6802	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	329.6122	227.3264	173.8979	88.4461	35.4461	0.0000	0.0000	0.0000	0.0000	76.8362	204.1453	343.3392	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	357.1096	246.2908	188.4051	95.8246	38.4032	0.0000	0.0000	0.0000	0.0000	83.2462	221.1758	371.9818	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9649	84.4106	83.6737	82.5300	81.1702	79.8000	79.8000	79.8000	79.8000	82.2471	84.1532	85.0772	(217)
Fuel for water heating, kWh/month	258.8586	230.4061	247.1576	221.1869	218.5273	200.8982	198.8576	206.5112	208.4765	224.8154	232.7002	255.8332	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.7829	17.4750	15.7343	11.5277	8.9043	7.2749	8.1228	10.5583	13.7142	17.9938	20.3239	22.3883	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.5568	-47.3592	-68.1531	-76.7310	-82.8400	-77.3720	-76.4273	-72.1080	-64.4904	-54.2111	-36.9141	-29.0069	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-18.8029	-39.5749	-78.6914	-118.2335	-156.3709	-157.1182	-155.2578	-131.4301	-96.3075	-56.5975	-25.1064	-14.8664	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1602.4371	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2704.2288	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	175.8004	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1767.5275	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2800.9389	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1602.4371	0.2100	336.5118	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2704.2288	0.2100	567.8881	(264)
Space and water heating			904.3999	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	175.8004	0.1443	25.3734	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	0.1346	-96.7689	
PV Unit electricity exported	-1048.3576	0.1259	-131.9744	
Total			-228.7433	(269)
Total CO2, kg/year			712.9592	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.9700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1602.4371	1.1300	1810.7539	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2704.2288	1.1300	3055.7786	(278)
Space and water heating			4866.5325	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	175.8004	1.5338	269.6485	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	1.4973	-1076.8103	
PV Unit electricity exported	-1048.3576	0.4621	-484.4365	
Total			-1561.2467	(283)
Total Primary energy kWh/year			3705.0351	(286)
Target Primary Energy Rate (TPER)			51.8000	(287)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.56	**TER**	9.97
Environmental	99 A	**% DER < TER**			84.35
CO_2 Emissions (t/year)	0.09	**DFEE**	19.48	**TFEE**	27.24
Compliance Check	See BREL	**% DFEE < TFEE**			28.49
% DPER < TPER	58.21	**DPER**	21.64	**TPER**	51.80

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		3 * 10 =	30.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1712	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.3212	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2489	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3174	0.3112	0.3049	0.2738	0.2676	0.2365	0.2365	0.2303	0.2489	0.2676	0.2801	0.2925	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5504	0.5484	0.5465	0.5375	0.5358	0.5280	0.5280	0.5265	0.5310	0.5358	0.5392	0.5428	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)

Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss										(33) + (36) + (36a) =		30.3121	(37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.8245	31.7114	31.6006	31.0799	30.9825	30.5289	30.5289	30.4450	30.7036	30.9825	31.1795	31.3856	(38)
Heat transfer coeff													
	62.1367	62.0236	61.9127	61.3920	61.2946	60.8411	60.8411	60.7571	61.0158	61.2946	61.4917	61.6977	(39)
Average = Sum(39)m / 12 =												61.3916	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8688	0.8672	0.8657	0.8584	0.8570	0.8507	0.8507	0.8495	0.8531	0.8570	0.8598	0.8627	(40)
HLP (average)												0.8584	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses													
	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												59.5787	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	65.0001	63.2172	61.2706	58.8477	56.6862	54.4399	53.9730	55.9157	57.9081	60.2149	62.6593	64.9088	(44)
Energy conte	102.9443	90.0205	94.1707	80.5595	76.3105	66.9402	65.2757	69.2353	71.4064	81.7111	89.2697	101.6316	(45)
Energy content (annual)										Total = Sum(45)m =		989.4754	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(64)
										Total per year (kWh/year) = Sum(64)m =		841.0541	(64)
12Total per year (kWh/year)												841	(64)
Electric shower(s)													
	50.0432	44.5889	48.6894	46.4637	47.3355	45.1535	46.6586	47.3355	46.4637	48.6894	47.7738	50.0432	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						569.2384	(64a)
Heat gains from water heating, kWh/month													
	34.3865	30.2766	32.1836	28.7348	28.0499	25.5132	25.5357	26.5464	26.7898	29.5359	30.9133	34.1075	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	107.6996	119.2388	107.6996	111.2896	107.6996	111.2896	107.6996	107.6996	111.2896	107.6996	111.2896	107.6996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)													
	46.2184	45.0544	43.2575	39.9095	37.7014	35.4350	34.3222	35.6806	37.2080	39.6988	42.9351	45.8434	(72)
Total internal gains													
	411.9730	424.4322	405.8448	394.9074	374.9975	363.0578	349.4944	348.7689	359.1376	369.2178	390.1559	402.7375	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	9.8900	46.7521	0.6800	0.7000	0.7700	152.5237	(78)
South	2.0370	46.7521	0.6800	0.7000	0.7700	31.4146	(78)

Solar gains	183.9383	301.2436	383.7309	433.6992	451.9414	434.9321	424.9551	412.6903	400.8522	324.9194	218.0296	158.9396	(83)
Total gains	595.9114	725.6758	789.5757	828.6066	826.9388	797.9898	774.4495	761.4592	759.9898	694.1372	608.1855	561.6771	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.2428	56.3453	56.4462	56.9250	57.0154	57.4404	57.4404	57.5198	57.2760	57.0154	56.8327	56.6429	
alpha	4.7495	4.7564	4.7631	4.7950	4.8010	4.8294	4.8294	4.8347	4.8184	4.8010	4.7888	4.7762	
util living area													
	0.9681	0.9288	0.8750	0.7794	0.6488	0.4800	0.3443	0.3652	0.5391	0.7906	0.9343	0.9747	(86)

MIT	20.0334	20.3188	20.5657	20.7958	20.9294	20.9867	20.9978	20.9971	20.9763	20.8134	20.3976	19.9725	(87)
Th 2	20.1941	20.1955	20.1968	20.2030	20.2042	20.2096	20.2096	20.2106	20.2075	20.2042	20.2018	20.1994	(88)
util rest of house													
	0.9619	0.9164	0.8546	0.7469	0.6031	0.4236	0.2831	0.3034	0.4822	0.7532	0.9207	0.9697	(89)
MIT 2	19.3248	19.6002	19.8331	20.0452	20.1567	20.2028	20.2089	20.2096	20.1944	20.0656	19.6852	19.2697	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.5656	19.8443	20.0820	20.3003	20.4192	20.4691	20.4769	20.4771	20.4601	20.3197	19.9272	19.5085	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5656	19.8443	20.0820	20.3003	20.4192	20.4691	20.4769	20.4771	20.4601	20.3197	19.9272	19.5085	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9561	0.9103	0.8514	0.7511	0.6157	0.4423	0.3039	0.3244	0.5006	0.7589	0.9153	0.9644	(94)
Useful gains	569.7473	660.5791	672.2766	622.3468	509.1850	352.9844	235.3490	246.9797	380.4636	526.8131	556.6553	541.6619	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	948.5522	926.9017	840.8989	699.8849	534.4413	357.0825	235.8761	247.7139	388.0638	595.7630	788.7675	944.4976	(97)
Space heating kWh													
	281.8309	178.9688	125.4550	55.8274	18.7907	0.0000	0.0000	0.0000	0.0000	51.2988	167.1208	299.7097	(98a)
Space heating requirement - total per year (kWh/year)												1179.0021	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	281.8309	178.9688	125.4550	55.8274	18.7907	0.0000	0.0000	0.0000	0.0000	51.2988	167.1208	299.7097	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1179.0021	
Space heating per m2											(98c) / (4) =	16.4849	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	571.9062	450.2240	461.7539	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9538	0.9788	0.9753	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	545.4911	440.6705	450.3437	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	887.3040	862.0640	849.0296	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	246.1053	313.5168	296.6223	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	61.5263	78.3792	74.1556	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												214.0611	(107)
Energy for space heating												16.4849	(99)
Energy for space cooling												2.9930	(108)
Total												19.4780	(109)
Fabric Energy Efficiency (DFEE)												19.5	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3264	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3020	0.3264	0.3509	0.3672	0.3836	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5866	0.5833	0.5800	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			11.9270	1.1450	13.6603			(27)
Heatloss floor			35.7600	0.1300	4.6488			(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.1800	6.3023			(29a)
500mm mineral wool	35.7600		35.7600	0.1100	3.9336			(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5850			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	175.9097	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.0600	0.0500	0.3530
E3 Sill	3.7400	0.0500	0.1870
E4 Jamb	23.3600	0.0500	1.1680
E5 Ground floor (normal)	11.1200	0.1600	1.7792
E6 Intermediate floor within a dwelling	4.0300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.3800	0.0600	0.3828
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	12.9900	0.0800	1.0392
P2 Party wall - Intermediate floor within a dwelling	15.4400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	15.4400	0.1200	1.8528
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.3500	0.0200	0.0470

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.3690	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	38.9540	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.9203	33.7259	33.5352	32.6398	32.4723	31.6925	31.6925	31.5481	31.9929	32.4723	32.8112	33.1655	(38)
Heat transfer coeff													
	72.8744	72.6799	72.4893	71.5939	71.4264	70.6465	70.6465	70.5021	70.9469	71.4264	71.7653	72.1196	(39)
Average = Sum(39)m / 12 =												71.5931	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0189	1.0162	1.0136	1.0010	0.9987	0.9878	0.9878	0.9858	0.9920	0.9987	1.0034	1.0084	(40)
HLP (average)												1.0010	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2825	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses													
	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												59.5787	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	65.0001	63.2172	61.2706	58.8477	56.6862	54.4399	53.9730	55.9157	57.9081	60.2149	62.6593	64.9088	(44)
Energy conte	102.9443	90.0205	94.1707	80.5595	76.3105	66.9402	65.2757	69.2353	71.4064	81.7111	89.2697	101.6316	(45)
Energy content (annual)										Total = Sum(45)m =		989.4754	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(64)
										Total per year (kWh/year) = Sum(64)m =		841.0541	(64)
12Total per year (kWh/year)												841	(64)
Electric shower(s)													
	50.0432	44.5889	48.6894	46.4637	47.3355	45.1535	46.6586	47.3355	46.4637	48.6894	47.7738	50.0432	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		569.2384	(64a)
Heat gains from water heating, kWh/month													
	34.3865	30.2766	32.1836	28.7348	28.0499	25.5132	25.5357	26.5464	26.7898	29.5359	30.9133	34.1075	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	104.8362	116.0686	104.8362	108.3307	104.8362	108.3307	104.8362	104.8362	108.3307	104.8362	108.3307	104.8362	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)													
	46.2184	45.0544	43.2575	39.9095	37.7014	35.4350	34.3222	35.6806	37.2080	39.6988	42.9351	45.8434	(72)
Total internal gains													
	409.1097	421.2621	402.9814	391.9486	372.1341	360.0989	346.6311	345.9056	356.1788	366.3544	387.1971	399.8741	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	11.9270	46.7521	0.6300	0.7000	0.7700	170.4134	(78)

Solar gains	170.4134	279.0933	355.5154	401.8095	418.7104	402.9518	393.7084	382.3454	371.3778	301.0283	201.9980	147.2529	(83)
Total gains	579.5231	700.3554	758.4968	793.7581	790.8445	763.0507	740.3395	728.2510	727.5566	667.3827	589.1951	547.1270	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.9557	48.0840	48.2104	48.8134	48.9279	49.4680	49.4680	49.5693	49.2585	48.9279	48.6968	48.4576	
alpha	4.1970	4.2056	4.2140	4.2542	4.2619	4.2979	4.2979	4.3046	4.2839	4.2619	4.2465	4.2305	
util living area													
	0.9762	0.9502	0.9139	0.8433	0.7335	0.5654	0.4140	0.4376	0.6269	0.8506	0.9533	0.9807	(86)
MIT	19.6842	19.9797	20.2759	20.6004	20.8291	20.9578	20.9911	20.9886	20.9320	20.6444	20.1160	19.6326	(87)
Th 2	20.0676	20.0698	20.0721	20.0825	20.0844	20.0935	20.0935	20.0952	20.0900	20.0844	20.0805	20.0764	(88)
util rest of house													
	0.9712	0.9403	0.8969	0.8131	0.6841	0.4945	0.3314	0.3550	0.5583	0.8160	0.9422	0.9765	(89)
MIT 2	18.8831	19.1721	19.4580	19.7676	19.9670	20.0717	20.0905	20.0911	20.0519	19.8146	19.3171	18.8393	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.1553	19.4465	19.7359	20.0506	20.2599	20.3727	20.3965	20.3960	20.3509	20.0965	19.5886	19.1088	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1553	19.4465	19.7359	20.0506	20.2599	20.3727	20.3965	20.3960	20.3509	20.0965	19.5886	19.1088	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9649	0.9323	0.8899	0.8120	0.6941	0.5170	0.3593	0.3829	0.5787	0.8165	0.9351	0.9710	(94)
Useful gains	559.1797	652.9724	674.9620	644.5201	548.9516	394.4871	266.0229	278.8132	421.0728	544.8964	550.9618	531.2450	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1082.5701	1057.2387	959.4597	798.3115	611.4022	407.8244	268.2104	281.7292	443.4814	678.3035	896.2442	1075.2173	(97)
Space heating kWh													
	389.4025	271.6670	211.6663	110.7299	46.4632	0.0000	0.0000	0.0000	0.0000	99.2549	248.6033	404.7153	(98a)
Space heating requirement - total per year (kWh/year)												1782.5023	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	389.4025	271.6670	211.6663	110.7299	46.4632	0.0000	0.0000	0.0000	0.0000	99.2549	248.6033	404.7153	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1782.5023	
Space heating per m2											(98c) / (4) =	24.9231	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	664.0772	522.7842	535.8159	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8961	0.9434	0.9364	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	595.0873	493.2193	501.7541	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	849.6739	825.2712	813.2097	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	183.3024	247.0466	231.7230	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	45.8256	61.7616	57.9308	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												165.5180	(107)
Energy for space heating												24.9231	(99)
Energy for space cooling												2.3143	(108)
Total												27.2374	(109)
Fabric Energy Efficiency (TFEE)												27.2	(109)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.56	**TER**	9.97
Environmental	99 A	**% DER < TER**			84.35
CO_2 Emissions (t/year)	0.09	**DFEE**	19.48	**TFEE**	27.24
Compliance Check	See BREL	**% DFEE < TFEE**			28.49
% DPER < TPER	58.21	**DPER**	21.64	**TPER**	51.80

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				3	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												175.9097	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6151	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	30.3121	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
										Total per year (kWh/year) = Sum(64)m =		2597.3645	(64)
12Total per year (kWh/year)												2597	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.6996	119.2388	107.6996	111.2896	107.6996	111.2896	107.6996	107.6996	111.2896	107.6996	111.2896	107.6996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains	515.4281	526.7231	505.4479	488.0289	464.3062	448.3397	432.0236	433.1332	445.7187	460.2911	487.4158	505.3106	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	9.8900	46.7521	0.6800	0.7000	0.7700	152.5237	(78)
South	2.0370	46.7521	0.6800	0.7000	0.7700	31.4146	(78)

Solar gains	183.9383	301.2436	383.7309	433.6992	451.9414	434.9321	424.9551	412.6903	400.8522	324.9194	218.0296	158.9396	(83)
Total gains	699.3664	827.9667	889.1787	921.7281	916.2476	883.2718	856.9787	845.8235	846.5709	785.2106	705.4454	664.2503	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9393	0.8844	0.8167	0.7130	0.5807	0.4253	0.3035	0.3213	0.4757	0.7176	0.8887	0.9502	(86)
MIT	20.2959	20.5309	20.7190	20.8741	20.9603	20.9929	20.9989	20.9985	20.9875	20.8887	20.5839	20.2288	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9289	0.8673	0.7922	0.6792	0.5378	0.3755	0.2506	0.2678	0.4250	0.6780	0.8692	0.9414	(89)
MIT 2	19.4300	19.7130	19.9335	20.1069	20.1954	20.2244	20.2286	20.2284	20.2204	20.1260	19.7820	19.3478	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.7242	19.9909	20.2004	20.3675	20.4553	20.4855	20.4903	20.4901	20.4810	20.3851	20.0544	19.6471	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7242	19.9909	20.2004	20.3675	20.4553	20.4855	20.4903	20.4901	20.4810	20.3851	20.0544	19.6471	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9211	0.8616	0.7913	0.6855	0.5506	0.3922	0.2686	0.2860	0.4417	0.6863	0.8644	0.9336	(94)
Useful gains	644.1645	713.3746	703.5898	631.8147	504.4789	346.4092	230.1425	241.8679	373.9653	538.9021	609.7612	620.1469	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	913.4861	893.7454	811.3940	679.1548	518.5241	348.5654	230.4007	242.2298	377.9098	579.5157	767.2148	914.8431	(97)
Space heating kWh													
	200.3752	121.2091	80.2064	34.0849	10.4497	0.0000	0.0000	0.0000	0.0000	30.2165	113.3666	219.2540	(98a)
Space heating requirement - total per year (kWh/year)												809.1624	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	200.3752	121.2091	80.2064	34.0849	10.4497	0.0000	0.0000	0.0000	0.0000	30.2165	113.3666	219.2540	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												809.1624	
Space heating per m2											(98c) / (4) =	11.3138	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	200.3752	121.2091	80.2064	34.0849	10.4497	0.0000	0.0000	0.0000	0.0000	30.2165	113.3666	219.2540	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	300.5629	181.8137	120.3096	51.1273	15.6745	0.0000	0.0000	0.0000	0.0000	45.3248	170.0498	328.8810	
Space heating requirement													
	300.5629	181.8137	120.3096	51.1273	15.6745	0.0000	0.0000	0.0000	0.0000	45.3248	170.0498	328.8810	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.8619	-24.6522	-41.9801	-54.0165	-62.8534	-60.2005	-59.0498	-53.1061	-43.0156	-30.6311	-17.3392	-12.2904	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.6369	-11.9261	-30.0153	-54.8475	-81.1374	-84.9515	-82.6912	-64.6364	-40.4468	-18.8657	-6.6109	-3.4586	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1213.7435	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3896.0468	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												12.1374	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.6671	(330a)
Total electricity for the above, kWh/year												19.6671	(331)
Electricity for lighting (calculated in Appendix L)												174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4345.9507	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1362.6108	0.1576	51.0184	(367)
Electrical energy for heat distribution (space & water)	12.1374	0.0000	7.4012	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			204.7655	(373)
Space and water heating			204.7655	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	0.1320	-62.5726	
PV Unit electricity exported	-484.2242	0.1214	-58.7607	
Total			-121.3332	(380)
Total CO2, kg/year			111.3769	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.5600	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1362.6108	1.5835	512.5174	(467)
Electrical energy for heat distribution (space & water)	12.1374	0.0000	78.4723	(472)
Overall CO2 factor for heat network			0.4249	(486)
Total CO2 associated with community systems			2171.0678	(473)
Space and water heating			2171.0678	(476)
Pumps, fans and electric keep-hot	19.6671	1.5128	29.7525	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	1.4877	-705.1878	
PV Unit electricity exported	-484.2242	0.4452	-215.5829	
Total			-920.7707	(480)
Total Primary energy kWh/year			1548.0319	(483)
Dwelling Primary energy Rate (DPER)			21.6400	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b) x	2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c) x	2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3264	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3020	0.3264	0.3509	0.3672	0.3836	(22b)
Effective ac	0.5866	0.5833	0.5800	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			11.9270	1.1450	13.6603			(27)
Heatloss floor			35.7600	0.1300	4.6488			(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.1800	6.3023			(29a)
500mm mineral wool	35.7600		35.7600	0.1100	3.9336			(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5850			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.9097 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.0600	0.0500	0.3530
E3 Sill	3.7400	0.0500	0.1870
E4 Jamb	23.3600	0.0500	1.1680
E5 Ground floor (normal)	11.1200	0.1600	1.7792
E6 Intermediate floor within a dwelling	4.0300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.3800	0.0600	0.3828
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	12.9900	0.0800	1.0392
P2 Party wall - Intermediate floor within a dwelling	15.4400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	15.4400	0.1200	1.8528
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.3500	0.0200	0.0470

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.3690 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 38.9540 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.9203	33.7259	33.5352	32.6398	32.4723	31.6925	31.6925	31.5481	31.9929	32.4723	32.8112	33.1655	(38)
Heat transfer coeff	72.8744	72.6799	72.4893	71.5939	71.4264	70.6465	70.6465	70.5021	70.9469	71.4264	71.7653	72.1196	(39)
Average = Sum(39)m / 12 =												71.5931	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0189	1.0162	1.0136	1.0010	0.9987	0.9878	0.9878	0.9858	0.9920	0.9987	1.0034	1.0084	(40)
HLP (average)												1.0010	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

Hot water usage for mixer showers

62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day) 117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	248.5063	219.7523	233.2621	204.4524	197.7953	177.7872	175.0641	182.2099	184.4398	206.2131	219.9654	245.6941	(62)
WWHRS	-28.5673	-25.2652	-26.4562	-21.9068	-20.4164	-17.4704	-16.3757	-17.4139	-18.0756	-21.3091	-24.1406	-28.0383	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
									Total per year (kWh/year) = Sum(64)m =			2229.7066	(64)
12Total per year (kWh/year)												2230	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	104.4115	92.7427	99.3428	89.0609	87.5501	80.1947	79.9919	82.3679	82.4067	90.3490	94.2189	103.4764	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.8362	116.0686	104.8362	108.3307	104.8362	108.3307	104.8362	104.8362	108.3307	104.8362	108.3307	104.8362	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	140.3380	138.0100	133.5252	123.6956	117.6748	111.3815	107.5160	110.7095	114.4537	121.4368	130.8596	139.0812	(72)
Total internal gains													

	506.2293	517.2176	496.2491	478.7347	455.1075	436.0455	419.8249	420.9345	433.4245	451.0924	478.1216	496.1119	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	11.9270	46.7521	0.6300	0.7000	0.7700	170.4134	(78)

Solar gains	170.4134	279.0933	355.5154	401.8095	418.7104	402.9518	393.7084	382.3454	371.3778	301.0283	201.9980	147.2529	(83)
Total gains	676.6428	796.3109	851.7645	880.5443	873.8179	838.9973	813.5333	803.2799	804.8022	752.1207	680.1197	643.3648	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.9557	48.0840	48.2104	48.8134	48.9279	49.4680	49.4680	49.5693	49.2585	48.9279	48.6968	48.4576	
alpha	4.1970	4.2056	4.2140	4.2542	4.2619	4.2979	4.2979	4.3046	4.2839	4.2619	4.2465	4.2305	
util living area	0.9603	0.9268	0.8826	0.8030	0.6860	0.5208	0.3783	0.3988	0.5777	0.8049	0.9277	0.9666	(86)
MIT	19.8540	20.1264	20.3944	20.6769	20.8684	20.9691	20.9937	20.9920	20.9500	20.7209	20.2566	19.8053	(87)
Th 2	20.0676	20.0698	20.0721	20.0825	20.0844	20.0935	20.0935	20.0952	20.0900	20.0844	20.0805	20.0764	(88)
util rest of house	0.9524	0.9134	0.8616	0.7693	0.6354	0.4534	0.3021	0.3226	0.5113	0.7654	0.9122	0.9598	(89)
MIT 2	18.7594	19.0965	19.4232	19.7616	19.9707	20.0734	20.0909	20.0916	20.0549	19.8192	19.2707	18.7052	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.1313	19.4464	19.7532	20.0726	20.2757	20.3777	20.3976	20.3975	20.3590	20.1256	19.6057	19.0790	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1313	19.4464	19.7532	20.0726	20.2757	20.3777	20.3976	20.3975	20.3590	20.1256	19.6057	19.0790	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9426	0.9028	0.8535	0.7689	0.6465	0.4750	0.3279	0.3483	0.5315	0.7673	0.9027	0.9506	(94)
Useful gains	637.7936	718.9467	726.9798	677.0500	564.8898	398.4864	266.7552	279.8104	427.7714	577.1027	613.9363	611.5893	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1080.8207	1057.2301	960.7136	799.8918	612.5325	408.1730	268.2878	281.8332	444.0571	680.3772	897.4714	1073.0667	(97)
Space heating kWh	329.6122	227.3264	173.8979	88.4461	35.4461	0.0000	0.0000	0.0000	0.0000	76.8362	204.1453	343.3392	(98a)
Space heating requirement - total per year (kWh/year)												1479.0495	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	329.6122	227.3264	173.8979	88.4461	35.4461	0.0000	0.0000	0.0000	0.0000	76.8362	204.1453	343.3392	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1479.0495	
Space heating per m2											(98c) / (4) =	20.6802	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	329.6122	227.3264	173.8979	88.4461	35.4461	0.0000	0.0000	0.0000	0.0000	76.8362	204.1453	343.3392	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	357.1096	246.2908	188.4051	95.8246	38.4032	0.0000	0.0000	0.0000	0.0000	83.2462	221.1758	371.9818	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9649	84.4106	83.6737	82.5300	81.1702	79.8000	79.8000	79.8000	79.8000	82.2471	84.1532	85.0772	(217)
Fuel for water heating, kWh/month	258.8586	230.4061	247.1576	221.1869	218.5273	200.8982	198.8576	206.5112	208.4765	224.8154	232.7002	255.8332	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.7829	17.4750	15.7343	11.5277	8.9043	7.2749	8.1228	10.5583	13.7142	17.9938	20.3239	22.3883	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.5568	-47.3592	-68.1531	-76.7310	-82.8400	-77.3720	-76.4273	-72.1080	-64.4904	-54.2111	-36.9141	-29.0069	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-18.8029	-39.5749	-78.6914	-118.2335	-156.3709	-157.1182	-155.2578	-131.4301	-96.3075	-56.5975	-25.1064	-14.8664	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1602.4371	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2704.2288	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	175.8004	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1767.5275	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2800.9389	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1602.4371	0.2100	336.5118	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2704.2288	0.2100	567.8881	(264)
Space and water heating			904.3999	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	175.8004	0.1443	25.3734	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	0.1346	-96.7689	
PV Unit electricity exported	-1048.3576	0.1259	-131.9744	
Total			-228.7433	(269)
Total CO2, kg/year			712.9592	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.9700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1602.4371	1.1300	1810.7539	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2704.2288	1.1300	3055.7786	(278)
Space and water heating			4866.5325	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	175.8004	1.5338	269.6485	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	1.4973	-1076.8103	
PV Unit electricity exported	-1048.3576	0.4621	-484.4365	
Total			-1561.2467	(283)
Total Primary energy kWh/year			3705.0351	(286)
Target Primary Energy Rate (TPER)			51.8000	(287)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.56	**TER**	9.97
Environmental	99 A	**% DER < TER**			84.35
CO_2 Emissions (t/year)	0.09	**DFEE**	19.48	**TFEE**	27.24
Compliance Check	See BREL	**% DFEE < TFEE**			28.49
% DPER < TPER	58.21	**DPER**	21.64	**TPER**	51.80

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												175.9097	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6151	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	30.3121	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
										Total per year (kWh/year) = Sum(64)m =		2597.3645	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains	570.7610	568.7779	552.3532	521.4980	490.9997	463.3358	446.9330	449.7815	465.4657	493.4744	527.3747	556.9668	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	9.8900	46.7521	0.6800	0.7000	0.7700	152.5237	(78)
South	2.0370	46.7521	0.6800	0.7000	0.7700	31.4146	(78)

Solar gains	183.9383	301.2436	383.7309	433.6992	451.9414	434.9321	424.9551	412.6903	400.8522	324.9194	218.0296	158.9396	(83)
Total gains	754.6994	870.0215	936.0841	955.1971	942.9411	898.2679	871.8881	862.4718	866.3179	818.3939	745.4043	715.9064	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area	0.9219	0.8672	0.7937	0.6948	0.5663	0.4185	0.2983	0.3151	0.4655	0.6964	0.8699	0.9356	(86)
MIT	20.3783	20.5781	20.7546	20.8877	20.9643	20.9934	20.9990	20.9987	20.9886	20.9025	20.6295	20.3107	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house	0.9094	0.8487	0.7681	0.6607	0.5240	0.3694	0.2463	0.2627	0.4157	0.6566	0.8485	0.9248	(89)
MIT 2	19.5298	19.7680	19.9731	20.1207	20.1990	20.2248	20.2286	20.2284	20.2212	20.1394	19.8345	19.4478	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.8181	20.0433	20.2386	20.3813	20.4590	20.4859	20.4904	20.4901	20.4819	20.3987	20.1046	19.7410	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8181	20.0433	20.2386	20.3813	20.4590	20.4859	20.4904	20.4901	20.4819	20.3987	20.1046	19.7410	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9019	0.8438	0.7684	0.6676	0.5368	0.3858	0.2640	0.2805	0.4322	0.6656	0.8448	0.9170	(94)
Useful gains	680.6370	734.1637	719.2863	637.7167	506.1492	346.5822	230.1651	241.9032	374.3802	544.7299	629.7008	656.4833	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	919.0459	896.8455	813.6567	679.9686	518.7455	348.5880	230.4037	242.2345	377.9641	580.3182	770.1875	920.4003	(97)
Space heating kWh	177.3762	109.3222	70.2116	30.4214	9.3717	0.0000	0.0000	0.0000	0.0000	26.4777	101.1504	196.3542	(98a)
Space heating requirement - total per year (kWh/year)												720.6854	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	177.3762	109.3222	70.2116	30.4214	9.3717	0.0000	0.0000	0.0000	0.0000	26.4777	101.1504	196.3542	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												720.6854	
Space heating per m2											(98c) / (4) =	10.0767	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	177.3762	109.3222	70.2116	30.4214	9.3717	0.0000	0.0000	0.0000	0.0000	26.4777	101.1504	196.3542	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	266.0644	163.9833	105.3174	45.6321	14.0575	0.0000	0.0000	0.0000	0.0000	39.7165	151.7256	294.5314	
Space heating requirement													
	266.0644	163.9833	105.3174	45.6321	14.0575	0.0000	0.0000	0.0000	0.0000	39.7165	151.7256	294.5314	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.8619	-24.6522	-41.9801	-54.0165	-62.8534	-60.2005	-59.0498	-53.1061	-43.0156	-30.6311	-17.3392	-12.2904	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.6369	-11.9261	-30.0153	-54.8475	-81.1374	-84.9515	-82.6912	-64.6364	-40.4468	-18.8657	-6.6109	-3.4586	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1081.0280	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3896.0468	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												10.8103	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.6671	(330a)
Total electricity for the above, kWh/year												19.6671	(331)
Electricity for lighting (calculated in Appendix L)												174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4213.2352	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1081.0280	4.4400	47.9976	(340a)
Space heating total			47.9976	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3896.0468	4.4400	172.9845	(342a)
Water heating total			172.9845	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	16.4900	3.2431	(349)
Energy for lighting	174.7141	16.4900	28.8104	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	16.4900	-78.1621	
PV Unit electricity exported	-484.2242	5.5900	-27.0681	
Total			-105.2302	(352)
Total energy cost			239.8054	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.7409	(357)
SAP value	87.9900	
SAP rating (Section 12)	88	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1327.2200	0.1576	45.4456	(367)
Electrical energy for heat distribution (space & water)	10.8103	0.0000	7.1922	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			198.9837	(373)
Space and water heating			198.9837	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	0.1320	-62.5726	
PV Unit electricity exported	-484.2242	0.1214	-58.7607	
Total			-121.3332	(380)
Total CO2, kg/year			105.5952	(383)
CO2 emissions per m2			1.4800	(384)
EI value			98.7856	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b)	x 2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c)	x 2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 71.5200						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =		0.7750	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =		0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
									Total per year (kWh/year) = Sum(64)m =			2597.3645	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)													
	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains													
	570.7610	568.7779	552.3532	521.4980	490.9997	463.3358	446.9330	449.7815	465.4657	493.4744	527.3747	556.9668	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	9.8900	54.0600	0.6800	0.7000	0.7700	176.3651	(78)
South	2.0370	54.0600	0.6800	0.7000	0.7700	36.3251	(78)

Solar gains	212.6902	308.7290	386.9992	444.4946	449.9093	466.7063	446.4770	438.6554	427.1787	350.9843	248.1236	185.0280	(83)
Total gains	783.4513	877.5070	939.3524	965.9926	940.9090	930.0421	893.4099	888.4369	892.6444	844.4587	775.4983	741.9948	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9071	0.8570	0.7757	0.6716	0.5401	0.3676	0.2583	0.2730	0.4337	0.6547	0.8439	0.9231	(86)
MIT	20.4475	20.6106	20.7871	20.9064	20.9725	20.9966	20.9995	20.9994	20.9920	20.9291	20.6925	20.3805	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.8926	0.8373	0.7483	0.6362	0.4966	0.3195	0.2074	0.2218	0.3845	0.6128	0.8195	0.9106	(89)
MIT 2	19.6135	19.8066	20.0099	20.1402	20.2066	20.2271	20.2289	20.2288	20.2237	20.1660	19.9072	19.5330	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.8969	20.0798	20.2740	20.4005	20.4668	20.4885	20.4907	20.4906	20.4848	20.4252	20.1740	19.8210	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8969	20.0798	20.2740	20.4005	20.4668	20.4885	20.4907	20.4906	20.4848	20.4252	20.1740	19.8210	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8857	0.8332	0.7500	0.6443	0.5102	0.3357	0.2247	0.2392	0.4010	0.6237	0.8176	0.9031	(94)
Useful gains	693.9047	731.1720	704.4910	622.4010	480.0436	312.2401	200.7146	212.5120	357.9075	526.7076	634.0701	670.0960	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	905.9444	881.2414	786.1396	657.4198	489.5948	313.2085	200.8132	212.6516	360.3654	552.2791	750.6051	907.3719	(97)
Space heating kWh													
	157.7576	100.8467	60.7465	25.2135	7.1061	0.0000	0.0000	0.0000	0.0000	19.0252	83.9052	176.5333	(98a)
Space heating requirement - total per year (kWh/year)												631.1341	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	157.7576	100.8467	60.7465	25.2135	7.1061	0.0000	0.0000	0.0000	0.0000	19.0252	83.9052	176.5333	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												631.1341	
Space heating per m2											(98c) / (4) =	8.8246	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	157.7576	100.8467	60.7465	25.2135	7.1061	0.0000	0.0000	0.0000	0.0000	19.0252	83.9052	176.5333	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	236.6364	151.2700	91.1198	37.8203	10.6591	0.0000	0.0000	0.0000	0.0000	28.5377	125.8578	264.7999	
Space heating requirement													
	236.6364	151.2700	91.1198	37.8203	10.6591	0.0000	0.0000	0.0000	0.0000	28.5377	125.8578	264.7999	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.7439	-26.4473	-44.1602	-56.7208	-64.1553	-63.6776	-61.8747	-56.5668	-46.5864	-34.0293	-20.3275	-14.7878	(333a)

Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.2546	-13.5179	-33.0849	-60.8523	-85.0852	-97.4411	-92.6154	-74.6748	-47.7624	-22.9670	-8.7029	-4.7110	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	946.7011	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3896.0468	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	9.4670	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(330a)
Total electricity for the above, kWh/year	19.6671	(331)
Electricity for lighting (calculated in Appendix L)	174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3982.3822	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	946.7011	6.5500	62.0089	(340a)
Space heating total			62.0089	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3896.0468	6.5500	255.1911	(342a)
Water heating total			255.1911	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	28.4300	5.5914	(349)
Energy for lighting	174.7141	28.4300	49.6712	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-507.0777	28.4300	-144.1622	
PV Unit electricity exported	-547.6693	5.8100	-31.8196	
Total			-175.9818	(352)
Total energy cost			300.4808	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1291.3994	0.1580	39.8879	(367)
Electrical energy for heat distribution (space & water)	9.4670	0.0000	6.9838	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			193.2176	(373)
Space and water heating			193.2176	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-507.0777	0.1323	-67.0962	
PV Unit electricity exported	-547.6693	0.1214	-66.4868	
Total			-133.5830	(380)
Total CO2, kg/year			87.5793	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1291.3994	1.5849	400.1072	(467)
Electrical energy for heat distribution (space & water)	9.4670	0.0000	74.2569	(472)
Overall CO2 factor for heat network			0.4242	(486)
Total CO2 associated with community systems			2054.4421	(473)
Space and water heating			2054.4421	(476)
Pumps, fans and electric keep-hot	19.6671	1.5128	29.7525	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-507.0777	1.4889	-754.9866	
PV Unit electricity exported	-547.6693	0.4453	-243.8963	
Total			-998.8829	(480)
Total Primary energy kWh/year			1353.2941	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - South

Current energy efficiency rating: B 88
Current environmental impact rating: A 99

N Solar water heating — Recommended
U Solar photovoltaic panels — Already installed
V2 Wind turbine — Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.4	-£ 47	-26 kg (29.6%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£47	0.36 kg/m²	B 89	A 99
Total Savings	£47	0.36 kg/m²		

Potential energy efficiency rating: B 89
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£55	£78	-£23
Community scheme	£421	£353	£69
Space heating	£172	£194	-£23
Water heating	£255	£187	£69
Lighting	£50	£50	£0
Generated (PV)	-£176	-£177	£1
Total cost of fuels	£300	£254	£47
Total cost of uses	£301	£254	£47
Delivered energy	56 kWh/m²	42 kWh/m²	14 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	19 kWh/m²	15 kWh/m²	4 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120 (1b) - (3b)	
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff													
	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers													
	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths													
	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses													
	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	
Distribution loss (46)m = 0.15 x (45)m													
	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												623.4568	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												623.4568	
Solar input	-0.0000	-16.2208	-58.0195	-79.9223	-105.1350	-97.1484	-96.5940	-84.1560	-57.6291	-28.6318	-0.0000	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	257.1882	211.3732	183.9246	132.9320	101.3423	89.0407	87.1521	106.7357	135.2126	186.2632	228.3672	254.3760	(64)
											Total per year (kWh/year) = Sum(64)m =	1973.9077	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
299.7288 302.8391 295.0013 278.3158 257.2532 237.4574 224.2325 221.1223 228.9600 245.6456 266.7082 286.5040 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 (71)
Water heating gains (Table 5)
149.6734 147.3454 142.8606 133.0310 127.0102 120.7169 116.8514 120.0449 123.7891 130.7722 140.1950 148.4166 (72)
Total internal gains
570.7610 568.7779 552.3532 521.4980 490.9997 463.3358 446.9330 449.7815 465.4657 493.4744 527.3747 556.9668 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	9.8900	46.7521	0.6800	0.7000	0.7700	152.5237	(78)
South	2.0370	46.7521	0.6800	0.7000	0.7700	31.4146	(78)

Solar gains 183.9383 301.2436 383.7309 433.6992 451.9414 434.9321 424.9551 412.6903 400.8522 324.9194 218.0296 158.9396 (83)
Total gains 754.6994 870.0215 936.0841 955.1971 942.9411 898.2679 871.8881 862.4718 866.3179 818.3939 745.4043 715.9064 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area	0.9219	0.8672	0.7937	0.6948	0.5663	0.4185	0.2983	0.3151	0.4655	0.6964	0.8699	0.9356	(86)
MIT	20.3783	20.5781	20.7546	20.8877	20.9643	20.9934	20.9990	20.9987	20.9886	20.9025	20.6295	20.3107	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house	0.9094	0.8487	0.7681	0.6607	0.5240	0.3694	0.2463	0.2627	0.4157	0.6566	0.8485	0.9248	(89)
MIT 2	19.5298	19.7680	19.9731	20.1207	20.1990	20.2248	20.2286	20.2284	20.2212	20.1394	19.8345	19.4478	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.8181	20.0433	20.2386	20.3813	20.4590	20.4859	20.4904	20.4901	20.4819	20.3987	20.1046	19.7410	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8181	20.0433	20.2386	20.3813	20.4590	20.4859	20.4904	20.4901	20.4819	20.3987	20.1046	19.7410	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9019	0.8438	0.7684	0.6676	0.5368	0.3858	0.2640	0.2805	0.4322	0.6656	0.8448	0.9170	(94)
Useful gains	680.6370	734.1637	719.2863	637.7167	506.1492	346.5822	230.1651	241.9032	374.3802	544.7299	629.7008	656.4833	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	919.0459	896.8455	813.6567	679.9686	518.7455	348.5880	230.4037	242.2345	377.9641	580.3182	770.1875	920.4003	(97)
Space heating kWh	177.3762	109.3222	70.2116	30.4214	9.3717	0.0000	0.0000	0.0000	0.0000	26.4777	101.1504	196.3542	(98a)
Space heating requirement - total per year (kWh/year)												720.6854	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	177.3762	109.3222	70.2116	30.4214	9.3717	0.0000	0.0000	0.0000	0.0000	26.4777	101.1504	196.3542	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												720.6854	
Space heating per m2											(98c) / (4) =	10.0767	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement
177.3762 109.3222 70.2116 30.4214 9.3717 0.0000 0.0000 0.0000 0.0000 26.4777 101.1504 196.3542 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50
307a 266.0644 163.9833 105.3174 45.6321 14.0575 0.0000 0.0000 0.0000 0.0000 39.7165 151.7256 294.5314
Space heating requirement
266.0644 163.9833 105.3174 45.6321 14.0575 0.0000 0.0000 0.0000 0.0000 39.7165 151.7256 294.5314 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)

Water heating
Annual water heating requirement
257.1882 211.3732 183.9246 132.9320 101.3423 89.0407 87.1521 106.7357 135.2126 186.2632 228.3672 254.3760 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50
310a 385.7824 317.0598 275.8868 199.3980 152.0134 133.5610 130.7281 160.1036 202.8189 279.3948 342.5508 381.5640
Water heating fuel
385.7824 317.0598 275.8868 199.3980 152.0134 133.5610 130.7281 160.1036 202.8189 279.3948 342.5508 381.5640 (310)
Cooling System Energy Efficiency Ratio 0.0000 (314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (315)
Pumps and Fa 8.4649 7.6457 8.4649 8.1918 8.4649 8.1918 8.4649 8.4649 8.1918 8.4649 8.1918 8.4649 (331)
Lighting 21.6483 17.3671 15.6371 11.4564 8.8493 7.2299 8.0726 10.4931 13.6295 17.8826 20.1983 22.2500 (332)
Electricity generated by PVs (Appendix M) (negative quantity)
(333a)m -14.9141 -24.7783 -42.2847 -54.5605 -63.6655 -61.0911 -59.9595 -53.8492 -43.4933 -30.8592 -17.4193 -12.3313 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)

(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5846	-11.8000	-29.7107	-54.3035	-80.3253	-84.0609	-81.7814	-63.8933	-39.9691	-18.6376	-6.5308	-3.4177	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1081.0280	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2960.8616	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	10.8103	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.6671	(331)
Electricity for lighting (calculated in Appendix L)	174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3358.0500	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1081.0280	4.4400	47.9976	(340a)
Space heating total			47.9976	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2960.8616	4.4400	131.4623	(342a)
Water heating total			131.4623	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	16.4900	3.2431	(349)
Pump for solar water heating	80.0000	16.4900	13.1920	(349)
Energy for lighting	174.7141	16.4900	28.8104	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-479.2061	16.4900	-79.0211	
PV Unit electricity exported	-479.0149	5.5900	-26.7769	
Total			-105.7980	(352)
Total energy cost			210.9074	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.6516	(357)
SAP value		89.4373	
SAP rating (Section 12)		89	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1077.8372	0.1576	45.4456	(367)
Electrical energy for heat distribution (space & water)	10.8103	0.0000	5.9995	(372)
Overall CO2 factor for heat network			0.0411	(386)
Total CO2 associated with community systems			165.9875	(373)
Space and water heating			165.9875	(376)
Pumps, fans and electric keep-hot	99.6671	0.1387	13.8251	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-479.2061	0.1320	-63.2320	
PV Unit electricity exported	-479.0149	0.1214	-58.1324	
Total			-121.3643	(380)
Total CO2, kg/year			83.6649	(383)
CO2 emissions per m2			1.1700	(384)
EI value			99.0378	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120 (1b) - (3b)	
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)

Average = Sum(39)m / 12 =	59.2241

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2825 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day)	117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	

Distribution loss (46)m = 0.15 x (45)m

30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:

Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												697.5235	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												697.5235	
Solar input	-0.3007	-19.8927	-63.0021	-86.8105	-108.5158	-108.4282	-105.5589	-94.8548	-67.4076	-37.8155	-4.9366	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	256.8875	207.7013	178.9419	126.0438	97.9614	77.7608	78.1872	96.0370	125.4340	177.0795	223.4306	254.3760	(64)
										Total per year (kWh/year) = Sum(64)m =		1899.8410	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)													
	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains													
	570.7610	568.7779	552.3532	521.4980	490.9997	463.3358	446.9330	449.7815	465.4657	493.4744	527.3747	556.9668	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	9.8900	54.0600	0.6800	0.7000	0.7700	176.3651	(78)
South	2.0370	54.0600	0.6800	0.7000	0.7700	36.3251	(78)

Solar gains	212.6902	308.7290	386.9992	444.4946	449.9093	466.7063	446.4770	438.6554	427.1787	350.9843	248.1236	185.0280	(83)
Total gains	783.4513	877.5070	939.3524	965.9926	940.9090	930.0421	893.4099	888.4369	892.6444	844.4587	775.4983	741.9948	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9071	0.8570	0.7757	0.6716	0.5401	0.3676	0.2583	0.2730	0.4337	0.6547	0.8439	0.9231	(86)
MIT	20.4475	20.6106	20.7871	20.9064	20.9725	20.9966	20.9995	20.9994	20.9920	20.9291	20.6925	20.3805	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.8926	0.8373	0.7483	0.6362	0.4966	0.3195	0.2074	0.2218	0.3845	0.6128	0.8195	0.9106	(89)
MIT 2	19.6135	19.8066	20.0099	20.1402	20.2066	20.2271	20.2289	20.2288	20.2237	20.1660	19.9072	19.5330	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.8969	20.0798	20.2740	20.4005	20.4668	20.4885	20.4907	20.4906	20.4848	20.4252	20.1740	19.8210	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8969	20.0798	20.2740	20.4005	20.4668	20.4885	20.4907	20.4906	20.4848	20.4252	20.1740	19.8210	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8857	0.8332	0.7500	0.6443	0.5102	0.3357	0.2247	0.2392	0.4010	0.6237	0.8176	0.9031	(94)
Useful gains	693.9047	731.1720	704.4910	622.4010	480.0436	312.2401	200.7146	212.5120	357.9075	526.7076	634.0701	670.0960	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	905.9444	881.2414	786.1396	657.4198	489.5948	313.2085	200.8132	212.6516	360.3654	552.2791	750.6051	907.3719	(97)
Space heating kWh													
	157.7576	100.8467	60.7465	25.2135	7.1061	0.0000	0.0000	0.0000	0.0000	19.0252	83.9052	176.5333	(98a)
Space heating requirement - total per year (kWh/year)												631.1341	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	157.7576	100.8467	60.7465	25.2135	7.1061	0.0000	0.0000	0.0000	0.0000	19.0252	83.9052	176.5333	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												631.1341	
Space heating per m2											(98c) / (4) =	8.8246	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement													
	157.7576	100.8467	60.7465	25.2135	7.1061	0.0000	0.0000	0.0000	0.0000	19.0252	83.9052	176.5333	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	236.6364	151.2700	91.1198	37.8203	10.6591	0.0000	0.0000	0.0000	0.0000	28.5377	125.8578	264.7999	
Space heating requirement													
	236.6364	151.2700	91.1198	37.8203	10.6591	0.0000	0.0000	0.0000	0.0000	28.5377	125.8578	264.7999	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement													
	256.8875	207.7013	178.9419	126.0438	97.9614	77.7608	78.1872	96.0370	125.4340	177.0795	223.4306	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.3312	311.5520	268.4128	189.0656	146.9421	116.6412	117.2807	144.0554	188.1511	265.6193	335.1459	381.5640	
Water heating fuel													
	385.3312	311.5520	268.4128	189.0656	146.9421	116.6412	117.2807	144.0554	188.1511	265.6193	335.1459	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	8.4649	7.6457	8.4649	8.1918	8.4649	8.1918	8.4649	8.4649	8.1918	8.4649	8.1918	8.4649	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.8133	-26.5889	-44.4924	-57.3150	-64.9996	-64.6716	-62.8712	-57.4038	-47.1375	-34.3017	-20.4312	-14.8426	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.1852	-13.3763	-32.7527	-60.2581	-84.2408	-96.4471	-91.6189	-73.8378	-47.2113	-22.6946	-8.5992	-4.6561	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	946.7011	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2849.7616	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	9.4670	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.6671	(331)
Electricity for lighting (calculated in Appendix L)	174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3016.0969	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	946.7011	6.5500	62.0089	(340a)
Space heating total			62.0089	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2849.7616	6.5500	186.6594	(342a)
Water heating total			186.6594	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	28.4300	5.5914	(349)
Pump for solar water heating	80.0000	28.4300	22.7440	(349)
Energy for lighting	174.7141	28.4300	49.6712	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-512.8689	28.4300	-145.8086	
PV Unit electricity exported	-541.8781	5.8100	-31.4831	
Total			-177.2917	(352)
Total energy cost			253.3832	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1012.3900	0.1580	39.8879	(367)
Electrical energy for heat distribution (space & water)	9.4670	0.0000	5.6477	(372)
Overall CO2 factor for heat network			0.0412	(386)
Total CO2 associated with community systems			156.2521	(373)
Space and water heating			156.2521	(376)
Pumps, fans and electric keep-hot	99.6671	0.1387	13.8251	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-512.8689	0.1323	-67.8299	
PV Unit electricity exported	-541.8781	0.1214	-65.7869	
Total			-133.6168	(380)
Total CO2, kg/year			61.6770	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1012.3900	1.5849	400.1072	(467)
Electrical energy for heat distribution (space & water)	9.4670	0.0000	58.8595	(472)
Overall CO2 factor for heat network			0.4289	(486)
Total CO2 associated with community systems			1628.4473	(473)
Space and water heating			1628.4473	(476)
Pumps, fans and electric keep-hot	99.6671	1.5128	150.7765	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-512.8689	1.4887	-763.4867	
PV Unit electricity exported	-541.8781	0.4454	-241.3296	
Total			-1004.8163	(480)
Total Primary energy kWh/year			1042.3899	(483)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.64	**TER**	10.27
Environmental	99 A	**% DER < TER**			84.03
CO_2 Emissions (t/year)	0.09	**DFEE**	21.16	**TFEE**	28.95
Compliance Check	See BREL	**% DFEE < TFEE**			26.89
% DPER < TPER	58.01	**DPER**	22.43	**TPER**	53.42

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												175.9097	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6151	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	30.3121	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
										Total per year (kWh/year) = Sum(64)m =		2597.3645	(64)
12Total per year (kWh/year)												2597	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.6996	119.2388	107.6996	111.2896	107.6996	111.2896	107.6996	107.6996	111.2896	107.6996	111.2896	107.6996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains	515.4281	526.7231	505.4479	488.0289	464.3062	448.3397	432.0236	433.1332	445.7187	460.2911	487.4158	505.3106	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.8900	36.7938	0.6800	0.7000	0.7700	120.0360	(77)
Southeast	2.0370	36.7938	0.6800	0.7000	0.7700	24.7233	(77)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	144.7593	246.5786	337.3796	418.0297	468.2281	464.8421	448.1574	410.7072	365.3108	272.5219	173.3883	123.8838	(83)
Total gains	660.1873	773.3018	842.8275	906.0586	932.5343	913.1818	880.1810	843.8404	811.0294	732.8130	660.8041	629.1944	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9502	0.9055	0.8392	0.7217	0.5718	0.4119	0.2955	0.3220	0.4952	0.7521	0.9084	0.9590	(86)
MIT	20.2332	20.4631	20.6789	20.8671	20.9628	20.9938	20.9990	20.9985	20.9851	20.8627	20.5275	20.1699	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9414	0.8906	0.8162	0.6880	0.5293	0.3635	0.2440	0.2684	0.4428	0.7135	0.8913	0.9515	(89)
MIT 2	19.3535	19.6330	19.8886	20.0997	20.1977	20.2251	20.2286	20.2284	20.2186	20.1001	19.7162	19.2753	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.6524	19.9150	20.1571	20.3605	20.4576	20.4863	20.4904	20.4900	20.4791	20.3592	19.9918	19.5792	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6524	19.9150	20.1571	20.3605	20.4576	20.4863	20.4904	20.4900	20.4791	20.3592	19.9918	19.5792	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9336	0.8839	0.8139	0.6940	0.5421	0.3797	0.2615	0.2866	0.4600	0.7203	0.8854	0.9439	(94)
Useful gains	616.3510	683.4949	685.9858	628.7963	505.5225	346.7403	230.1768	241.8634	373.0889	527.8641	585.1008	593.9026	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	909.2308	889.2519	808.8297	678.7366	518.6625	348.6087	230.4053	242.2292	377.7950	577.9799	763.5067	910.8215	(97)
Space heating kWh													
	217.9026	138.2687	91.3959	35.9570	9.7762	0.0000	0.0000	0.0000	0.0000	37.2862	128.4522	235.7877	(98a)
Space heating requirement - total per year (kWh/year)												894.8265	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	217.9026	138.2687	91.3959	35.9570	9.7762	0.0000	0.0000	0.0000	0.0000	37.2862	128.4522	235.7877	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												894.8265	
Space heating per m2											(98c) / (4) =	12.5116	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	217.9026	138.2687	91.3959	35.9570	9.7762	0.0000	0.0000	0.0000	0.0000	37.2862	128.4522	235.7877	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	326.8538	207.4030	137.0938	53.9355	14.6643	0.0000	0.0000	0.0000	0.0000	55.9293	192.6783	353.6815	
Space heating requirement													
	326.8538	207.4030	137.0938	53.9355	14.6643	0.0000	0.0000	0.0000	0.0000	55.9293	192.6783	353.6815	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.8619	-24.6522	-41.9801	-54.0165	-62.8534	-60.2005	-59.0498	-53.1061	-43.0156	-30.6311	-17.3392	-12.2904	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.6369	-11.9261	-30.0153	-54.8475	-81.1374	-84.9515	-82.6912	-64.6364	-40.4468	-18.8657	-6.6109	-3.4586	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1342.2397	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3896.0468	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												13.4224	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.6671	(330a)
Total electricity for the above, kWh/year												19.6671	(331)
Electricity for lighting (calculated in Appendix L)												174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4474.4469	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1396.8764	0.1575	56.3830	(367)
Electrical energy for heat distribution (space & water)	13.4224	0.0000	7.6023	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			210.3313	(373)
Space and water heating			210.3313	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	0.1320	-62.5726	
PV Unit electricity exported	-484.2242	0.1214	-58.7607	
Total			-121.3332	(380)
Total CO2, kg/year			116.9428	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6400	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1396.8764	1.5831	566.6450	(467)
Electrical energy for heat distribution (space & water)	13.4224	0.0000	80.5021	(472)
Overall CO2 factor for heat network			0.4252	(486)
Total CO2 associated with community systems			2227.2252	(473)
Space and water heating			2227.2252	(476)
Pumps, fans and electric keep-hot	19.6671	1.5128	29.7525	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	1.4877	-705.1878	
PV Unit electricity exported	-484.2242	0.4452	-215.5829	
Total			-920.7707	(480)
Total Primary energy kWh/year			1604.1893	(483)
Dwelling Primary energy Rate (DPER)			22.4300	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b) x	2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c) x	2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3264	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3020	0.3264	0.3509	0.3672	0.3836	(22b)
Effective ac	0.5866	0.5833	0.5800	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			11.9270	1.1450	13.6603			(27)
Heatloss floor			35.7600	0.1300	4.6488			(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.1800	6.3023			(29a)
500mm mineral wool	35.7600		35.7600	0.1100	3.9336			(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5850			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.9097 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.0600	0.0500	0.3530
E3 Sill	3.7400	0.0500	0.1870
E4 Jamb	23.3600	0.0500	1.1680
E5 Ground floor (normal)	11.1200	0.1600	1.7792
E6 Intermediate floor within a dwelling	4.0300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.3800	0.0600	0.3828
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	12.9900	0.0800	1.0392
P2 Party wall - Intermediate floor within a dwelling	15.4400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	15.4400	0.1200	1.8528
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.3500	0.0200	0.0470

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.3690 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 38.9540 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.9203	33.7259	33.5352	32.6398	32.4723	31.6925	31.6925	31.5481	31.9929	32.4723	32.8112	33.1655	(38)
Heat transfer coeff	72.8744	72.6799	72.4893	71.5939	71.4264	70.6465	70.6465	70.5021	70.9469	71.4264	71.7653	72.1196	(39)
Average = Sum(39)m / 12 =												71.5931	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0189	1.0162	1.0136	1.0010	0.9987	0.9878	0.9878	0.9858	0.9920	0.9987	1.0034	1.0084	(40)
HLP (average)												1.0010	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

Hot water usage for mixer showers

62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day) 117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	248.5063	219.7523	233.2621	204.4524	197.7953	177.7872	175.0641	182.2099	184.4398	206.2131	219.9654	245.6941	(62)
WWHRS	-28.5673	-25.2652	-26.4562	-21.9068	-20.4164	-17.4704	-16.3757	-17.4139	-18.0756	-21.3091	-24.1406	-28.0383	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
									Total per year (kWh/year) = Sum(64)m =			2229.7066	(64)
12Total per year (kWh/year)												2230	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	104.4115	92.7427	99.3428	89.0609	87.5501	80.1947	79.9919	82.3679	82.4067	90.3490	94.2189	103.4764	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.8362	116.0686	104.8362	108.3307	104.8362	108.3307	104.8362	104.8362	108.3307	104.8362	108.3307	104.8362	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	140.3380	138.0100	133.5252	123.6956	117.6748	111.3815	107.5160	110.7095	114.4537	121.4368	130.8596	139.0812	(72)
Total internal gains													

	506.2293	517.2176	496.2491	478.7347	455.1075	436.0455	419.8249	420.9345	433.4245	451.0924	478.1216	496.1119	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	11.9270	36.7938	0.6300	0.7000	0.7700	134.1152	(77)

Solar gains	134.1152	228.4478	312.5723	387.2922	433.7996	430.6626	415.2047	380.5081	338.4497	252.4835	160.6391	114.7747	(83)
Total gains	640.3445	745.6655	808.8214	866.0270	888.9071	866.7081	835.0295	801.4426	771.8742	703.5759	638.7607	610.8866	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.9557	48.0840	48.2104	48.8134	48.9279	49.4680	49.4680	49.5693	49.2585	48.9279	48.6968	48.4576	
alpha	4.1970	4.2056	4.2140	4.2542	4.2619	4.2979	4.2979	4.3046	4.2839	4.2619	4.2465	4.2305	
util living area													
	0.9668	0.9397	0.8974	0.8098	0.6777	0.5059	0.3689	0.3997	0.5980	0.8313	0.9400	0.9719	(86)
MIT	19.7920	20.0509	20.3420	20.6652	20.8744	20.9723	20.9943	20.9919	20.9431	20.6792	20.1947	19.7483	(87)
Th 2	20.0676	20.0698	20.0721	20.0825	20.0844	20.0935	20.0935	20.0952	20.0900	20.0844	20.0805	20.0764	(88)
util rest of house													
	0.9600	0.9281	0.8782	0.7766	0.6270	0.4398	0.2945	0.3233	0.5305	0.7943	0.9265	0.9660	(89)
MIT 2	18.6824	19.0050	19.3620	19.7490	19.9763	20.0755	20.0911	20.0916	20.0496	19.7755	19.1964	18.6341	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.0594	19.3603	19.6950	20.0603	20.2814	20.3802	20.3980	20.3975	20.3532	20.0825	19.5356	19.0127	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0594	19.3603	19.6950	20.0603	20.2814	20.3802	20.3980	20.3975	20.3532	20.0825	19.5356	19.0127	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9508	0.9176	0.8693	0.7757	0.6384	0.4612	0.3197	0.3491	0.5507	0.7942	0.9169	0.9575	(94)
Useful gains	608.8262	684.2199	703.1432	671.8005	567.4826	399.6867	266.9262	279.7898	425.0554	558.8012	585.7006	584.9022	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1075.5800	1050.9750	956.4956	799.0105	612.9414	408.3522	268.3138	281.8301	443.6448	677.3030	892.4416	1068.2826	(97)
Space heating kWh	347.2648	246.4594	188.4942	91.5912	33.8214	0.0000	0.0000	0.0000	0.0000	88.1653	220.8536	359.6350	(98a)
Space heating requirement - total per year (kWh/year)												1576.2849	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	347.2648	246.4594	188.4942	91.5912	33.8214	0.0000	0.0000	0.0000	0.0000	88.1653	220.8536	359.6350	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1576.2849	
Space heating per m2											(98c) / (4) =	22.0398	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	347.2648	246.4594	188.4942	91.5912	33.8214	0.0000	0.0000	0.0000	0.0000	88.1653	220.8536	359.6350	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	376.2349	267.0199	204.2191	99.2321	36.6429	0.0000	0.0000	0.0000	0.0000	95.5204	239.2780	389.6371	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.0793	84.5920	83.8524	82.5969	81.1165	79.8000	79.8000	79.8000	79.8000	82.4996	84.3302	85.1780	(217)
Fuel for water heating, kWh/month													
	258.5107	229.9119	246.6308	221.0078	218.6718	200.8982	198.8576	206.5112	208.4765	224.1271	232.2119	255.5304	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.7829	17.4750	15.7343	11.5277	8.9043	7.2749	8.1228	10.5583	13.7142	17.9938	20.3239	22.3883	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.5568	-47.3592	-68.1531	-76.7310	-82.8400	-77.3720	-76.4273	-72.1080	-64.4904	-54.2111	-36.9141	-29.0069	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-18.8029	-39.5749	-78.6914	-118.2335	-156.3709	-157.1182	-155.2578	-131.4301	-96.3075	-56.5975	-25.1064	-14.8664	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1707.7843	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2701.3458	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	175.8004	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1767.5275	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2903.4031	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1707.7843	0.2100	358.6347	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2701.3458	0.2100	567.2826	(264)
Space and water heating			925.9173	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	175.8004	0.1443	25.3734	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	0.1346	-96.7689	
PV Unit electricity exported	-1048.3576	0.1259	-131.9744	
Total			-228.7433	(269)
Total CO2, kg/year			734.4767	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.2700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1707.7843	1.1300	1929.7963	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2701.3458	1.1300	3052.5208	(278)
Space and water heating			4982.3171	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	175.8004	1.5338	269.6485	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	1.4973	-1076.8103	
PV Unit electricity exported	-1048.3576	0.4621	-484.4365	
Total			-1561.2467	(283)
Total Primary energy kWh/year			3820.8197	(286)
Target Primary Energy Rate (TPER)			53.4200	(287)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.64	**TER**	10.27
Environmental	99 A	**% DER < TER**			84.03
CO_2 Emissions (t/year)	0.09	**DFEE**	21.16	**TFEE**	28.95
Compliance Check	See BREL	**% DFEE < TFEE**			26.89
% DPER < TPER	58.01	**DPER**	22.43	**TPER**	53.42

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		3 * 10 =	30.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1712	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.3212	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2489	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3174	0.3112	0.3049	0.2738	0.2676	0.2365	0.2365	0.2303	0.2489	0.2676	0.2801	0.2925	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

Effective ac	0.5504	0.5484	0.5465	0.5375	0.5358	0.5280	0.5280	0.5265	0.5310	0.5358	0.5392	0.5428	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)

Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss										(33) + (36) + (36a) =		30.3121	(37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.8245	31.7114	31.6006	31.0799	30.9825	30.5289	30.5289	30.4450	30.7036	30.9825	31.1795	31.3856	(38)
Heat transfer coeff	62.1367	62.0236	61.9127	61.3920	61.2946	60.8411	60.8411	60.7571	61.0158	61.2946	61.4917	61.6977	(39)
Average = Sum(39)m / 12 =												61.3916	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8688	0.8672	0.8657	0.8584	0.8570	0.8507	0.8507	0.8495	0.8531	0.8570	0.8598	0.8627	(40)
HLP (average)												0.8584	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses													
	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												59.5787	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	65.0001	63.2172	61.2706	58.8477	56.6862	54.4399	53.9730	55.9157	57.9081	60.2149	62.6593	64.9088	(44)
Energy conte	102.9443	90.0205	94.1707	80.5595	76.3105	66.9402	65.2757	69.2353	71.4064	81.7111	89.2697	101.6316	(45)
Energy content (annual)										Total = Sum(45)m =		989.4754	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(64)
										Total per year (kWh/year) = Sum(64)m =		841.0541	(64)
12Total per year (kWh/year)												841	(64)
Electric shower(s)													
	50.0432	44.5889	48.6894	46.4637	47.3355	45.1535	46.6586	47.3355	46.4637	48.6894	47.7738	50.0432	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		569.2384	(64a)
Heat gains from water heating, kWh/month													
	34.3865	30.2766	32.1836	28.7348	28.0499	25.5132	25.5357	26.5464	26.7898	29.5359	30.9133	34.1075	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	107.6996	119.2388	107.6996	111.2896	107.6996	111.2896	107.6996	107.6996	111.2896	107.6996	111.2896	107.6996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)													
	46.2184	45.0544	43.2575	39.9095	37.7014	35.4350	34.3222	35.6806	37.2080	39.6988	42.9351	45.8434	(72)
Total internal gains													
	411.9730	424.4322	405.8448	394.9074	374.9975	363.0578	349.4944	348.7689	359.1376	369.2178	390.1559	402.7375	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.8900	36.7938	0.6800	0.7000	0.7700	120.0360	(77)
Southeast	2.0370	36.7938	0.6800	0.7000	0.7700	24.7233	(77)

Solar gains	144.7593	246.5786	337.3796	418.0297	468.2281	464.8421	448.1574	410.7072	365.3108	272.5219	173.3883	123.8838	(83)
Total gains	556.7323	671.0108	743.2244	812.9371	843.2256	827.8999	797.6518	759.4761	724.4484	641.7397	563.5442	526.6213	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.2428	56.3453	56.4462	56.9250	57.0154	57.4404	57.4404	57.5198	57.2760	57.0154	56.8327	56.6429	
alpha	4.7495	4.7564	4.7631	4.7950	4.8010	4.8294	4.8294	4.8347	4.8184	4.8010	4.7888	4.7762	
util living area													
	0.9752	0.9449	0.8945	0.7881	0.6387	0.4637	0.3345	0.3661	0.5625	0.8248	0.9491	0.9802	(86)

MIT	19.9622	20.2350	20.5109	20.7852	20.9339	20.9885	20.9981	20.9970	20.9716	20.7725	20.3274	19.9068	(87)
Th 2	20.1941	20.1955	20.1968	20.2030	20.2042	20.2096	20.2096	20.2106	20.2075	20.2042	20.2018	20.1994	(88)
util rest of house													
	0.9702	0.9347	0.8762	0.7562	0.5932	0.4089	0.2749	0.3042	0.5040	0.7901	0.9379	0.9762	(89)
MIT 2	19.2555	19.5208	19.7836	20.0364	20.1599	20.2037	20.2090	20.2095	20.1917	20.0324	19.6192	19.2054	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.4956	19.7635	20.0307	20.2908	20.4228	20.4704	20.4771	20.4771	20.4567	20.2838	19.8598	19.4437	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4956	19.7635	20.0307	20.2908	20.4228	20.4704	20.4771	20.4771	20.4567	20.2838	19.8598	19.4437	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9649	0.9284	0.8720	0.7599	0.6060	0.4271	0.2951	0.3252	0.5228	0.7938	0.9323	0.9714	(94)
Useful gains	537.2096	622.9880	648.0862	617.7296	511.0263	353.6303	235.4223	246.9702	378.7389	509.4229	525.3796	511.5696	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	944.2022	921.8855	837.7230	699.3054	534.6629	357.1591	235.8852	247.7128	387.8586	593.5662	784.6219	940.5040	(97)
Space heating kWh													
	302.8025	200.8591	141.0897	58.7346	17.5857	0.0000	0.0000	0.0000	0.0000	62.6026	186.6545	319.1272	(98a)
Space heating requirement - total per year (kWh/year)												1289.4559	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	302.8025	200.8591	141.0897	58.7346	17.5857	0.0000	0.0000	0.0000	0.0000	62.6026	186.6545	319.1272	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1289.4559	
Space heating per m2											(98c) / (4) =	18.0293	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	571.9062	450.2240	461.7539	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9597	0.9812	0.9750	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	548.8707	441.7560	450.2242	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	922.2639	889.1836	846.7117	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	268.8430	332.8861	294.9867	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	67.2108	83.2215	73.7467	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												224.1790	(107)
Energy for space heating												18.0293	(99)
Energy for space cooling												3.1345	(108)
Total												21.1638	(109)
Fabric Energy Efficiency (DFEE)												21.2	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)		
Main dwelling							
Ground floor	35.7600	(1b)	x 2.4500	(2b)	= 87.6120	(1b) - (3b)	
First floor	35.7600	(1c)	x 2.4500	(2c)	= 87.6120	(1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)	
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		= 175.2240	(5)	

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3264	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3020	0.3264	0.3509	0.3672	0.3836	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5866	0.5833	0.5800	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			11.9270	1.1450	13.6603			(27)
Heatloss floor			35.7600	0.1300	4.6488			(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.1800	6.3023			(29a)
500mm mineral wool	35.7600		35.7600	0.1100	3.9336			(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5850			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	175.9097	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.0600	0.0500	0.3530
E3 Sill	3.7400	0.0500	0.1870
E4 Jamb	23.3600	0.0500	1.1680
E5 Ground floor (normal)	11.1200	0.1600	1.7792
E6 Intermediate floor within a dwelling	4.0300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.3800	0.0600	0.3828
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	12.9900	0.0800	1.0392
P2 Party wall - Intermediate floor within a dwelling	15.4400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	15.4400	0.1200	1.8528
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.3500	0.0200	0.0470

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.3690	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	38.9540	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.9203	33.7259	33.5352	32.6398	32.4723	31.6925	31.6925	31.5481	31.9929	32.4723	32.8112	33.1655	(38)
Heat transfer coeff													
	72.8744	72.6799	72.4893	71.5939	71.4264	70.6465	70.6465	70.5021	70.9469	71.4264	71.7653	72.1196	(39)
Average = Sum(39)m / 12 =												71.5931	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0189	1.0162	1.0136	1.0010	0.9987	0.9878	0.9878	0.9858	0.9920	0.9987	1.0034	1.0084	(40)
HLP (average)												1.0010	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2825	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses													
	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												59.5787	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	65.0001	63.2172	61.2706	58.8477	56.6862	54.4399	53.9730	55.9157	57.9081	60.2149	62.6593	64.9088	(44)
Energy conte	102.9443	90.0205	94.1707	80.5595	76.3105	66.9402	65.2757	69.2353	71.4064	81.7111	89.2697	101.6316	(45)
Energy content (annual)										Total = Sum(45)m =		989.4754	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(64)
										Total per year (kWh/year) = Sum(64)m =		841.0541	(64)
12Total per year (kWh/year)												841	(64)
Electric shower(s)													
	50.0432	44.5889	48.6894	46.4637	47.3355	45.1535	46.6586	47.3355	46.4637	48.6894	47.7738	50.0432	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		569.2384	(64a)
Heat gains from water heating, kWh/month													
	34.3865	30.2766	32.1836	28.7348	28.0499	25.5132	25.5357	26.5464	26.7898	29.5359	30.9133	34.1075	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	104.8362	116.0686	104.8362	108.3307	104.8362	108.3307	104.8362	104.8362	108.3307	104.8362	108.3307	104.8362 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982 (71)

Water heating gains (Table 5)

	46.2184	45.0544	43.2575	39.9095	37.7014	35.4350	34.3222	35.6806	37.2080	39.6988	42.9351	45.8434 (72)

Total internal gains

	409.1097	421.2621	402.9814	391.9486	372.1341	360.0989	346.6311	345.9056	356.1788	366.3544	387.1971	399.8741 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	11.9270	36.7938	0.6300	0.7000	0.7700	134.1152	(77)

Solar gains	134.1152	228.4478	312.5723	387.2922	433.7996	430.6626	415.2047	380.5081	338.4497	252.4835	160.6391	114.7747 (83)
Total gains	543.2249	649.7099	715.5537	779.2408	805.9337	790.7615	761.8357	726.4137	694.6285	618.8379	547.8362	514.6488 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.9557	48.0840	48.2104	48.8134	48.9279	49.4680	49.4680	49.5693	49.2585	48.9279	48.6968	48.4576	
alpha	4.1970	4.2056	4.2140	4.2542	4.2619	4.2979	4.2979	4.3046	4.2839	4.2619	4.2465	4.2305	
util living area	0.9810	0.9607	0.9270	0.8499	0.7247	0.5484	0.4029	0.4387	0.6496	0.8759	0.9630	0.9845	(86)
MIT	19.6178	19.8962	20.2155	20.5860	20.8371	20.9624	20.9920	20.9885	20.9221	20.5922	20.0469	19.5720	(87)
Th 2	20.0676	20.0698	20.0721	20.0825	20.0844	20.0935	20.0935	20.0952	20.0900	20.0844	20.0805	20.0764	(88)
util rest of house	0.9768	0.9526	0.9120	0.8205	0.6749	0.4788	0.3222	0.3558	0.5805	0.8447	0.9539	0.9810	(89)
MIT 2	18.8181	19.0920	19.4019	19.7552	19.9729	20.0742	20.0908	20.0911	20.0458	19.7703	19.2511	18.7797	(90)
Living area fraction									fLA = Living area / (4) =			0.3398	(91)
MIT	19.0898	19.3652	19.6783	20.0375	20.2665	20.3760	20.3970	20.3960	20.3436	20.0496	19.5214	19.0489	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0898	19.3652	19.6783	20.0375	20.2665	20.3760	20.3970	20.3960	20.3436	20.0496	19.5214	19.0489	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9712	0.9450	0.9046	0.8189	0.6854	0.5010	0.3495	0.3838	0.6006	0.8434	0.9471	0.9761	(94)
Useful gains	527.5896	614.0047	647.2823	638.0996	552.3667	396.1976	266.2808	278.7817	417.2139	521.9019	518.8689	502.3393	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1077.7977	1051.3311	955.2884	797.3773	611.8763	408.0521	268.2460	281.7249	442.9606	674.9477	891.4285	1070.8949	(97)
Space heating kWh	409.3549	293.8833	229.1566	114.6799	44.2751	0.0000	0.0000	0.0000	0.0000	113.8661	268.2429	423.0053	(98a)
Space heating requirement - total per year (kWh/year)												1896.4640	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	409.3549	293.8833	229.1566	114.6799	44.2751	0.0000	0.0000	0.0000	0.0000	113.8661	268.2429	423.0053	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1896.4640	
Space heating per m2											(98c) / (4) =	26.5166	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	664.0772	522.7842	535.8159	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9062	0.9485	0.9359	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	601.7797	495.8543	501.4808	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	882.0632	850.3967	811.0622	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	201.8041	263.7795	230.3286	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	50.4510	65.9449	57.5822	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												173.9781	(107)
Energy for space heating												26.5166	(99)
Energy for space cooling												2.4326	(108)
Total												28.9491	(109)
Fabric Energy Efficiency (TFEE)												28.9	(109)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.64	**TER**	10.27
Environmental	99 A	**% DER < TER**			84.03
CO_2 Emissions (t/year)	0.09	**DFEE**	21.16	**TFEE**	28.95
Compliance Check	See BREL	**% DFEE < TFEE**			26.89
% DPER < TPER	58.01	**DPER**	22.43	**TPER**	53.42

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												175.9097	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6151	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	30.3121	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
										Total per year (kWh/year) = Sum(64)m =		2597.3645	(64)
12Total per year (kWh/year)												2597	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.6996	119.2388	107.6996	111.2896	107.6996	111.2896	107.6996	107.6996	111.2896	107.6996	111.2896	107.6996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains	515.4281	526.7231	505.4479	488.0289	464.3062	448.3397	432.0236	433.1332	445.7187	460.2911	487.4158	505.3106	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.8900	36.7938	0.6800	0.7000	0.7700	120.0360	(77)
Southeast	2.0370	36.7938	0.6800	0.7000	0.7700	24.7233	(77)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	144.7593	246.5786	337.3796	418.0297	468.2281	464.8421	448.1574	410.7072	365.3108	272.5219	173.3883	123.8838	(83)
Total gains	660.1873	773.3018	842.8275	906.0586	932.5343	913.1818	880.1810	843.8404	811.0294	732.8130	660.8041	629.1944	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9502	0.9055	0.8392	0.7217	0.5718	0.4119	0.2955	0.3220	0.4952	0.7521	0.9084	0.9590	(86)
MIT	20.2332	20.4631	20.6789	20.8671	20.9628	20.9938	20.9990	20.9985	20.9851	20.8627	20.5275	20.1699	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9414	0.8906	0.8162	0.6880	0.5293	0.3635	0.2440	0.2684	0.4428	0.7135	0.8913	0.9515	(89)
MIT 2	19.3535	19.6330	19.8886	20.0997	20.1977	20.2251	20.2286	20.2284	20.2186	20.1001	19.7162	19.2753	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.6524	19.9150	20.1571	20.3605	20.4576	20.4863	20.4904	20.4900	20.4791	20.3592	19.9918	19.5792	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6524	19.9150	20.1571	20.3605	20.4576	20.4863	20.4904	20.4900	20.4791	20.3592	19.9918	19.5792	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9336	0.8839	0.8139	0.6940	0.5421	0.3797	0.2615	0.2866	0.4600	0.7203	0.8854	0.9439	(94)
Useful gains	616.3510	683.4949	685.9858	628.7963	505.5225	346.7403	230.1768	241.8634	373.0889	527.8641	585.1008	593.9026	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	909.2308	889.2519	808.8297	678.7366	518.6625	348.6087	230.4053	242.2292	377.7950	577.9799	763.5067	910.8215	(97)
Space heating kWh													
	217.9026	138.2687	91.3959	35.9570	9.7762	0.0000	0.0000	0.0000	0.0000	37.2862	128.4522	235.7877	(98a)
Space heating requirement - total per year (kWh/year)												894.8265	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	217.9026	138.2687	91.3959	35.9570	9.7762	0.0000	0.0000	0.0000	0.0000	37.2862	128.4522	235.7877	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												894.8265	
Space heating per m2											(98c) / (4) =	12.5116	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	217.9026	138.2687	91.3959	35.9570	9.7762	0.0000	0.0000	0.0000	0.0000	37.2862	128.4522	235.7877	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	326.8538	207.4030	137.0938	53.9355	14.6643	0.0000	0.0000	0.0000	0.0000	55.9293	192.6783	353.6815	
Space heating requirement													
	326.8538	207.4030	137.0938	53.9355	14.6643	0.0000	0.0000	0.0000	0.0000	55.9293	192.6783	353.6815	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.8619	-24.6522	-41.9801	-54.0165	-62.8534	-60.2005	-59.0498	-53.1061	-43.0156	-30.6311	-17.3392	-12.2904	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.6369	-11.9261	-30.0153	-54.8475	-81.1374	-84.9515	-82.6912	-64.6364	-40.4468	-18.8657	-6.6109	-3.4586	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1342.2397	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3896.0468	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												13.4224	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.6671	(330a)
Total electricity for the above, kWh/year												19.6671	(331)
Electricity for lighting (calculated in Appendix L)												174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4474.4469	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1396.8764	0.1575	56.3830	(367)
Electrical energy for heat distribution (space & water)	13.4224	0.0000	7.6023	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			210.3313	(373)
Space and water heating			210.3313	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	0.1320	-62.5726	
PV Unit electricity exported	-484.2242	0.1214	-58.7607	
Total			-121.3332	(380)
Total CO2, kg/year			116.9428	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6400	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1396.8764	1.5831	566.6450	(467)
Electrical energy for heat distribution (space & water)	13.4224	0.0000	80.5021	(472)
Overall CO2 factor for heat network			0.4252	(486)
Total CO2 associated with community systems			2227.2252	(473)
Space and water heating			2227.2252	(476)
Pumps, fans and electric keep-hot	19.6671	1.5128	29.7525	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	1.4877	-705.1878	
PV Unit electricity exported	-484.2242	0.4452	-215.5829	
Total			-920.7707	(480)
Total Primary energy kWh/year			1604.1893	(483)
Dwelling Primary energy Rate (DPER)			22.4300	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b) x	2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c) x	2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3264	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3020	0.3264	0.3509	0.3672	0.3836	(22b)
Effective ac	0.5866	0.5833	0.5800	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			11.9270	1.1450	13.6603			(27)
Heatloss floor			35.7600	0.1300	4.6488			(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.1800	6.3023			(29a)
500mm mineral wool	35.7600		35.7600	0.1100	3.9336			(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5850			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.9097 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.0600	0.0500	0.3530
E3 Sill	3.7400	0.0500	0.1870
E4 Jamb	23.3600	0.0500	1.1680
E5 Ground floor (normal)	11.1200	0.1600	1.7792
E6 Intermediate floor within a dwelling	4.0300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.3800	0.0600	0.3828
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	12.9900	0.0800	1.0392
P2 Party wall - Intermediate floor within a dwelling	15.4400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	15.4400	0.1200	1.8528
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.3500	0.0200	0.0470

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.3690 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 38.9540 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.9203	33.7259	33.5352	32.6398	32.4723	31.6925	31.6925	31.5481	31.9929	32.4723	32.8112	33.1655	(38)
Heat transfer coeff	72.8744	72.6799	72.4893	71.5939	71.4264	70.6465	70.6465	70.5021	70.9469	71.4264	71.7653	72.1196	(39)
Average = Sum(39)m / 12 =												71.5931	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0189	1.0162	1.0136	1.0010	0.9987	0.9878	0.9878	0.9858	0.9920	0.9987	1.0034	1.0084	(40)
HLP (average)												1.0010	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

Hot water usage for mixer showers

62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day) 117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	248.5063	219.7523	233.2621	204.4524	197.7953	177.7872	175.0641	182.2099	184.4398	206.2131	219.9654	245.6941	(62)
WWHRS	-28.5673	-25.2652	-26.4562	-21.9068	-20.4164	-17.4704	-16.3757	-17.4139	-18.0756	-21.3091	-24.1406	-28.0383	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
									Total per year (kWh/year) = Sum(64)m =			2229.7066	(64)
12Total per year (kWh/year)												2230	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	104.4115	92.7427	99.3428	89.0609	87.5501	80.1947	79.9919	82.3679	82.4067	90.3490	94.2189	103.4764	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.8362	116.0686	104.8362	108.3307	104.8362	108.3307	104.8362	104.8362	108.3307	104.8362	108.3307	104.8362	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	140.3380	138.0100	133.5252	123.6956	117.6748	111.3815	107.5160	110.7095	114.4537	121.4368	130.8596	139.0812	(72)
Total internal gains													

	506.2293	517.2176	496.2491	478.7347	455.1075	436.0455	419.8249	420.9345	433.4245	451.0924	478.1216	496.1119	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	11.9270	36.7938	0.6300	0.7000	0.7700	134.1152	(77)

Solar gains	134.1152	228.4478	312.5723	387.2922	433.7996	430.6626	415.2047	380.5081	338.4497	252.4835	160.6391	114.7747	(83)
Total gains	640.3445	745.6655	808.8214	866.0270	888.9071	866.7081	835.0295	801.4426	771.8742	703.5759	638.7607	610.8866	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.9557	48.0840	48.2104	48.8134	48.9279	49.4680	49.4680	49.5693	49.2585	48.9279	48.6968	48.4576	
alpha	4.1970	4.2056	4.2140	4.2542	4.2619	4.2979	4.2979	4.3046	4.2839	4.2619	4.2465	4.2305	
util living area													
	0.9668	0.9397	0.8974	0.8098	0.6777	0.5059	0.3689	0.3997	0.5980	0.8313	0.9400	0.9719	(86)
MIT	19.7920	20.0509	20.3420	20.6652	20.8744	20.9723	20.9943	20.9919	20.9431	20.6792	20.1947	19.7483	(87)
Th 2	20.0676	20.0698	20.0721	20.0825	20.0844	20.0935	20.0935	20.0952	20.0900	20.0844	20.0805	20.0764	(88)
util rest of house													
	0.9600	0.9281	0.8782	0.7766	0.6270	0.4398	0.2945	0.3233	0.5305	0.7943	0.9265	0.9660	(89)
MIT 2	18.6824	19.0050	19.3620	19.7490	19.9763	20.0755	20.0911	20.0916	20.0496	19.7755	19.1964	18.6341	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.0594	19.3603	19.6950	20.0603	20.2814	20.3802	20.3980	20.3975	20.3532	20.0825	19.5356	19.0127	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0594	19.3603	19.6950	20.0603	20.2814	20.3802	20.3980	20.3975	20.3532	20.0825	19.5356	19.0127	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9508	0.9176	0.8693	0.7757	0.6384	0.4612	0.3197	0.3491	0.5507	0.7942	0.9169	0.9575	(94)
Useful gains	608.8262	684.2199	703.1432	671.8005	567.4826	399.6867	266.9262	279.7898	425.0554	558.8012	585.7006	584.9022	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1075.5800	1050.9750	956.4956	799.0105	612.9414	408.3522	268.3138	281.8301	443.6448	677.3030	892.4416	1068.2826	(97)
Space heating kWh	347.2648	246.4594	188.4942	91.5912	33.8214	0.0000	0.0000	0.0000	0.0000	88.1653	220.8536	359.6350	(98a)
Space heating requirement - total per year (kWh/year)												1576.2849	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	347.2648	246.4594	188.4942	91.5912	33.8214	0.0000	0.0000	0.0000	0.0000	88.1653	220.8536	359.6350	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1576.2849	
Space heating per m2											(98c) / (4) =	22.0398	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	347.2648	246.4594	188.4942	91.5912	33.8214	0.0000	0.0000	0.0000	0.0000	88.1653	220.8536	359.6350	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	376.2349	267.0199	204.2191	99.2321	36.6429	0.0000	0.0000	0.0000	0.0000	95.5204	239.2780	389.6371	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.0793	84.5920	83.8524	82.5969	81.1165	79.8000	79.8000	79.8000	79.8000	82.4996	84.3302	85.1780	(217)
Fuel for water heating, kWh/month													
	258.5107	229.9119	246.6308	221.0078	218.6718	200.8982	198.8576	206.5112	208.4765	224.1271	232.2119	255.5304	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.7829	17.4750	15.7343	11.5277	8.9043	7.2749	8.1228	10.5583	13.7142	17.9938	20.3239	22.3883	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.5568	-47.3592	-68.1531	-76.7310	-82.8400	-77.3720	-76.4273	-72.1080	-64.4904	-54.2111	-36.9141	-29.0069	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-18.8029	-39.5749	-78.6914	-118.2335	-156.3709	-157.1182	-155.2578	-131.4301	-96.3075	-56.5975	-25.1064	-14.8664	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1707.7843	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2701.3458	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	175.8004	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1767.5275	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2903.4031	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1707.7843	0.2100	358.6347	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2701.3458	0.2100	567.2826	(264)
Space and water heating			925.9173	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	175.8004	0.1443	25.3734	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	0.1346	-96.7689	
PV Unit electricity exported	-1048.3576	0.1259	-131.9744	
Total			-228.7433	(269)
Total CO2, kg/year			734.4767	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.2700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1707.7843	1.1300	1929.7963	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2701.3458	1.1300	3052.5208	(278)
Space and water heating			4982.3171	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	175.8004	1.5338	269.6485	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	1.4973	-1076.8103	
PV Unit electricity exported	-1048.3576	0.4621	-484.4365	
Total			-1561.2467	(283)
Total Primary energy kWh/year			3820.8197	(286)
Target Primary Energy Rate (TPER)			53.4200	(287)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.64	**TER**	10.27
Environmental	99 A	**% DER < TER**			84.03
CO_2 Emissions (t/year)	0.09	**DFEE**	21.16	**TFEE**	28.95
Compliance Check	See BREL	**% DFEE < TFEE**			26.89
% DPER < TPER	58.01	**DPER**	22.43	**TPER**	53.42

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.2825 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day)		117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:		
Store volume		110.0000 (47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)		0.0152 (51)
Volume factor from Table 2a		1.0294 (52)
Temperature factor from Table 2b		0.6000 (53)
Enter (49) or (54) in (55)		1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
										Total per year (kWh/year) = Sum(64)m =		2597.3645	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains	570.7610	568.7779	552.3532	521.4980	490.9997	463.3358	446.9330	449.7815	465.4657	493.4744	527.3747	556.9668	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.8900	36.7938	0.6800	0.7000	0.7700	120.0360	(77)
Southeast	2.0370	36.7938	0.6800	0.7000	0.7700	24.7233	(77)

Solar gains	144.7593	246.5786	337.3796	418.0297	468.2281	464.8421	448.1574	410.7072	365.3108	272.5219	173.3883	123.8838	(83)
Total gains	715.5203	815.3566	889.7328	939.5277	959.2278	928.1780	895.0904	860.4887	830.7765	765.9963	700.7629	680.8506	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)		21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area	0.9344	0.8894	0.8164	0.7033	0.5578	0.4054	0.2907	0.3159	0.4842	0.7301	0.8908	0.9457	(86)
MIT	20.3207	20.5159	20.7194	20.8815	20.9666	20.9942	20.9991	20.9986	20.9865	20.8798	20.5782	20.2558	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house	0.9234	0.8728	0.7920	0.6693	0.5158	0.3577	0.2400	0.2633	0.4328	0.6908	0.8716	0.9363	(89)
MIT 2	19.4602	19.6954	19.9340	20.1144	20.2010	20.2253	20.2287	20.2284	20.2196	20.1172	19.7754	19.3808	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.7526	19.9742	20.2009	20.3751	20.4611	20.4866	20.4904	20.4901	20.4802	20.3763	20.0482	19.6781	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7526	19.9742	20.2009	20.3751	20.4611	20.4866	20.4904	20.4901	20.4802	20.3763	20.0482	19.6781	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9156	0.8668	0.7910	0.6759	0.5286	0.3737	0.2572	0.2811	0.4497	0.6986	0.8666	0.9284	(94)
Useful gains	655.1547	706.7726	703.7872	635.0425	507.0716	346.8865	230.1964	241.8992	373.5980	535.1336	607.2942	632.1315	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	915.1644	892.7561	811.4226	679.6005	518.8675	348.6278	230.4080	242.2340	377.8617	578.9937	766.8453	916.6779	(97)
Space heating kWh	193.4472	124.9809	80.0807	32.0818	8.7762	0.0000	0.0000	0.0000	0.0000	32.6319	114.8768	211.7025	(98a)
Space heating requirement - total per year (kWh/year)												798.5779	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	193.4472	124.9809	80.0807	32.0818	8.7762	0.0000	0.0000	0.0000	0.0000	32.6319	114.8768	211.7025	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												798.5779	
Space heating per m2											(98c) / (4) =	11.1658	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	193.4472	124.9809	80.0807	32.0818	8.7762	0.0000	0.0000	0.0000	0.0000	32.6319	114.8768	211.7025	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	290.1708	187.4713	120.1211	48.1227	13.1643	0.0000	0.0000	0.0000	0.0000	48.9479	172.3151	317.5538	
Space heating requirement													
	290.1708	187.4713	120.1211	48.1227	13.1643	0.0000	0.0000	0.0000	0.0000	48.9479	172.3151	317.5538	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.8619	-24.6522	-41.9801	-54.0165	-62.8534	-60.2005	-59.0498	-53.1061	-43.0156	-30.6311	-17.3392	-12.2904	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.6369	-11.9261	-30.0153	-54.8475	-81.1374	-84.9515	-82.6912	-64.6364	-40.4468	-18.8657	-6.6109	-3.4586	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1197.8669	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3896.0468	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	11.9787	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(330a)
Total electricity for the above, kWh/year	19.6671	(331)
Electricity for lighting (calculated in Appendix L)	174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4330.0741	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1197.8669	4.4400	53.1853	(340a)
Space heating total			53.1853	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3896.0468	4.4400	172.9845	(342a)
Water heating total			172.9845	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	16.4900	3.2431	(349)
Energy for lighting	174.7141	16.4900	28.8104	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	16.4900	-78.1621	
PV Unit electricity exported	-484.2242	5.5900	-27.0681	
Total			-105.2302	(352)
Total energy cost			244.9930	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.7569	(357)
SAP value	87.7302	
SAP rating (Section 12)	88	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1358.3770	0.1576	50.3277	(367)
Electrical energy for heat distribution (space & water)	11.9787	0.0000	7.3753	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			204.0489	(373)
Space and water heating			204.0489	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	0.1320	-62.5726	
PV Unit electricity exported	-484.2242	0.1214	-58.7607	
Total			-121.3332	(380)
Total CO2, kg/year			110.6604	(383)
CO2 emissions per m2			1.5500	(384)
EI value			98.7274	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b) x	2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c) x	2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 71.5200						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor (20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =		0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
									Total per year (kWh/year) = Sum(64)m =			2597.3645	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)													
	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains													
	570.7610	568.7779	552.3532	521.4980	490.9997	463.3358	446.9330	449.7815	465.4657	493.4744	527.3747	556.9668	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.8900	42.9509	0.6800	0.7000	0.7700	140.1229	(77)
Southeast	2.0370	42.9509	0.6800	0.7000	0.7700	28.8605	(77)

Solar gains	168.9834	255.7923	345.6414	435.9036	473.4466	505.7912	477.8325	443.9806	395.8869	298.4015	199.3503	145.4902	(83)
Total gains	739.7444	824.5702	897.9946	957.4016	964.4463	969.1270	924.7655	893.7621	861.3526	791.8759	726.7249	702.4571	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9224	0.8794	0.7967	0.6762	0.5281	0.3531	0.2496	0.2714	0.4487	0.6880	0.8686	0.9358	(86)
MIT	20.3875	20.5536	20.7589	20.9035	20.9750	20.9972	20.9996	20.9994	20.9907	20.9120	20.6432	20.3220	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9097	0.8616	0.7702	0.6409	0.4853	0.3067	0.2003	0.2205	0.3981	0.6460	0.8463	0.9248	(89)
MIT 2	19.5417	19.7405	19.9792	20.1374	20.2087	20.2274	20.2289	20.2288	20.2229	20.1498	19.8515	19.4623	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.8291	20.0167	20.2441	20.3977	20.4691	20.4889	20.4908	20.4906	20.4838	20.4088	20.1205	19.7544	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8291	20.0167	20.2441	20.3977	20.4691	20.4889	20.4908	20.4906	20.4838	20.4088	20.1205	19.7544	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9022	0.8563	0.7707	0.6488	0.4988	0.3224	0.2171	0.2378	0.4150	0.6561	0.8429	0.9171	(94)
Useful gains	667.4151	706.0404	692.1204	621.1730	481.0632	312.4263	200.7315	212.5164	357.4454	519.5434	612.5867	644.2153	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	901.9286	877.5071	784.3724	657.2523	489.7290	313.2329	200.8155	212.6523	360.3050	551.3048	747.4374	903.4284	(97)
Space heating kWh													
	174.4780	115.2256	68.6356	25.9771	6.4473	0.0000	0.0000	0.0000	0.0000	23.6305	97.0925	192.8545	(98a)
Space heating requirement - total per year (kWh/year)												704.3413	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	174.4780	115.2256	68.6356	25.9771	6.4473	0.0000	0.0000	0.0000	0.0000	23.6305	97.0925	192.8545	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												704.3413	
Space heating per m2											(98c) / (4) =	9.8482	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	174.4780	115.2256	68.6356	25.9771	6.4473	0.0000	0.0000	0.0000	0.0000	23.6305	97.0925	192.8545	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	261.7171	172.8385	102.9533	38.9657	9.6710	0.0000	0.0000	0.0000	0.0000	35.4458	145.6388	289.2818	
Space heating requirement													
	261.7171	172.8385	102.9533	38.9657	9.6710	0.0000	0.0000	0.0000	0.0000	35.4458	145.6388	289.2818	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.7439	-26.4473	-44.1602	-56.7208	-64.1553	-63.6776	-61.8747	-56.5668	-46.5864	-34.0293	-20.3275	-14.7878	(333a)

Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.2546	-13.5179	-33.0849	-60.8523	-85.0852	-97.4411	-92.6154	-74.6748	-47.7624	-22.9670	-8.7029	-4.7110	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1056.5119	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3896.0468	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	10.5651	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(330a)
Total electricity for the above, kWh/year	19.6671	(331)
Electricity for lighting (calculated in Appendix L)	174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4092.1930	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1056.5119	6.5500	69.2015	(340a)
Space heating total			69.2015	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3896.0468	6.5500	255.1911	(342a)
Water heating total			255.1911	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	28.4300	5.5914	(349)
Energy for lighting	174.7141	28.4300	49.6712	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-507.0777	28.4300	-144.1622	
PV Unit electricity exported	-547.6693	5.8100	-31.8196	
Total			-175.9818	(352)
Total energy cost			307.6734	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1320.6823	0.1580	44.5012	(367)
Electrical energy for heat distribution (space & water)	10.5651	0.0000	7.1568	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			198.0039	(373)
Space and water heating			198.0039	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-507.0777	0.1323	-67.0962	
PV Unit electricity exported	-547.6693	0.1214	-66.4868	
Total			-133.5830	(380)
Total CO2, kg/year			92.3656	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1320.6823	1.5847	446.4680	(467)
Electrical energy for heat distribution (space & water)	10.5651	0.0000	75.9955	(472)
Overall CO2 factor for heat network			0.4245	(486)
Total CO2 associated with community systems			2102.5415	(473)
Space and water heating			2102.5415	(476)
Pumps, fans and electric keep-hot	19.6671	1.5128	29.7525	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-507.0777	1.4889	-754.9866	
PV Unit electricity exported	-547.6693	0.4453	-243.8963	
Total			-998.8829	(480)
Total Primary energy kWh/year			1401.3935	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Southeast

Current energy efficiency rating: B 88
Current environmental impact rating: A 99

N Solar water heating — Recommended
U Solar photovoltaic panels — Already installed
V2 Wind turbine — Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.4	-£ 47	-26 kg (28.0%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£47	0.36 kg/m²	B 89	A 99
Total Savings	£47	0.36 kg/m²		

Potential energy efficiency rating: B 89
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£55	£78	-£23
Community scheme	£428	£360	£69
Space heating	£179	£202	-£23
Water heating	£255	£187	£69
Lighting	£50	£50	£0
Generated (PV)	-£176	-£177	£1
Total cost of fuels	£307	£261	£47
Total cost of uses	£308	£262	£47
Delivered energy	57 kWh/m²	44 kWh/m²	14 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	20 kWh/m²	15 kWh/m²	4 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120 (1b) - (3b)	
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff													
	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers													
	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths													
	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses													
	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	
Distribution loss (46)m = 0.15 x (45)m													
	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												623.4568	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												623.4568	
Solar input	-0.0000	-16.2208	-58.0195	-79.9223	-105.1350	-97.1484	-96.5940	-84.1560	-57.6291	-28.6318	-0.0000	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	257.1882	211.3732	183.9246	132.9320	101.3423	89.0407	87.1521	106.7357	135.2126	186.2632	228.3672	254.3760	(64)
											Total per year (kWh/year) = Sum(64)m =	1973.9077	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
299.7288 302.8391 295.0013 278.3158 257.2532 237.4574 224.2325 221.1223 228.9600 245.6456 266.7082 286.5040 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 (71)
Water heating gains (Table 5)
149.6734 147.3454 142.8606 133.0310 127.0102 120.7169 116.8514 120.0449 123.7891 130.7722 140.1950 148.4166 (72)
Total internal gains
570.7610 568.7779 552.3532 521.4980 490.9997 463.3358 446.9330 449.7815 465.4657 493.4744 527.3747 556.9668 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.8900	36.7938	0.6800	0.7000	0.7700	120.0360	(77)
Southeast	2.0370	36.7938	0.6800	0.7000	0.7700	24.7233	(77)

Solar gains	144.7593	246.5786	337.3796	418.0297	468.2281	464.8421	448.1574	410.7072	365.3108	272.5219	173.3883	123.8838 (83)
Total gains	715.5203	815.3566	889.7328	939.5277	959.2278	928.1780	895.0904	860.4887	830.7765	765.9963	700.7629	680.8506 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area	0.9344	0.8894	0.8164	0.7033	0.5578	0.4054	0.2907	0.3159	0.4842	0.7301	0.8908	0.9457	(86)
MIT	20.3207	20.5159	20.7194	20.8815	20.9666	20.9942	20.9991	20.9986	20.9865	20.8798	20.5782	20.2558	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house	0.9234	0.8728	0.7920	0.6693	0.5158	0.3577	0.2400	0.2633	0.4328	0.6908	0.8716	0.9363	(89)
MIT 2	19.4602	19.6954	19.9340	20.1144	20.2010	20.2253	20.2287	20.2284	20.2196	20.1172	19.7754	19.3808	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.7526	19.9742	20.2009	20.3751	20.4611	20.4866	20.4904	20.4901	20.4802	20.3763	20.0482	19.6781	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7526	19.9742	20.2009	20.3751	20.4611	20.4866	20.4904	20.4901	20.4802	20.3763	20.0482	19.6781	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9156	0.8668	0.7910	0.6759	0.5286	0.3737	0.2572	0.2811	0.4497	0.6986	0.8666	0.9284	(94)
Useful gains	655.1547	706.7726	703.7872	635.0425	507.0716	346.8865	230.1964	241.8992	373.5980	535.1336	607.2942	632.1315	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	915.1644	892.7561	811.4226	679.6005	518.8675	348.6278	230.4080	242.2340	377.8617	578.9937	766.8453	916.6779	(97)
Space heating kWh	193.4472	124.9809	80.0807	32.0818	8.7762	0.0000	0.0000	0.0000	0.0000	32.6319	114.8768	211.7025	(98a)
Space heating requirement - total per year (kWh/year)												798.5779	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	193.4472	124.9809	80.0807	32.0818	8.7762	0.0000	0.0000	0.0000	0.0000	32.6319	114.8768	211.7025	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												798.5779	
Space heating per m2											(98c) / (4) =	11.1658	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement

	193.4472	124.9809	80.0807	32.0818	8.7762	0.0000	0.0000	0.0000	0.0000	32.6319	114.8768	211.7025 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	290.1708	187.4713	120.1211	48.1227	13.1643	0.0000	0.0000	0.0000	0.0000	48.9479	172.3151	317.5538
Space heating requirement												
	290.1708	187.4713	120.1211	48.1227	13.1643	0.0000	0.0000	0.0000	0.0000	48.9479	172.3151	317.5538 (307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating
Annual water heating requirement

	257.1882	211.3732	183.9246	132.9320	101.3423	89.0407	87.1521	106.7357	135.2126	186.2632	228.3672	254.3760 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	385.7824	317.0598	275.8868	199.3980	152.0134	133.5610	130.7281	160.1036	202.8189	279.3948	342.5508	381.5640
Water heating fuel												
	385.7824	317.0598	275.8868	199.3980	152.0134	133.5610	130.7281	160.1036	202.8189	279.3948	342.5508	381.5640 (310)

Cooling System Energy Efficiency Ratio 0.0000 (314)

Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	8.4649	7.6457	8.4649	8.1918	8.4649	8.1918	8.4649	8.4649	8.1918	8.4649	8.1918	8.4649 (331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500 (332)

Electricity generated by PVs (Appendix M) (negative quantity)

(333a)m	-14.9141	-24.7783	-42.2847	-54.5605	-63.6655	-61.0911	-59.9595	-53.8492	-43.4933	-30.8592	-17.4193	-12.3313 (333a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5846	-11.8000	-29.7107	-54.3035	-80.3253	-84.0609	-81.7814	-63.8933	-39.9691	-18.6376	-6.5308	-3.4177	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1197.8669	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2960.8616	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	11.9787	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.6671	(331)
Electricity for lighting (calculated in Appendix L)	174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3474.8888	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1197.8669	4.4400	53.1853	(340a)
Space heating total			53.1853	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2960.8616	4.4400	131.4623	(342a)
Water heating total			131.4623	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	16.4900	3.2431	(349)
Pump for solar water heating	80.0000	16.4900	13.1920	(349)
Energy for lighting	174.7141	16.4900	28.8104	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-479.2061	16.4900	-79.0211	
PV Unit electricity exported	-479.0149	5.5900	-26.7769	
Total			-105.7980	(352)
Total energy cost			216.0950	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.6676	(357)
SAP value	89.1774	
SAP rating (Section 12)	89	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1108.9943	0.1576	50.3277	(367)
Electrical energy for heat distribution (space & water)	11.9787	0.0000	6.1826	(372)
Overall CO2 factor for heat network			0.0411	(386)
Total CO2 associated with community systems			171.0527	(373)
Space and water heating			171.0527	(376)
Pumps, fans and electric keep-hot	99.6671	0.1387	13.8251	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-479.2061	0.1320	-63.2320	
PV Unit electricity exported	-479.0149	0.1214	-58.1324	
Total			-121.3643	(380)
Total CO2, kg/year			88.7300	(383)
CO2 emissions per m2			1.2400	(384)
EI value			98.9796	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120 (1b) - (3b)	
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)

Average = Sum(39)m / 12 =	59.2241

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2825 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day)	117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	

Distribution loss (46)m = 0.15 x (45)m

30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:

Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												697.5235	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												697.5235	
Solar input	-0.3007	-19.8927	-63.0021	-86.8105	-108.5158	-108.4282	-105.5589	-94.8548	-67.4076	-37.8155	-4.9366	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	256.8875	207.7013	178.9419	126.0438	97.9614	77.7608	78.1872	96.0370	125.4340	177.0795	223.4306	254.3760	(64)
											Total per year (kWh/year) = Sum(64)m =	1899.8410	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)													
	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains													
	570.7610	568.7779	552.3532	521.4980	490.9997	463.3358	446.9330	449.7815	465.4657	493.4744	527.3747	556.9668	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.8900	42.9509	0.6800	0.7000	0.7700	140.1229	(77)
Southeast	2.0370	42.9509	0.6800	0.7000	0.7700	28.8605	(77)

Solar gains	168.9834	255.7923	345.6414	435.9036	473.4466	505.7912	477.8325	443.9806	395.8869	298.4015	199.3503	145.4902	(83)
Total gains	739.7444	824.5702	897.9946	957.4016	964.4463	969.1270	924.7655	893.7621	861.3526	791.8759	726.7249	702.4571	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9224	0.8794	0.7967	0.6762	0.5281	0.3531	0.2496	0.2714	0.4487	0.6880	0.8686	0.9358	(86)
MIT	20.3875	20.5536	20.7589	20.9035	20.9750	20.9972	20.9996	20.9994	20.9907	20.9120	20.6432	20.3220	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9097	0.8616	0.7702	0.6409	0.4853	0.3067	0.2003	0.2205	0.3981	0.6460	0.8463	0.9248	(89)
MIT 2	19.5417	19.7405	19.9792	20.1374	20.2087	20.2274	20.2289	20.2288	20.2229	20.1498	19.8515	19.4623	(90)
Living area fraction											fLA = Living area / (4) =	0.3398	(91)
MIT	19.8291	20.0167	20.2441	20.3977	20.4691	20.4889	20.4908	20.4906	20.4838	20.4088	20.1205	19.7544	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8291	20.0167	20.2441	20.3977	20.4691	20.4889	20.4908	20.4906	20.4838	20.4088	20.1205	19.7544	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9022	0.8563	0.7707	0.6488	0.4988	0.3224	0.2171	0.2378	0.4150	0.6561	0.8429	0.9171	(94)
Useful gains	667.4151	706.0404	692.1204	621.1730	481.0632	312.4263	200.7315	212.5164	357.4454	519.5434	612.5867	644.2153	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	901.9286	877.5071	784.3724	657.2523	489.7290	313.2329	200.8155	212.6523	360.3050	551.3048	747.4374	903.4284	(97)
Space heating kWh	174.4780	115.2256	68.6356	25.9771	6.4473	0.0000	0.0000	0.0000	0.0000	23.6305	97.0925	192.8545	(98a)
Space heating requirement - total per year (kWh/year)												704.3413	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	174.4780	115.2256	68.6356	25.9771	6.4473	0.0000	0.0000	0.0000	0.0000	23.6305	97.0925	192.8545	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												704.3413	
Space heating per m2											(98c) / (4) =	9.8482	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement													
	174.4780	115.2256	68.6356	25.9771	6.4473	0.0000	0.0000	0.0000	0.0000	23.6305	97.0925	192.8545	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	261.7171	172.8385	102.9533	38.9657	9.6710	0.0000	0.0000	0.0000	0.0000	35.4458	145.6388	289.2818	
Space heating requirement													
	261.7171	172.8385	102.9533	38.9657	9.6710	0.0000	0.0000	0.0000	0.0000	35.4458	145.6388	289.2818	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	256.8875	207.7013	178.9419	126.0438	97.9614	77.7608	78.1872	96.0370	125.4340	177.0795	223.4306	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.3312	311.5520	268.4128	189.0656	146.9421	116.6412	117.2807	144.0554	188.1511	265.6193	335.1459	381.5640	
Water heating fuel													
	385.3312	311.5520	268.4128	189.0656	146.9421	116.6412	117.2807	144.0554	188.1511	265.6193	335.1459	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	8.4649	7.6457	8.4649	8.1918	8.4649	8.1918	8.4649	8.4649	8.1918	8.4649	8.1918	8.4649	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.8133	-26.5889	-44.4924	-57.3150	-64.9996	-64.6716	-62.8712	-57.4038	-47.1375	-34.3017	-20.4312	-14.8426	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.1852	-13.3763	-32.7527	-60.2581	-84.2408	-96.4471	-91.6189	-73.8378	-47.2113	-22.6946	-8.5992	-4.6561	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1056.5119	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2849.7616	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	10.5651	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.6671	(331)
Electricity for lighting (calculated in Appendix L)	174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3125.9077	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1056.5119	6.5500	69.2015	(340a)
Space heating total			69.2015	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2849.7616	6.5500	186.6594	(342a)
Water heating total			186.6594	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	28.4300	5.5914	(349)
Pump for solar water heating	80.0000	28.4300	22.7440	(349)
Energy for lighting	174.7141	28.4300	49.6712	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-512.8689	28.4300	-145.8086	
PV Unit electricity exported	-541.8781	5.8100	-31.4831	
Total			-177.2917	(352)
Total energy cost			260.5758	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1041.6729	0.1580	44.5012	(367)
Electrical energy for heat distribution (space & water)	10.5651	0.0000	5.8207	(372)
Overall CO2 factor for heat network			0.0412	(386)
Total CO2 associated with community systems			161.0385	(373)
Space and water heating			161.0385	(376)
Pumps, fans and electric keep-hot	99.6671	0.1387	13.8251	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-512.8689	0.1323	-67.8299	
PV Unit electricity exported	-541.8781	0.1214	-65.7869	
Total			-133.6168	(380)
Total CO2, kg/year			66.4633	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1041.6729	1.5847	446.4680	(467)
Electrical energy for heat distribution (space & water)	10.5651	0.0000	60.5981	(472)
Overall CO2 factor for heat network			0.4292	(486)
Total CO2 associated with community systems			1676.5467	(473)
Space and water heating			1676.5467	(476)
Pumps, fans and electric keep-hot	99.6671	1.5128	150.7765	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-512.8689	1.4887	-763.4867	
PV Unit electricity exported	-541.8781	0.4454	-241.3296	
Total			-1004.8163	(480)
Total Primary energy kWh/year			1090.4893	(483)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.64	**TER**	10.27
Environmental	99 A	**% DER < TER**			84.03
CO_2 Emissions (t/year)	0.09	**DFEE**	21.16	**TFEE**	28.95
Compliance Check	See BREL	**% DFEE < TFEE**			26.89
% DPER < TPER	58.01	**DPER**	22.43	**TPER**	53.42

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				3	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 3.6151 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)

Average = Sum(39)m / 12 = 59.2241

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day) 117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)

Energy content (annual) Total = Sum(45)m = 1946.5248

Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)

Total per year (kWh/year) = Sum(64)m = 2597.3645 (64)

12Total per year (kWh/year) 2597 (64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.6996	119.2388	107.6996	111.2896	107.6996	111.2896	107.6996	107.6996	111.2896	107.6996	111.2896	107.6996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains	515.4281	526.7231	505.4479	488.0289	464.3062	448.3397	432.0236	433.1332	445.7187	460.2911	487.4158	505.3106	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	9.8900	36.7938	0.6800	0.7000	0.7700	120.0360	(79)
Southwest	2.0370	36.7938	0.6800	0.7000	0.7700	24.7233	(79)

Solar gains	144.7593	246.5786	337.3796	418.0297	468.2281	464.8421	448.1574	410.7072	365.3108	272.5219	173.3883	123.8838	(83)
Total gains	660.1873	773.3018	842.8275	906.0586	932.5343	913.1818	880.1810	843.8404	811.0294	732.8130	660.8041	629.1944	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9502	0.9055	0.8392	0.7217	0.5718	0.4119	0.2955	0.3220	0.4952	0.7521	0.9084	0.9590	(86)
MIT	20.2332	20.4631	20.6789	20.8671	20.9628	20.9938	20.9990	20.9985	20.9851	20.8627	20.5275	20.1699	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9414	0.8906	0.8162	0.6880	0.5293	0.3635	0.2440	0.2684	0.4428	0.7135	0.8913	0.9515	(89)
MIT 2	19.3535	19.6330	19.8886	20.0997	20.1977	20.2251	20.2286	20.2284	20.2186	20.1001	19.7162	19.2753	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.6524	19.9150	20.1571	20.3605	20.4576	20.4863	20.4904	20.4900	20.4791	20.3592	19.9918	19.5792	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6524	19.9150	20.1571	20.3605	20.4576	20.4863	20.4904	20.4900	20.4791	20.3592	19.9918	19.5792	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9336	0.8839	0.8139	0.6940	0.5421	0.3797	0.2615	0.2866	0.4600	0.7203	0.8854	0.9439	(94)
Useful gains	616.3510	683.4949	685.9858	628.7963	505.5225	346.7403	230.1768	241.8634	373.0889	527.8641	585.1008	593.9026	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	909.2308	889.2519	808.8297	678.7366	518.6625	348.6087	230.4053	242.2292	377.7950	577.9799	763.5067	910.8215	(97)
Space heating kWh													
	217.9026	138.2687	91.3959	35.9570	9.7762	0.0000	0.0000	0.0000	0.0000	37.2862	128.4522	235.7877	(98a)
Space heating requirement - total per year (kWh/year)												894.8265	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	217.9026	138.2687	91.3959	35.9570	9.7762	0.0000	0.0000	0.0000	0.0000	37.2862	128.4522	235.7877	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												894.8265	
Space heating per m2											(98c) / (4) =	12.5116	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	217.9026	138.2687	91.3959	35.9570	9.7762	0.0000	0.0000	0.0000	0.0000	37.2862	128.4522	235.7877	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	326.8538	207.4030	137.0938	53.9355	14.6643	0.0000	0.0000	0.0000	0.0000	55.9293	192.6783	353.6815	
Space heating requirement													
	326.8538	207.4030	137.0938	53.9355	14.6643	0.0000	0.0000	0.0000	0.0000	55.9293	192.6783	353.6815	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.8619	-24.6522	-41.9801	-54.0165	-62.8534	-60.2005	-59.0498	-53.1061	-43.0156	-30.6311	-17.3392	-12.2904	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.6369	-11.9261	-30.0153	-54.8475	-81.1374	-84.9515	-82.6912	-64.6364	-40.4468	-18.8657	-6.6109	-3.4586	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1342.2397	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3896.0468	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												13.4224	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.6671	(330a)
Total electricity for the above, kWh/year												19.6671	(331)
Electricity for lighting (calculated in Appendix L)												174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4474.4469	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1396.8764	0.1575	56.3830	(367)
Electrical energy for heat distribution (space & water)	13.4224	0.0000	7.6023	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			210.3313	(373)
Space and water heating			210.3313	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	0.1320	-62.5726	
PV Unit electricity exported	-484.2242	0.1214	-58.7607	
Total			-121.3332	(380)
Total CO2, kg/year			116.9428	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6400	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1396.8764	1.5831	566.6450	(467)
Electrical energy for heat distribution (space & water)	13.4224	0.0000	80.5021	(472)
Overall CO2 factor for heat network			0.4252	(486)
Total CO2 associated with community systems			2227.2252	(473)
Space and water heating			2227.2252	(476)
Pumps, fans and electric keep-hot	19.6671	1.5128	29.7525	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	1.4877	-705.1878	
PV Unit electricity exported	-484.2242	0.4452	-215.5829	
Total			-920.7707	(480)
Total Primary energy kWh/year			1604.1893	(483)
Dwelling Primary energy Rate (DPER)			22.4300	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b) x	2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c) x	2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3264	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3020	0.3264	0.3509	0.3672	0.3836	(22b)
Effective ac	0.5866	0.5833	0.5800	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			11.9270	1.1450	13.6603			(27)
Heatloss floor			35.7600	0.1300	4.6488			(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.1800	6.3023			(29a)
500mm mineral wool	35.7600		35.7600	0.1100	3.9336			(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5850			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.9097 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.0600	0.0500	0.3530
E3 Sill	3.7400	0.0500	0.1870
E4 Jamb	23.3600	0.0500	1.1680
E5 Ground floor (normal)	11.1200	0.1600	1.7792
E6 Intermediate floor within a dwelling	4.0300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.3800	0.0600	0.3828
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	12.9900	0.0800	1.0392
P2 Party wall - Intermediate floor within a dwelling	15.4400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	15.4400	0.1200	1.8528
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.3500	0.0200	0.0470

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.3690 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 38.9540 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.9203	33.7259	33.5352	32.6398	32.4723	31.6925	31.6925	31.5481	31.9929	32.4723	32.8112	33.1655	(38)
Heat transfer coeff	72.8744	72.6799	72.4893	71.5939	71.4264	70.6465	70.6465	70.5021	70.9469	71.4264	71.7653	72.1196	(39)
Average = Sum(39)m / 12 =												71.5931	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0189	1.0162	1.0136	1.0010	0.9987	0.9878	0.9878	0.9858	0.9920	0.9987	1.0034	1.0084	(40)
HLP (average)												1.0010	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

Hot water usage for mixer showers

62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day) 117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	248.5063	219.7523	233.2621	204.4524	197.7953	177.7872	175.0641	182.2099	184.4398	206.2131	219.9654	245.6941	(62)
WWHRS	-28.5673	-25.2652	-26.4562	-21.9068	-20.4164	-17.4704	-16.3757	-17.4139	-18.0756	-21.3091	-24.1406	-28.0383	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
									Total per year (kWh/year) = Sum(64)m =			2229.7066	(64)
12Total per year (kWh/year)												2230	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	104.4115	92.7427	99.3428	89.0609	87.5501	80.1947	79.9919	82.3679	82.4067	90.3490	94.2189	103.4764	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.8362	116.0686	104.8362	108.3307	104.8362	108.3307	104.8362	104.8362	108.3307	104.8362	108.3307	104.8362	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	140.3380	138.0100	133.5252	123.6956	117.6748	111.3815	107.5160	110.7095	114.4537	121.4368	130.8596	139.0812	(72)
Total internal gains													

	506.2293	517.2176	496.2491	478.7347	455.1075	436.0455	419.8249	420.9345	433.4245	451.0924	478.1216	496.1119	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	11.9270	36.7938	0.6300	0.7000	0.7700	134.1152	(79)

Solar gains	134.1152	228.4478	312.5723	387.2922	433.7996	430.6626	415.2047	380.5081	338.4497	252.4835	160.6391	114.7747	(83)
Total gains	640.3445	745.6655	808.8214	866.0270	888.9071	866.7081	835.0295	801.4426	771.8742	703.5759	638.7607	610.8866	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.9557	48.0840	48.2104	48.8134	48.9279	49.4680	49.4680	49.5693	49.2585	48.9279	48.6968	48.4576	
alpha	4.1970	4.2056	4.2140	4.2542	4.2619	4.2979	4.2979	4.3046	4.2839	4.2619	4.2465	4.2305	
util living area													
	0.9668	0.9397	0.8974	0.8098	0.6777	0.5059	0.3689	0.3997	0.5980	0.8313	0.9400	0.9719	(86)
MIT	19.7920	20.0509	20.3420	20.6652	20.8744	20.9723	20.9943	20.9919	20.9431	20.6792	20.1947	19.7483	(87)
Th 2	20.0676	20.0698	20.0721	20.0825	20.0844	20.0935	20.0935	20.0952	20.0900	20.0844	20.0805	20.0764	(88)
util rest of house													
	0.9600	0.9281	0.8782	0.7766	0.6270	0.4398	0.2945	0.3233	0.5305	0.7943	0.9265	0.9660	(89)
MIT 2	18.6824	19.0050	19.3620	19.7490	19.9763	20.0755	20.0911	20.0916	20.0496	19.7755	19.1964	18.6341	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.0594	19.3603	19.6950	20.0603	20.2814	20.3802	20.3980	20.3975	20.3532	20.0825	19.5356	19.0127	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0594	19.3603	19.6950	20.0603	20.2814	20.3802	20.3980	20.3975	20.3532	20.0825	19.5356	19.0127	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9508	0.9176	0.8693	0.7757	0.6384	0.4612	0.3197	0.3491	0.5507	0.7942	0.9169	0.9575	(94)
Useful gains	608.8262	684.2199	703.1432	671.8005	567.4826	399.6867	266.9262	279.7898	425.0554	558.8012	585.7006	584.9022	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1075.5800	1050.9750	956.4956	799.0105	612.9414	408.3522	268.3138	281.8301	443.6448	677.3030	892.4416	1068.2826	(97)
Space heating kWh													
	347.2648	246.4594	188.4942	91.5912	33.8214	0.0000	0.0000	0.0000	0.0000	88.1653	220.8536	359.6350	(98a)
Space heating requirement - total per year (kWh/year)												1576.2849	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	347.2648	246.4594	188.4942	91.5912	33.8214	0.0000	0.0000	0.0000	0.0000	88.1653	220.8536	359.6350	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1576.2849	
Space heating per m2											(98c) / (4) =	22.0398	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	347.2648	246.4594	188.4942	91.5912	33.8214	0.0000	0.0000	0.0000	0.0000	88.1653	220.8536	359.6350	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	376.2349	267.0199	204.2191	99.2321	36.6429	0.0000	0.0000	0.0000	0.0000	95.5204	239.2780	389.6371	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.0793	84.5920	83.8524	82.5969	81.1165	79.8000	79.8000	79.8000	79.8000	82.4996	84.3302	85.1780	(217)
Fuel for water heating, kWh/month													
	258.5107	229.9119	246.6308	221.0078	218.6718	200.8982	198.8576	206.5112	208.4765	224.1271	232.2119	255.5304	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.7829	17.4750	15.7343	11.5277	8.9043	7.2749	8.1228	10.5583	13.7142	17.9938	20.3239	22.3883	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.5568	-47.3592	-68.1531	-76.7310	-82.8400	-77.3720	-76.4273	-72.1080	-64.4904	-54.2111	-36.9141	-29.0069	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-18.8029	-39.5749	-78.6914	-118.2335	-156.3709	-157.1182	-155.2578	-131.4301	-96.3075	-56.5975	-25.1064	-14.8664	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1707.7843	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2701.3458	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	175.8004	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1767.5275	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2903.4031	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1707.7843	0.2100	358.6347	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2701.3458	0.2100	567.2826	(264)
Space and water heating			925.9173	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	175.8004	0.1443	25.3734	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	0.1346	-96.7689	
PV Unit electricity exported	-1048.3576	0.1259	-131.9744	
Total			-228.7433	(269)
Total CO2, kg/year			734.4767	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.2700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1707.7843	1.1300	1929.7963	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2701.3458	1.1300	3052.5208	(278)
Space and water heating			4982.3171	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	175.8004	1.5338	269.6485	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	1.4973	-1076.8103	
PV Unit electricity exported	-1048.3576	0.4621	-484.4365	
Total			-1561.2467	(283)
Total Primary energy kWh/year			3820.8197	(286)
Target Primary Energy Rate (TPER)			53.4200	(287)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.64	**TER**	10.27
Environmental	99 A	**% DER < TER**			84.03
CO_2 Emissions (t/year)	0.09	**DFEE**	21.16	**TFEE**	28.95
Compliance Check	See BREL	**% DFEE < TFEE**			26.89
% DPER < TPER	58.01	**DPER**	22.43	**TPER**	53.42

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		3 * 10 =	30.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1712	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.3212	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2489	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3174	0.3112	0.3049	0.2738	0.2676	0.2365	0.2365	0.2303	0.2489	0.2676	0.2801	0.2925	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5504	0.5484	0.5465	0.5375	0.5358	0.5280	0.5280	0.5265	0.5310	0.5358	0.5392	0.5428	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			12581.0601	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							175.9097	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							3.6151	(36)

Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss										(33) + (36) + (36a) =		30.3121	(37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.8245	31.7114	31.6006	31.0799	30.9825	30.5289	30.5289	30.4450	30.7036	30.9825	31.1795	31.3856	(38)
Heat transfer coeff	62.1367	62.0236	61.9127	61.3920	61.2946	60.8411	60.8411	60.7571	61.0158	61.2946	61.4917	61.6977	(39)
Average = Sum(39)m / 12 =												61.3916	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8688	0.8672	0.8657	0.8584	0.8570	0.8507	0.8507	0.8495	0.8531	0.8570	0.8598	0.8627	(40)
HLP (average)												0.8584	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses													
	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												59.5787	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	65.0001	63.2172	61.2706	58.8477	56.6862	54.4399	53.9730	55.9157	57.9081	60.2149	62.6593	64.9088	(44)
Energy conte	102.9443	90.0205	94.1707	80.5595	76.3105	66.9402	65.2757	69.2353	71.4064	81.7111	89.2697	101.6316	(45)
Energy content (annual)										Total = Sum(45)m =		989.4754	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(64)
										Total per year (kWh/year) = Sum(64)m =		841.0541	(64)
12Total per year (kWh/year)												841	(64)
Electric shower(s)													
	50.0432	44.5889	48.6894	46.4637	47.3355	45.1535	46.6586	47.3355	46.4637	48.6894	47.7738	50.0432	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		569.2384	(64a)
Heat gains from water heating, kWh/month													
	34.3865	30.2766	32.1836	28.7348	28.0499	25.5132	25.5357	26.5464	26.7898	29.5359	30.9133	34.1075	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	107.6996	119.2388	107.6996	111.2896	107.6996	111.2896	107.6996	107.6996	111.2896	107.6996	111.2896	107.6996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)													
	46.2184	45.0544	43.2575	39.9095	37.7014	35.4350	34.3222	35.6806	37.2080	39.6988	42.9351	45.8434	(72)
Total internal gains													
	411.9730	424.4322	405.8448	394.9074	374.9975	363.0578	349.4944	348.7689	359.1376	369.2178	390.1559	402.7375	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	9.8900	36.7938	0.6800	0.7000	0.7700	120.0360	(79)
Southwest	2.0370	36.7938	0.6800	0.7000	0.7700	24.7233	(79)

Solar gains	144.7593	246.5786	337.3796	418.0297	468.2281	464.8421	448.1574	410.7072	365.3108	272.5219	173.3883	123.8838	(83)
Total gains	556.7323	671.0108	743.2244	812.9371	843.2256	827.8999	797.6518	759.4761	724.4484	641.7397	563.5442	526.6213	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.2428	56.3453	56.4462	56.9250	57.0154	57.4404	57.4404	57.5198	57.2760	57.0154	56.8327	56.6429	
alpha	4.7495	4.7564	4.7631	4.7950	4.8010	4.8294	4.8294	4.8347	4.8184	4.8010	4.7888	4.7762	
util living area													
	0.9752	0.9449	0.8945	0.7881	0.6387	0.4637	0.3345	0.3661	0.5625	0.8248	0.9491	0.9802	(86)

MIT	19.9622	20.2350	20.5109	20.7852	20.9339	20.9885	20.9981	20.9970	20.9716	20.7725	20.3274	19.9068	(87)
Th 2	20.1941	20.1955	20.1968	20.2030	20.2042	20.2096	20.2096	20.2106	20.2075	20.2042	20.2018	20.1994	(88)
util rest of house													
	0.9702	0.9347	0.8762	0.7562	0.5932	0.4089	0.2749	0.3042	0.5040	0.7901	0.9379	0.9762	(89)
MIT 2	19.2555	19.5208	19.7836	20.0364	20.1599	20.2037	20.2090	20.2095	20.1917	20.0324	19.6192	19.2054	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.4956	19.7635	20.0307	20.2908	20.4228	20.4704	20.4771	20.4771	20.4567	20.2838	19.8598	19.4437	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4956	19.7635	20.0307	20.2908	20.4228	20.4704	20.4771	20.4771	20.4567	20.2838	19.8598	19.4437	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9649	0.9284	0.8720	0.7599	0.6060	0.4271	0.2951	0.3252	0.5228	0.7938	0.9323	0.9714	(94)
Useful gains	537.2096	622.9880	648.0862	617.7296	511.0263	353.6303	235.4223	246.9702	378.7389	509.4229	525.3796	511.5696	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	944.2022	921.8855	837.7230	699.3054	534.6629	357.1591	235.8852	247.7128	387.8586	593.5662	784.6219	940.5040	(97)
Space heating kWh													
	302.8025	200.8591	141.0897	58.7346	17.5857	0.0000	0.0000	0.0000	0.0000	62.6026	186.6545	319.1272	(98a)
Space heating requirement - total per year (kWh/year)												1289.4559	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	302.8025	200.8591	141.0897	58.7346	17.5857	0.0000	0.0000	0.0000	0.0000	62.6026	186.6545	319.1272	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1289.4559	
Space heating per m2											(98c) / (4) =	18.0293	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	571.9062	450.2240	461.7539	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9597	0.9812	0.9750	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	548.8707	441.7560	450.2242	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	922.2639	889.1836	846.7117	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	268.8430	332.8861	294.9867	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	67.2108	83.2215	73.7467	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												224.1790	(107)
Energy for space heating												18.0293	(99)
Energy for space cooling												3.1345	(108)
Total												21.1638	(109)
Fabric Energy Efficiency (DFEE)												21.2	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)		
Main dwelling							
Ground floor	35.7600	(1b)	x 2.4500	(2b)	= 87.6120	(1b) - (3b)	
First floor	35.7600	(1c)	x 2.4500	(2c)	= 87.6120	(1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)	
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		= 175.2240	(5)	

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3264	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3020	0.3264	0.3509	0.3672	0.3836	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5866	0.5833	0.5800	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			11.9270	1.1450	13.6603			(27)
Heatloss floor			35.7600	0.1300	4.6488			(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.1800	6.3023			(29a)
500mm mineral wool	35.7600		35.7600	0.1100	3.9336			(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5850			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	175.9097	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.0600	0.0500	0.3530
E3 Sill	3.7400	0.0500	0.1870
E4 Jamb	23.3600	0.0500	1.1680
E5 Ground floor (normal)	11.1200	0.1600	1.7792
E6 Intermediate floor within a dwelling	4.0300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.3800	0.0600	0.3828
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	12.9900	0.0800	1.0392
P2 Party wall - Intermediate floor within a dwelling	15.4400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	15.4400	0.1200	1.8528
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.3500	0.0200	0.0470

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.3690	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	38.9540	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.9203	33.7259	33.5352	32.6398	32.4723	31.6925	31.6925	31.5481	31.9929	32.4723	32.8112	33.1655	(38)
Heat transfer coeff													
	72.8744	72.6799	72.4893	71.5939	71.4264	70.6465	70.6465	70.5021	70.9469	71.4264	71.7653	72.1196	(39)
Average = Sum(39)m / 12 =												71.5931	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0189	1.0162	1.0136	1.0010	0.9987	0.9878	0.9878	0.9858	0.9920	0.9987	1.0034	1.0084	(40)
HLP (average)												1.0010	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2825	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses													
	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												59.5787	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	65.0001	63.2172	61.2706	58.8477	56.6862	54.4399	53.9730	55.9157	57.9081	60.2149	62.6593	64.9088	(44)
Energy conte	102.9443	90.0205	94.1707	80.5595	76.3105	66.9402	65.2757	69.2353	71.4064	81.7111	89.2697	101.6316	(45)
Energy content (annual)										Total = Sum(45)m =		989.4754	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(64)
										Total per year (kWh/year) = Sum(64)m =		841.0541	(64)
12Total per year (kWh/year)												841	(64)
Electric shower(s)													
	50.0432	44.5889	48.6894	46.4637	47.3355	45.1535	46.6586	47.3355	46.4637	48.6894	47.7738	50.0432	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		569.2384	(64a)
Heat gains from water heating, kWh/month													
	34.3865	30.2766	32.1836	28.7348	28.0499	25.5132	25.5357	26.5464	26.7898	29.5359	30.9133	34.1075	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	104.8362	116.0686	104.8362	108.3307	104.8362	108.3307	104.8362	104.8362	108.3307	104.8362	108.3307	104.8362 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982 (71)

Water heating gains (Table 5)

	46.2184	45.0544	43.2575	39.9095	37.7014	35.4350	34.3222	35.6806	37.2080	39.6988	42.9351	45.8434 (72)

Total internal gains

	409.1097	421.2621	402.9814	391.9486	372.1341	360.0989	346.6311	345.9056	356.1788	366.3544	387.1971	399.8741 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	11.9270	36.7938	0.6300	0.7000	0.7700	134.1152	(79)

Solar gains	134.1152	228.4478	312.5723	387.2922	433.7996	430.6626	415.2047	380.5081	338.4497	252.4835	160.6391	114.7747 (83)
Total gains	543.2249	649.7099	715.5537	779.2408	805.9337	790.7615	761.8357	726.4137	694.6285	618.8379	547.8362	514.6488 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.9557	48.0840	48.2104	48.8134	48.9279	49.4680	49.4680	49.5693	49.2585	48.9279	48.6968	48.4576	
alpha	4.1970	4.2056	4.2140	4.2542	4.2619	4.2979	4.2979	4.3046	4.2839	4.2619	4.2465	4.2305	
util living area	0.9810	0.9607	0.9270	0.8499	0.7247	0.5484	0.4029	0.4387	0.6496	0.8759	0.9630	0.9845	(86)
MIT	19.6178	19.8962	20.2155	20.5860	20.8371	20.9624	20.9920	20.9885	20.9221	20.5922	20.0469	19.5720	(87)
Th 2	20.0676	20.0698	20.0721	20.0825	20.0844	20.0935	20.0935	20.0952	20.0900	20.0844	20.0805	20.0764	(88)
util rest of house	0.9768	0.9526	0.9120	0.8205	0.6749	0.4788	0.3222	0.3558	0.5805	0.8447	0.9539	0.9810	(89)
MIT 2	18.8181	19.0920	19.4019	19.7552	19.9729	20.0742	20.0908	20.0911	20.0458	19.7703	19.2511	18.7797	(90)
Living area fraction									fLA = Living area / (4) =			0.3398	(91)
MIT	19.0898	19.3652	19.6783	20.0375	20.2665	20.3760	20.3970	20.3960	20.3436	20.0496	19.5214	19.0489	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0898	19.3652	19.6783	20.0375	20.2665	20.3760	20.3970	20.3960	20.3436	20.0496	19.5214	19.0489	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9712	0.9450	0.9046	0.8189	0.6854	0.5010	0.3495	0.3838	0.6006	0.8434	0.9471	0.9761	(94)
Useful gains	527.5896	614.0047	647.2823	638.0996	552.3667	396.1976	266.2808	278.7817	417.2139	521.9019	518.8689	502.3393	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1077.7977	1051.3311	955.2884	797.3773	611.8763	408.0521	268.2460	281.7249	442.9606	674.9477	891.4285	1070.8949	(97)
Space heating kWh	409.3549	293.8833	229.1566	114.6799	44.2751	0.0000	0.0000	0.0000	0.0000	113.8661	268.2429	423.0053	(98a)
Space heating requirement - total per year (kWh/year)												1896.4640	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	409.3549	293.8833	229.1566	114.6799	44.2751	0.0000	0.0000	0.0000	0.0000	113.8661	268.2429	423.0053	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1896.4640	
Space heating per m2											(98c) / (4) =	26.5166	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	664.0772	522.7842	535.8159	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9062	0.9485	0.9359	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	601.7797	495.8543	501.4808	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	882.0632	850.3967	811.0622	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	201.8041	263.7795	230.3286	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	50.4510	65.9449	57.5822	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												173.9781	(107)
Energy for space heating												26.5166	(99)
Energy for space cooling												2.4326	(108)
Total												28.9491	(109)
Fabric Energy Efficiency (TFEE)												28.9	(109)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.64	**TER**	10.27
Environmental	99 A	**% DER < TER**			84.03
CO_2 Emissions (t/year)	0.09	**DFEE**	21.16	**TFEE**	28.95
Compliance Check	See BREL	**% DFEE < TFEE**			26.89
% DPER < TPER	58.01	**DPER**	22.43	**TPER**	53.42

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				3	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 3.6151 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)

Average = Sum(39)m / 12 = 59.2241

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day) 117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)

Energy content (annual) Total = Sum(45)m = 1946.5248

Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)

Total per year (kWh/year) = Sum(64)m = 2597.3645 (64)

12Total per year (kWh/year) 2597 (64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.6996	119.2388	107.6996	111.2896	107.6996	111.2896	107.6996	107.6996	111.2896	107.6996	111.2896	107.6996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains	515.4281	526.7231	505.4479	488.0289	464.3062	448.3397	432.0236	433.1332	445.7187	460.2911	487.4158	505.3106	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	9.8900	36.7938	0.6800	0.7000	0.7700	120.0360	(79)
Southwest	2.0370	36.7938	0.6800	0.7000	0.7700	24.7233	(79)

Solar gains	144.7593	246.5786	337.3796	418.0297	468.2281	464.8421	448.1574	410.7072	365.3108	272.5219	173.3883	123.8838	(83)
Total gains	660.1873	773.3018	842.8275	906.0586	932.5343	913.1818	880.1810	843.8404	811.0294	732.8130	660.8041	629.1944	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9502	0.9055	0.8392	0.7217	0.5718	0.4119	0.2955	0.3220	0.4952	0.7521	0.9084	0.9590	(86)
MIT	20.2332	20.4631	20.6789	20.8671	20.9628	20.9938	20.9990	20.9985	20.9851	20.8627	20.5275	20.1699	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9414	0.8906	0.8162	0.6880	0.5293	0.3635	0.2440	0.2684	0.4428	0.7135	0.8913	0.9515	(89)
MIT 2	19.3535	19.6330	19.8886	20.0997	20.1977	20.2251	20.2286	20.2284	20.2186	20.1001	19.7162	19.2753	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.6524	19.9150	20.1571	20.3605	20.4576	20.4863	20.4904	20.4900	20.4791	20.3592	19.9918	19.5792	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6524	19.9150	20.1571	20.3605	20.4576	20.4863	20.4904	20.4900	20.4791	20.3592	19.9918	19.5792	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9336	0.8839	0.8139	0.6940	0.5421	0.3797	0.2615	0.2866	0.4600	0.7203	0.8854	0.9439	(94)
Useful gains	616.3510	683.4949	685.9858	628.7963	505.5225	346.7403	230.1768	241.8634	373.0889	527.8641	585.1008	593.9026	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	909.2308	889.2519	808.8297	678.7366	518.6625	348.6087	230.4053	242.2292	377.7950	577.9799	763.5067	910.8215	(97)
Space heating kWh													
	217.9026	138.2687	91.3959	35.9570	9.7762	0.0000	0.0000	0.0000	0.0000	37.2862	128.4522	235.7877	(98a)
Space heating requirement - total per year (kWh/year)												894.8265	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	217.9026	138.2687	91.3959	35.9570	9.7762	0.0000	0.0000	0.0000	0.0000	37.2862	128.4522	235.7877	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												894.8265	
Space heating per m2											(98c) / (4) =	12.5116	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	217.9026	138.2687	91.3959	35.9570	9.7762	0.0000	0.0000	0.0000	0.0000	37.2862	128.4522	235.7877	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	326.8538	207.4030	137.0938	53.9355	14.6643	0.0000	0.0000	0.0000	0.0000	55.9293	192.6783	353.6815	
Space heating requirement													
	326.8538	207.4030	137.0938	53.9355	14.6643	0.0000	0.0000	0.0000	0.0000	55.9293	192.6783	353.6815	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.8619	-24.6522	-41.9801	-54.0165	-62.8534	-60.2005	-59.0498	-53.1061	-43.0156	-30.6311	-17.3392	-12.2904	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.6369	-11.9261	-30.0153	-54.8475	-81.1374	-84.9515	-82.6912	-64.6364	-40.4468	-18.8657	-6.6109	-3.4586	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1342.2397	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3896.0468	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												13.4224	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.6671	(330a)
Total electricity for the above, kWh/year												19.6671	(331)
Electricity for lighting (calculated in Appendix L)												174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4474.4469	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1396.8764	0.1575	56.3830	(367)
Electrical energy for heat distribution (space & water)	13.4224	0.0000	7.6023	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			210.3313	(373)
Space and water heating			210.3313	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	0.1320	-62.5726	
PV Unit electricity exported	-484.2242	0.1214	-58.7607	
Total			-121.3332	(380)
Total CO2, kg/year			116.9428	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6400	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1396.8764	1.5831	566.6450	(467)
Electrical energy for heat distribution (space & water)	13.4224	0.0000	80.5021	(472)
Overall CO2 factor for heat network			0.4252	(486)
Total CO2 associated with community systems			2227.2252	(473)
Space and water heating			2227.2252	(476)
Pumps, fans and electric keep-hot	19.6671	1.5128	29.7525	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	1.4877	-705.1878	
PV Unit electricity exported	-484.2242	0.4452	-215.5829	
Total			-920.7707	(480)
Total Primary energy kWh/year			1604.1893	(483)
Dwelling Primary energy Rate (DPER)			22.4300	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b) x	2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c) x	2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3264	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3020	0.3264	0.3509	0.3672	0.3836	(22b)
Effective ac	0.5866	0.5833	0.5800	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			11.9270	1.1450	13.6603			(27)
Heatloss floor			35.7600	0.1300	4.6488			(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.1800	6.3023			(29a)
500mm mineral wool	35.7600		35.7600	0.1100	3.9336			(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5850			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.9097 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.0600	0.0500	0.3530
E3 Sill	3.7400	0.0500	0.1870
E4 Jamb	23.3600	0.0500	1.1680
E5 Ground floor (normal)	11.1200	0.1600	1.7792
E6 Intermediate floor within a dwelling	4.0300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.3800	0.0600	0.3828
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	12.9900	0.0800	1.0392
P2 Party wall - Intermediate floor within a dwelling	15.4400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	15.4400	0.1200	1.8528
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.3500	0.0200	0.0470

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.3690 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 38.9540 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.9203	33.7259	33.5352	32.6398	32.4723	31.6925	31.6925	31.5481	31.9929	32.4723	32.8112	33.1655	(38)
Heat transfer coeff	72.8744	72.6799	72.4893	71.5939	71.4264	70.6465	70.6465	70.5021	70.9469	71.4264	71.7653	72.1196	(39)
Average = Sum(39)m / 12 =												71.5931	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0189	1.0162	1.0136	1.0010	0.9987	0.9878	0.9878	0.9858	0.9920	0.9987	1.0034	1.0084	(40)
HLP (average)												1.0010	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

Hot water usage for mixer showers

62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day) 117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	248.5063	219.7523	233.2621	204.4524	197.7953	177.7872	175.0641	182.2099	184.4398	206.2131	219.9654	245.6941	(62)
WWHRS	-28.5673	-25.2652	-26.4562	-21.9068	-20.4164	-17.4704	-16.3757	-17.4139	-18.0756	-21.3091	-24.1406	-28.0383	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
									Total per year (kWh/year) = Sum(64)m =			2229.7066	(64)
12Total per year (kWh/year)												2230	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	104.4115	92.7427	99.3428	89.0609	87.5501	80.1947	79.9919	82.3679	82.4067	90.3490	94.2189	103.4764	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.8362	116.0686	104.8362	108.3307	104.8362	108.3307	104.8362	104.8362	108.3307	104.8362	108.3307	104.8362	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	140.3380	138.0100	133.5252	123.6956	117.6748	111.3815	107.5160	110.7095	114.4537	121.4368	130.8596	139.0812	(72)
Total internal gains													

	506.2293	517.2176	496.2491	478.7347	455.1075	436.0455	419.8249	420.9345	433.4245	451.0924	478.1216	496.1119	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	11.9270	36.7938	0.6300	0.7000	0.7700	134.1152	(79)

Solar gains	134.1152	228.4478	312.5723	387.2922	433.7996	430.6626	415.2047	380.5081	338.4497	252.4835	160.6391	114.7747	(83)
Total gains	640.3445	745.6655	808.8214	866.0270	888.9071	866.7081	835.0295	801.4426	771.8742	703.5759	638.7607	610.8866	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.9557	48.0840	48.2104	48.8134	48.9279	49.4680	49.4680	49.5693	49.2585	48.9279	48.6968	48.4576	
alpha	4.1970	4.2056	4.2140	4.2542	4.2619	4.2979	4.2979	4.3046	4.2839	4.2619	4.2465	4.2305	
util living area													
	0.9668	0.9397	0.8974	0.8098	0.6777	0.5059	0.3689	0.3997	0.5980	0.8313	0.9400	0.9719	(86)
MIT	19.7920	20.0509	20.3420	20.6652	20.8744	20.9723	20.9943	20.9919	20.9431	20.6792	20.1947	19.7483	(87)
Th 2	20.0676	20.0698	20.0721	20.0825	20.0844	20.0935	20.0935	20.0952	20.0900	20.0844	20.0805	20.0764	(88)
util rest of house													
	0.9600	0.9281	0.8782	0.7766	0.6270	0.4398	0.2945	0.3233	0.5305	0.7943	0.9265	0.9660	(89)
MIT 2	18.6824	19.0050	19.3620	19.7490	19.9763	20.0755	20.0911	20.0916	20.0496	19.7755	19.1964	18.6341	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.0594	19.3603	19.6950	20.0603	20.2814	20.3802	20.3980	20.3975	20.3532	20.0825	19.5356	19.0127	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0594	19.3603	19.6950	20.0603	20.2814	20.3802	20.3980	20.3975	20.3532	20.0825	19.5356	19.0127	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9508	0.9176	0.8693	0.7757	0.6384	0.4612	0.3197	0.3491	0.5507	0.7942	0.9169	0.9575	(94)
Useful gains	608.8262	684.2199	703.1432	671.8005	567.4826	399.6867	266.9262	279.7898	425.0554	558.8012	585.7006	584.9022	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1075.5800	1050.9750	956.4956	799.0105	612.9414	408.3522	268.3138	281.8301	443.6448	677.3030	892.4416	1068.2826	(97)
Space heating kWh													
	347.2648	246.4594	188.4942	91.5912	33.8214	0.0000	0.0000	0.0000	0.0000	88.1653	220.8536	359.6350	(98a)
Space heating requirement - total per year (kWh/year)												1576.2849	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	347.2648	246.4594	188.4942	91.5912	33.8214	0.0000	0.0000	0.0000	0.0000	88.1653	220.8536	359.6350	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1576.2849	
Space heating per m2											(98c) / (4) =	22.0398	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	347.2648	246.4594	188.4942	91.5912	33.8214	0.0000	0.0000	0.0000	0.0000	88.1653	220.8536	359.6350	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	376.2349	267.0199	204.2191	99.2321	36.6429	0.0000	0.0000	0.0000	0.0000	95.5204	239.2780	389.6371	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.0793	84.5920	83.8524	82.5969	81.1165	79.8000	79.8000	79.8000	79.8000	82.4996	84.3302	85.1780	(217)
Fuel for water heating, kWh/month													
	258.5107	229.9119	246.6308	221.0078	218.6718	200.8982	198.8576	206.5112	208.4765	224.1271	232.2119	255.5304	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.7829	17.4750	15.7343	11.5277	8.9043	7.2749	8.1228	10.5583	13.7142	17.9938	20.3239	22.3883	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.5568	-47.3592	-68.1531	-76.7310	-82.8400	-77.3720	-76.4273	-72.1080	-64.4904	-54.2111	-36.9141	-29.0069	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-18.8029	-39.5749	-78.6914	-118.2335	-156.3709	-157.1182	-155.2578	-131.4301	-96.3075	-56.5975	-25.1064	-14.8664	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1707.7843	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2701.3458	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	175.8004	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1767.5275	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2903.4031	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1707.7843	0.2100	358.6347	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2701.3458	0.2100	567.2826	(264)
Space and water heating			925.9173	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	175.8004	0.1443	25.3734	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	0.1346	-96.7689	
PV Unit electricity exported	-1048.3576	0.1259	-131.9744	
Total			-228.7433	(269)
Total CO2, kg/year			734.4767	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.2700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1707.7843	1.1300	1929.7963	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2701.3458	1.1300	3052.5208	(278)
Space and water heating			4982.3171	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	175.8004	1.5338	269.6485	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	1.4973	-1076.8103	
PV Unit electricity exported	-1048.3576	0.4621	-484.4365	
Total			-1561.2467	(283)
Total Primary energy kWh/year			3820.8197	(286)
Target Primary Energy Rate (TPER)			53.4200	(287)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.64	**TER**	10.27
Environmental	99 A	**% DER < TER**			84.03
CO_2 Emissions (t/year)	0.09	**DFEE**	21.16	**TFEE**	28.95
Compliance Check	See BREL	**% DFEE < TFEE**			26.89
% DPER < TPER	58.01	**DPER**	22.43	**TPER**	53.42

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												175.9097	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6151	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	30.3121	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
										Total per year (kWh/year) = Sum(64)m =		2597.3645	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains	570.7610	568.7779	552.3532	521.4980	490.9997	463.3358	446.9330	449.7815	465.4657	493.4744	527.3747	556.9668	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	9.8900	36.7938	0.6800	0.7000	0.7700	120.0360	(79)
Southwest	2.0370	36.7938	0.6800	0.7000	0.7700	24.7233	(79)

Solar gains	144.7593	246.5786	337.3796	418.0297	468.2281	464.8421	448.1574	410.7072	365.3108	272.5219	173.3883	123.8838	(83)
Total gains	715.5203	815.3566	889.7328	939.5277	959.2278	928.1780	895.0904	860.4887	830.7765	765.9963	700.7629	680.8506	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area	0.9344	0.8894	0.8164	0.7033	0.5578	0.4054	0.2907	0.3159	0.4842	0.7301	0.8908	0.9457	(86)
MIT	20.3207	20.5159	20.7194	20.8815	20.9666	20.9942	20.9991	20.9986	20.9865	20.8798	20.5782	20.2558	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house	0.9234	0.8728	0.7920	0.6693	0.5158	0.3577	0.2400	0.2633	0.4328	0.6908	0.8716	0.9363	(89)
MIT 2	19.4602	19.6954	19.9340	20.1144	20.2010	20.2253	20.2287	20.2284	20.2196	20.1172	19.7754	19.3808	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.7526	19.9742	20.2009	20.3751	20.4611	20.4866	20.4904	20.4901	20.4802	20.3763	20.0482	19.6781	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7526	19.9742	20.2009	20.3751	20.4611	20.4866	20.4904	20.4901	20.4802	20.3763	20.0482	19.6781	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9156	0.8668	0.7910	0.6759	0.5286	0.3737	0.2572	0.2811	0.4497	0.6986	0.8666	0.9284	(94)
Useful gains	655.1547	706.7726	703.7872	635.0425	507.0716	346.8865	230.1964	241.8992	373.5980	535.1336	607.2942	632.1315	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	915.1644	892.7561	811.4226	679.6005	518.8675	348.6278	230.4080	242.2340	377.8617	578.9937	766.8453	916.6779	(97)
Space heating kWh	193.4472	124.9809	80.0807	32.0818	8.7762	0.0000	0.0000	0.0000	0.0000	32.6319	114.8768	211.7025	(98a)
Space heating requirement - total per year (kWh/year)												798.5779	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	193.4472	124.9809	80.0807	32.0818	8.7762	0.0000	0.0000	0.0000	0.0000	32.6319	114.8768	211.7025	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												798.5779	
Space heating per m2											(98c) / (4) =	11.1658	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	193.4472	124.9809	80.0807	32.0818	8.7762	0.0000	0.0000	0.0000	0.0000	32.6319	114.8768	211.7025	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	290.1708	187.4713	120.1211	48.1227	13.1643	0.0000	0.0000	0.0000	0.0000	48.9479	172.3151	317.5538	
Space heating requirement													
	290.1708	187.4713	120.1211	48.1227	13.1643	0.0000	0.0000	0.0000	0.0000	48.9479	172.3151	317.5538	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.8619	-24.6522	-41.9801	-54.0165	-62.8534	-60.2005	-59.0498	-53.1061	-43.0156	-30.6311	-17.3392	-12.2904	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.6369	-11.9261	-30.0153	-54.8475	-81.1374	-84.9515	-82.6912	-64.6364	-40.4468	-18.8657	-6.6109	-3.4586	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1197.8669	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3896.0468	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	11.9787	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(330a)
Total electricity for the above, kWh/year	19.6671	(331)
Electricity for lighting (calculated in Appendix L)	174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4330.0741	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1197.8669	4.4400	53.1853	(340a)
Space heating total			53.1853	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3896.0468	4.4400	172.9845	(342a)
Water heating total			172.9845	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	16.4900	3.2431	(349)
Energy for lighting	174.7141	16.4900	28.8104	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	16.4900	-78.1621	
PV Unit electricity exported	-484.2242	5.5900	-27.0681	
Total			-105.2302	(352)
Total energy cost			244.9930	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.7569	(357)
SAP value	87.7302	
SAP rating (Section 12)	88	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1358.3770	0.1576	50.3277	(367)
Electrical energy for heat distribution (space & water)	11.9787	0.0000	7.3753	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			204.0489	(373)
Space and water heating			204.0489	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	0.1320	-62.5726	
PV Unit electricity exported	-484.2242	0.1214	-58.7607	
Total			-121.3332	(380)
Total CO2, kg/year			110.6604	(383)
CO2 emissions per m2			1.5500	(384)
EI value			98.7274	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b) x	2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c) x	2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 71.5200						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor (20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =		0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
									Total per year (kWh/year) = Sum(64)m =			2597.3645	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)													
	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains													
	570.7610	568.7779	552.3532	521.4980	490.9997	463.3358	446.9330	449.7815	465.4657	493.4744	527.3747	556.9668	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	9.8900	42.9509	0.6800	0.7000	0.7700	140.1229	(79)
Southwest	2.0370	42.9509	0.6800	0.7000	0.7700	28.8605	(79)

Solar gains	168.9834	255.7923	345.6414	435.9036	473.4466	505.7912	477.8325	443.9806	395.8869	298.4015	199.3503	145.4902	(83)
Total gains	739.7444	824.5702	897.9946	957.4016	964.4463	969.1270	924.7655	893.7621	861.3526	791.8759	726.7249	702.4571	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9224	0.8794	0.7967	0.6762	0.5281	0.3531	0.2496	0.2714	0.4487	0.6880	0.8686	0.9358	(86)
MIT	20.3875	20.5536	20.7589	20.9035	20.9750	20.9972	20.9996	20.9994	20.9907	20.9120	20.6432	20.3220	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9097	0.8616	0.7702	0.6409	0.4853	0.3067	0.2003	0.2205	0.3981	0.6460	0.8463	0.9248	(89)
MIT 2	19.5417	19.7405	19.9792	20.1374	20.2087	20.2274	20.2289	20.2288	20.2229	20.1498	19.8515	19.4623	(90)
Living area fraction									fLA = Living area / (4) =			0.3398	(91)
MIT	19.8291	20.0167	20.2441	20.3977	20.4691	20.4889	20.4908	20.4906	20.4838	20.4088	20.1205	19.7544	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8291	20.0167	20.2441	20.3977	20.4691	20.4889	20.4908	20.4906	20.4838	20.4088	20.1205	19.7544	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9022	0.8563	0.7707	0.6488	0.4988	0.3224	0.2171	0.2378	0.4150	0.6561	0.8429	0.9171	(94)
Useful gains	667.4151	706.0404	692.1204	621.1730	481.0632	312.4263	200.7315	212.5164	357.4454	519.5434	612.5867	644.2153	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	901.9286	877.5071	784.3724	657.2523	489.7290	313.2329	200.8155	212.6523	360.3050	551.3048	747.4374	903.4284	(97)
Space heating kWh													
	174.4780	115.2256	68.6356	25.9771	6.4473	0.0000	0.0000	0.0000	0.0000	23.6305	97.0925	192.8545	(98a)
Space heating requirement - total per year (kWh/year)												704.3413	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	174.4780	115.2256	68.6356	25.9771	6.4473	0.0000	0.0000	0.0000	0.0000	23.6305	97.0925	192.8545	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												704.3413	
Space heating per m2										(98c) / (4) =		9.8482	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	174.4780	115.2256	68.6356	25.9771	6.4473	0.0000	0.0000	0.0000	0.0000	23.6305	97.0925	192.8545	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	261.7171	172.8385	102.9533	38.9657	9.6710	0.0000	0.0000	0.0000	0.0000	35.4458	145.6388	289.2818	
Space heating requirement													
	261.7171	172.8385	102.9533	38.9657	9.6710	0.0000	0.0000	0.0000	0.0000	35.4458	145.6388	289.2818	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.7439	-26.4473	-44.1602	-56.7208	-64.1553	-63.6776	-61.8747	-56.5668	-46.5864	-34.0293	-20.3275	-14.7878	(333a)

Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.2546	-13.5179	-33.0849	-60.8523	-85.0852	-97.4411	-92.6154	-74.6748	-47.7624	-22.9670	-8.7029	-4.7110	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1056.5119	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3896.0468	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	10.5651	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(330a)
Total electricity for the above, kWh/year	19.6671	(331)
Electricity for lighting (calculated in Appendix L)	174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4092.1930	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1056.5119	6.5500	69.2015	(340a)
Space heating total			69.2015	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3896.0468	6.5500	255.1911	(342a)
Water heating total			255.1911	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	28.4300	5.5914	(349)
Energy for lighting	174.7141	28.4300	49.6712	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-507.0777	28.4300	-144.1622	
PV Unit electricity exported	-547.6693	5.8100	-31.8196	
Total			-175.9818	(352)
Total energy cost			307.6734	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1320.6823	0.1580	44.5012	(367)
Electrical energy for heat distribution (space & water)	10.5651	0.0000	7.1568	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			198.0039	(373)
Space and water heating			198.0039	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-507.0777	0.1323	-67.0962	
PV Unit electricity exported	-547.6693	0.1214	-66.4868	
Total			-133.5830	(380)
Total CO2, kg/year			92.3656	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1320.6823	1.5847	446.4680	(467)
Electrical energy for heat distribution (space & water)	10.5651	0.0000	75.9955	(472)
Overall CO2 factor for heat network			0.4245	(486)
Total CO2 associated with community systems			2102.5415	(473)
Space and water heating			2102.5415	(476)
Pumps, fans and electric keep-hot	19.6671	1.5128	29.7525	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-507.0777	1.4889	-754.9866	
PV Unit electricity exported	-547.6693	0.4453	-243.8963	
Total			-998.8829	(480)
Total Primary energy kWh/year			1401.3935	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Southwest

Current energy efficiency rating: B 88
Current environmental impact rating: A 99

N Solar water heating — Recommended
U Solar photovoltaic panels — Already installed
V2 Wind turbine — Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.4	-£ 47	-26 kg (28.0%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£47	0.36 kg/m²	B 89	A 99
Total Savings	£47	0.36 kg/m²		

Potential energy efficiency rating: B 89
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£55	£78	-£23
Community scheme	£428	£360	£69
Space heating	£179	£202	-£23
Water heating	£255	£187	£69
Lighting	£50	£50	£0
Generated (PV)	-£176	-£177	£1
Total cost of fuels	£307	£261	£47
Total cost of uses	£308	£262	£47
Delivered energy	57 kWh/m²	44 kWh/m²	14 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	20 kWh/m²	15 kWh/m²	4 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120 (1b) - (3b)	
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff													
	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers													
	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths													
	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses													
	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	
Distribution loss (46)m = 0.15 x (45)m													
	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												623.4568	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												623.4568	
Solar input	-0.0000	-16.2208	-58.0195	-79.9223	-105.1350	-97.1484	-96.5940	-84.1560	-57.6291	-28.6318	-0.0000	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	257.1882	211.3732	183.9246	132.9320	101.3423	89.0407	87.1521	106.7357	135.2126	186.2632	228.3672	254.3760	(64)
											Total per year (kWh/year) = Sum(64)m =	1973.9077	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
299.7288 302.8391 295.0013 278.3158 257.2532 237.4574 224.2325 221.1223 228.9600 245.6456 266.7082 286.5040 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 (71)
Water heating gains (Table 5)
149.6734 147.3454 142.8606 133.0310 127.0102 120.7169 116.8514 120.0449 123.7891 130.7722 140.1950 148.4166 (72)
Total internal gains
570.7610 568.7779 552.3532 521.4980 490.9997 463.3358 446.9330 449.7815 465.4657 493.4744 527.3747 556.9668 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	9.8900	36.7938	0.6800	0.7000	0.7700	120.0360	(79)
Southwest	2.0370	36.7938	0.6800	0.7000	0.7700	24.7233	(79)

Solar gains	144.7593	246.5786	337.3796	418.0297	468.2281	464.8421	448.1574	410.7072	365.3108	272.5219	173.3883	123.8838 (83)
Total gains	715.5203	815.3566	889.7328	939.5277	959.2278	928.1780	895.0904	860.4887	830.7765	765.9963	700.7629	680.8506 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area	0.9344	0.8894	0.8164	0.7033	0.5578	0.4054	0.2907	0.3159	0.4842	0.7301	0.8908	0.9457	(86)
MIT	20.3207	20.5159	20.7194	20.8815	20.9666	20.9942	20.9991	20.9986	20.9865	20.8798	20.5782	20.2558	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house	0.9234	0.8728	0.7920	0.6693	0.5158	0.3577	0.2400	0.2633	0.4328	0.6908	0.8716	0.9363	(89)
MIT 2	19.4602	19.6954	19.9340	20.1144	20.2010	20.2253	20.2287	20.2284	20.2196	20.1172	19.7754	19.3808	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.7526	19.9742	20.2009	20.3751	20.4611	20.4866	20.4904	20.4901	20.4802	20.3763	20.0482	19.6781	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7526	19.9742	20.2009	20.3751	20.4611	20.4866	20.4904	20.4901	20.4802	20.3763	20.0482	19.6781	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9156	0.8668	0.7910	0.6759	0.5286	0.3737	0.2572	0.2811	0.4497	0.6986	0.8666	0.9284	(94)
Useful gains	655.1547	706.7726	703.7872	635.0425	507.0716	346.8865	230.1964	241.8992	373.5980	535.1336	607.2942	632.1315	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	915.1644	892.7561	811.4226	679.6005	518.8675	348.6278	230.4080	242.2340	377.8617	578.9937	766.8453	916.6779	(97)
Space heating kWh	193.4472	124.9809	80.0807	32.0818	8.7762	0.0000	0.0000	0.0000	0.0000	32.6319	114.8768	211.7025	(98a)
Space heating requirement - total per year (kWh/year)												798.5779	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	193.4472	124.9809	80.0807	32.0818	8.7762	0.0000	0.0000	0.0000	0.0000	32.6319	114.8768	211.7025	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												798.5779	
Space heating per m2											(98c) / (4) =	11.1658	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement

	193.4472	124.9809	80.0807	32.0818	8.7762	0.0000	0.0000	0.0000	0.0000	32.6319	114.8768	211.7025 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	290.1708	187.4713	120.1211	48.1227	13.1643	0.0000	0.0000	0.0000	0.0000	48.9479	172.3151	317.5538
Space heating requirement												
	290.1708	187.4713	120.1211	48.1227	13.1643	0.0000	0.0000	0.0000	0.0000	48.9479	172.3151	317.5538 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating
Annual water heating requirement

	257.1882	211.3732	183.9246	132.9320	101.3423	89.0407	87.1521	106.7357	135.2126	186.2632	228.3672	254.3760 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	385.7824	317.0598	275.8868	199.3980	152.0134	133.5610	130.7281	160.1036	202.8189	279.3948	342.5508	381.5640
Water heating fuel												
	385.7824	317.0598	275.8868	199.3980	152.0134	133.5610	130.7281	160.1036	202.8189	279.3948	342.5508	381.5640 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	8.4649	7.6457	8.4649	8.1918	8.4649	8.1918	8.4649	8.4649	8.1918	8.4649	8.1918	8.4649 (331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-14.9141	-24.7783	-42.2847	-54.5605	-63.6655	-61.0911	-59.9595	-53.8492	-43.4933	-30.8592	-17.4193	-12.3313 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												

(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5846	-11.8000	-29.7107	-54.3035	-80.3253	-84.0609	-81.7814	-63.8933	-39.9691	-18.6376	-6.5308	-3.4177	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1197.8669	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2960.8616	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	11.9787	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.6671	(331)
Electricity for lighting (calculated in Appendix L)	174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3474.8888	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1197.8669	4.4400	53.1853	(340a)
Space heating total			53.1853	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2960.8616	4.4400	131.4623	(342a)
Water heating total			131.4623	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	16.4900	3.2431	(349)
Pump for solar water heating	80.0000	16.4900	13.1920	(349)
Energy for lighting	174.7141	16.4900	28.8104	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-479.2061	16.4900	-79.0211	
PV Unit electricity exported	-479.0149	5.5900	-26.7769	
Total			-105.7980	(352)
Total energy cost			216.0950	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.6676	(357)
SAP value	89.1774	
SAP rating (Section 12)	89	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1108.9943	0.1576	50.3277	(367)
Electrical energy for heat distribution (space & water)	11.9787	0.0000	6.1826	(372)
Overall CO2 factor for heat network			0.0411	(386)
Total CO2 associated with community systems			171.0527	(373)
Space and water heating			171.0527	(376)
Pumps, fans and electric keep-hot	99.6671	0.1387	13.8251	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-479.2061	0.1320	-63.2320	
PV Unit electricity exported	-479.0149	0.1214	-58.1324	
Total			-121.3643	(380)
Total CO2, kg/year			88.7300	(383)
CO2 emissions per m2			1.2400	(384)
EI value			98.9796	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120 (1b) - (3b)	
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)

Average = Sum(39)m / 12 =	59.2241

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2825 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day)	117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	

Distribution loss (46)m = 0.15 x (45)m

30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:

Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												697.5235	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												697.5235	
Solar input	-0.3007	-19.8927	-63.0021	-86.8105	-108.5158	-108.4282	-105.5589	-94.8548	-67.4076	-37.8155	-4.9366	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	256.8875	207.7013	178.9419	126.0438	97.9614	77.7608	78.1872	96.0370	125.4340	177.0795	223.4306	254.3760	(64)
											Total per year (kWh/year) = Sum(64)m =	1899.8410	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)													
	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains													
	570.7610	568.7779	552.3532	521.4980	490.9997	463.3358	446.9330	449.7815	465.4657	493.4744	527.3747	556.9668	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	9.8900	42.9509	0.6800	0.7000	0.7700	140.1229	(79)
Southwest	2.0370	42.9509	0.6800	0.7000	0.7700	28.8605	(79)

Solar gains	168.9834	255.7923	345.6414	435.9036	473.4466	505.7912	477.8325	443.9806	395.8869	298.4015	199.3503	145.4902	(83)
Total gains	739.7444	824.5702	897.9946	957.4016	964.4463	969.1270	924.7655	893.7621	861.3526	791.8759	726.7249	702.4571	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9224	0.8794	0.7967	0.6762	0.5281	0.3531	0.2496	0.2714	0.4487	0.6880	0.8686	0.9358	(86)
MIT	20.3875	20.5536	20.7589	20.9035	20.9750	20.9972	20.9996	20.9994	20.9907	20.9120	20.6432	20.3220	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9097	0.8616	0.7702	0.6409	0.4853	0.3067	0.2003	0.2205	0.3981	0.6460	0.8463	0.9248	(89)
MIT 2	19.5417	19.7405	19.9792	20.1374	20.2087	20.2274	20.2289	20.2288	20.2229	20.1498	19.8515	19.4623	(90)
Living area fraction											fLA = Living area / (4) =	0.3398	(91)
MIT	19.8291	20.0167	20.2441	20.3977	20.4691	20.4889	20.4908	20.4906	20.4838	20.4088	20.1205	19.7544	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8291	20.0167	20.2441	20.3977	20.4691	20.4889	20.4908	20.4906	20.4838	20.4088	20.1205	19.7544	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9022	0.8563	0.7707	0.6488	0.4988	0.3224	0.2171	0.2378	0.4150	0.6561	0.8429	0.9171	(94)
Useful gains	667.4151	706.0404	692.1204	621.1730	481.0632	312.4263	200.7315	212.5164	357.4454	519.5434	612.5867	644.2153	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	901.9286	877.5071	784.3724	657.2523	489.7290	313.2329	200.8155	212.6523	360.3050	551.3048	747.4374	903.4284	(97)
Space heating kWh	174.4780	115.2256	68.6356	25.9771	6.4473	0.0000	0.0000	0.0000	0.0000	23.6305	97.0925	192.8545	(98a)
Space heating requirement - total per year (kWh/year)												704.3413	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	174.4780	115.2256	68.6356	25.9771	6.4473	0.0000	0.0000	0.0000	0.0000	23.6305	97.0925	192.8545	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												704.3413	
Space heating per m2											(98c) / (4) =	9.8482	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement													
	174.4780	115.2256	68.6356	25.9771	6.4473	0.0000	0.0000	0.0000	0.0000	23.6305	97.0925	192.8545	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	261.7171	172.8385	102.9533	38.9657	9.6710	0.0000	0.0000	0.0000	0.0000	35.4458	145.6388	289.2818	
Space heating requirement													
	261.7171	172.8385	102.9533	38.9657	9.6710	0.0000	0.0000	0.0000	0.0000	35.4458	145.6388	289.2818	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	256.8875	207.7013	178.9419	126.0438	97.9614	77.7608	78.1872	96.0370	125.4340	177.0795	223.4306	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.3312	311.5520	268.4128	189.0656	146.9421	116.6412	117.2807	144.0554	188.1511	265.6193	335.1459	381.5640	
Water heating fuel													
	385.3312	311.5520	268.4128	189.0656	146.9421	116.6412	117.2807	144.0554	188.1511	265.6193	335.1459	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	8.4649	7.6457	8.4649	8.1918	8.4649	8.1918	8.4649	8.4649	8.1918	8.4649	8.1918	8.4649	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.8133	-26.5889	-44.4924	-57.3150	-64.9996	-64.6716	-62.8712	-57.4038	-47.1375	-34.3017	-20.4312	-14.8426	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.1852	-13.3763	-32.7527	-60.2581	-84.2408	-96.4471	-91.6189	-73.8378	-47.2113	-22.6946	-8.5992	-4.6561	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1056.5119	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2849.7616	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	10.5651	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.6671	(331)
Electricity for lighting (calculated in Appendix L)	174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3125.9077	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1056.5119	6.5500	69.2015	(340a)
Space heating total			69.2015	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2849.7616	6.5500	186.6594	(342a)
Water heating total			186.6594	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	28.4300	5.5914	(349)
Pump for solar water heating	80.0000	28.4300	22.7440	(349)
Energy for lighting	174.7141	28.4300	49.6712	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-512.8689	28.4300	-145.8086	
PV Unit electricity exported	-541.8781	5.8100	-31.4831	
Total			-177.2917	(352)
Total energy cost			260.5758	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1041.6729	0.1580	44.5012	(367)
Electrical energy for heat distribution (space & water)	10.5651	0.0000	5.8207	(372)
Overall CO2 factor for heat network			0.0412	(386)
Total CO2 associated with community systems			161.0385	(373)
Space and water heating			161.0385	(376)
Pumps, fans and electric keep-hot	99.6671	0.1387	13.8251	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-512.8689	0.1323	-67.8299	
PV Unit electricity exported	-541.8781	0.1214	-65.7869	
Total			-133.6168	(380)
Total CO2, kg/year			66.4633	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1041.6729	1.5847	446.4680	(467)
Electrical energy for heat distribution (space & water)	10.5651	0.0000	60.5981	(472)
Overall CO2 factor for heat network			0.4292	(486)
Total CO2 associated with community systems			1676.5467	(473)
Space and water heating			1676.5467	(476)
Pumps, fans and electric keep-hot	99.6671	1.5128	150.7765	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-512.8689	1.4887	-763.4867	
PV Unit electricity exported	-541.8781	0.4454	-241.3296	
Total			-1004.8163	(480)
Total Primary energy kWh/year			1090.4893	(483)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.80	**TER**	10.88
Environmental	99 A	**% DER < TER**			83.46
CO_2 Emissions (t/year)	0.1	**DFEE**	24.15	**TFEE**	32.03
Compliance Check	See BREL	**% DFEE < TFEE**			24.60
% DPER < TPER	57.59	**DPER**	24.05	**TPER**	56.71

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.2825 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day)		117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:		
Store volume		110.0000 (47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)		0.0152 (51)
Volume factor from Table 2a		1.0294 (52)
Temperature factor from Table 2b		0.6000 (53)
Enter (49) or (54) in (55)		1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
										Total per year (kWh/year) = Sum(64)m =		2597.3645	(64)
12Total per year (kWh/year)												2597	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)

Heat gains from water heating, kWh/month

111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.6996	119.2388	107.6996	111.2896	107.6996	111.2896	107.6996	107.6996	111.2896	107.6996	111.2896	107.6996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains	515.4281	526.7231	505.4479	488.0289	464.3062	448.3397	432.0236	433.1332	445.7187	460.2911	487.4158	505.3106	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.8900	19.6403	0.6800	0.7000	0.7700	64.0743	(80)
West	2.0370	19.6403	0.6800	0.7000	0.7700	13.1971	(80)

Solar gains	77.2714	151.1592	248.9377	363.0608	444.9447	455.4800	433.6356	372.4865	289.5249	179.3632	96.3483	63.5442	(83)
Total gains	592.6994	677.8824	754.3856	851.0898	909.2509	903.8197	865.6592	805.6198	735.2435	639.6543	583.7641	568.8548	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9664	0.9381	0.8805	0.7530	0.5845	0.4160	0.3005	0.3371	0.5418	0.8154	0.9387	0.9718	(86)
MIT	20.1176	20.3268	20.5876	20.8394	20.9591	20.9936	20.9990	20.9982	20.9781	20.8000	20.4165	20.0628	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9599	0.9272	0.8610	0.7201	0.5415	0.3672	0.2481	0.2811	0.4859	0.7804	0.9259	0.9664	(89)
MIT 2	19.2106	19.4693	19.7842	20.0710	20.1944	20.2249	20.2286	20.2282	20.2135	20.0358	19.5843	19.1422	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.5188	19.7607	20.0572	20.3321	20.4542	20.4860	20.4904	20.4898	20.4733	20.2954	19.8670	19.4550	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5188	19.7607	20.0572	20.3321	20.4542	20.4860	20.4904	20.4898	20.4733	20.2954	19.8670	19.4550	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9528	0.9195	0.8563	0.7247	0.5543	0.3835	0.2659	0.3001	0.5039	0.7837	0.9189	0.9596	(94)
Useful gains	564.7170	623.3387	645.9790	616.7599	504.0057	346.6426	230.1559	241.7651	370.4730	501.2766	536.4375	545.8828	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	901.3170	880.1092	802.9129	677.0558	518.4613	348.5959	230.4025	242.2160	377.4510	574.2031	756.1163	903.4611	(97)
Space heating kWh													
	250.4305	172.5498	116.7588	43.4131	10.7550	0.0000	0.0000	0.0000	0.0000	54.2573	158.1687	266.0383	(98a)
Space heating requirement - total per year (kWh/year)												1072.3714	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	250.4305	172.5498	116.7588	43.4131	10.7550	0.0000	0.0000	0.0000	0.0000	54.2573	158.1687	266.0383	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1072.3714	
Space heating per m2											(98c) / (4) =	14.9940	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	250.4305	172.5498	116.7588	43.4131	10.7550	0.0000	0.0000	0.0000	0.0000	54.2573	158.1687	266.0383	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	375.6457	258.8247	175.1383	65.1196	16.1324	0.0000	0.0000	0.0000	0.0000	81.3860	237.2531	399.0574	
Space heating requirement													
	375.6457	258.8247	175.1383	65.1196	16.1324	0.0000	0.0000	0.0000	0.0000	81.3860	237.2531	399.0574	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.8619	-24.6522	-41.9801	-54.0165	-62.8534	-60.2005	-59.0498	-53.1061	-43.0156	-30.6311	-17.3392	-12.2904	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.6369	-11.9261	-30.0153	-54.8475	-81.1374	-84.9515	-82.6912	-64.6364	-40.4468	-18.8657	-6.6109	-3.4586	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1608.5572	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3896.0468	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												16.0856	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.6671	(330a)
Total electricity for the above, kWh/year												19.6671	(331)
Electricity for lighting (calculated in Appendix L)												174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4740.7643	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1467.8944	0.1572	67.4187	(367)
Electrical energy for heat distribution (space & water)	16.0856	0.0000	8.0162	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			221.7808	(373)
Space and water heating			221.7808	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	0.1320	-62.5726	
PV Unit electricity exported	-484.2242	0.1214	-58.7607	
Total			-121.3332	(380)
Total CO2, kg/year			128.3923	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.8000	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1467.8944	1.5818	678.5237	(467)
Electrical energy for heat distribution (space & water)	16.0856	0.0000	84.6976	(472)
Overall CO2 factor for heat network			0.4257	(486)
Total CO2 associated with community systems			2343.2993	(473)
Space and water heating			2343.2993	(476)
Pumps, fans and electric keep-hot	19.6671	1.5128	29.7525	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	1.4877	-705.1878	
PV Unit electricity exported	-484.2242	0.4452	-215.5829	
Total			-920.7707	(480)
Total Primary energy kWh/year			1720.2634	(483)
Dwelling Primary energy Rate (DPER)			24.0500	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b) x	2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c) x	2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3264	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3020	0.3264	0.3509	0.3672	0.3836	(22b)
Effective ac	0.5866	0.5833	0.5800	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			11.9270	1.1450	13.6603			(27)
Heatloss floor			35.7600	0.1300	4.6488			(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.1800	6.3023			(29a)
500mm mineral wool	35.7600		35.7600	0.1100	3.9336			(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5850			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.9097 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.0600	0.0500	0.3530
E3 Sill	3.7400	0.0500	0.1870
E4 Jamb	23.3600	0.0500	1.1680
E5 Ground floor (normal)	11.1200	0.1600	1.7792
E6 Intermediate floor within a dwelling	4.0300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.3800	0.0600	0.3828
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	12.9900	0.0800	1.0392
P2 Party wall - Intermediate floor within a dwelling	15.4400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	15.4400	0.1200	1.8528
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.3500	0.0200	0.0470

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.3690 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 38.9540 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.9203	33.7259	33.5352	32.6398	32.4723	31.6925	31.6925	31.5481	31.9929	32.4723	32.8112	33.1655	(38)
Heat transfer coeff	72.8744	72.6799	72.4893	71.5939	71.4264	70.6465	70.6465	70.5021	70.9469	71.4264	71.7653	72.1196	(39)
Average = Sum(39)m / 12 =												71.5931	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0189	1.0162	1.0136	1.0010	0.9987	0.9878	0.9878	0.9858	0.9920	0.9987	1.0034	1.0084	(40)
HLP (average)												1.0010	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

Hot water usage for mixer showers

62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day) 117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	248.5063	219.7523	233.2621	204.4524	197.7953	177.7872	175.0641	182.2099	184.4398	206.2131	219.9654	245.6941	(62)
WWHRS	-28.5673	-25.2652	-26.4562	-21.9068	-20.4164	-17.4704	-16.3757	-17.4139	-18.0756	-21.3091	-24.1406	-28.0383	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
									Total per year (kWh/year) = Sum(64)m =			2229.7066	(64)
12Total per year (kWh/year)												2230	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	104.4115	92.7427	99.3428	89.0609	87.5501	80.1947	79.9919	82.3679	82.4067	90.3490	94.2189	103.4764	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.8362	116.0686	104.8362	108.3307	104.8362	108.3307	104.8362	104.8362	108.3307	104.8362	108.3307	104.8362	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	140.3380	138.0100	133.5252	123.6956	117.6748	111.3815	107.5160	110.7095	114.4537	121.4368	130.8596	139.0812	(72)
Total internal gains													

	506.2293	517.2176	496.2491	478.7347	455.1075	436.0455	419.8249	420.9345	433.4245	451.0924	478.1216	496.1119	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	11.9270	19.6403	0.6300	0.7000	0.7700	71.5897	(80)

Solar gains	71.5897	140.0446	230.6335	336.3652	412.2282	421.9889	401.7506	345.0978	268.2363	166.1747	89.2639	58.8719	(83)
Total gains	577.8190	657.2622	726.8826	815.0999	867.3356	858.0344	821.5755	766.0323	701.6608	617.2671	567.3855	554.9837	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.9557	48.0840	48.2104	48.8134	48.9279	49.4680	49.4680	49.5693	49.2585	48.9279	48.6968	48.4576	
alpha	4.1970	4.2056	4.2140	4.2542	4.2619	4.2979	4.2979	4.3046	4.2839	4.2619	4.2465	4.2305	
util living area													
	0.9765	0.9592	0.9236	0.8335	0.6896	0.5105	0.3747	0.4173	0.6446	0.8767	0.9586	0.9797	(86)
MIT	19.6811	19.9089	20.2318	20.6207	20.8657	20.9713	20.9939	20.9905	20.9243	20.5905	20.0799	19.6471	(87)
Th 2	20.0676	20.0698	20.0721	20.0825	20.0844	20.0935	20.0935	20.0952	20.0900	20.0844	20.0805	20.0764	(88)
util rest of house													
	0.9714	0.9508	0.9081	0.8023	0.6391	0.4440	0.2992	0.3379	0.5757	0.8456	0.9486	0.9754	(89)
MIT 2	18.5438	18.8308	19.2316	19.7007	19.9682	20.0749	20.0910	20.0909	20.0351	19.6793	19.0568	18.5072	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	18.9302	19.1971	19.5714	20.0133	20.2732	20.3795	20.3978	20.3965	20.3372	19.9889	19.4044	18.8945	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9302	19.1971	19.5714	20.0133	20.2732	20.3795	20.3978	20.3965	20.3372	19.9889	19.4044	18.8945	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9635	0.9410	0.8983	0.7998	0.6500	0.4654	0.3248	0.3647	0.5952	0.8419	0.9394	0.9681	(94)
Useful gains	556.7074	618.5041	652.9330	651.8923	563.7341	399.3278	266.8216	279.3473	417.6525	519.6993	533.0088	537.2541	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1066.1689	1039.1099	947.5387	795.6428	612.3498	408.2987	268.2979	281.7634	442.5112	670.6156	883.0306	1059.7608	(97)
Space heating kWh													
	379.0393	282.6471	219.1867	103.5004	36.1701	0.0000	0.0000	0.0000	0.0000	112.2818	252.0157	388.7449	(98a)
Space heating requirement - total per year (kWh/year)												1773.5859	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	379.0393	282.6471	219.1867	103.5004	36.1701	0.0000	0.0000	0.0000	0.0000	112.2818	252.0157	388.7449	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1773.5859	
Space heating per m2											(98c) / (4) =	24.7985	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	379.0393	282.6471	219.1867	103.5004	36.1701	0.0000	0.0000	0.0000	0.0000	112.2818	252.0157	388.7449	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	410.6601	306.2266	237.4720	112.1347	39.1875	0.0000	0.0000	0.0000	0.0000	121.6487	273.0398	421.1754	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.2688	84.8971	84.1904	82.8378	81.1938	79.8000	79.8000	79.8000	79.8000	82.9774	84.6266	85.3452	(217)
Fuel for water heating, kWh/month													
	257.9361	229.0856	245.6407	220.3650	218.4637	200.8982	198.8576	206.5112	208.4765	222.8366	231.3986	255.0301	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.7829	17.4750	15.7343	11.5277	8.9043	7.2749	8.1228	10.5583	13.7142	17.9938	20.3239	22.3883	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.5568	-47.3592	-68.1531	-76.7310	-82.8400	-77.3720	-76.4273	-72.1080	-64.4904	-54.2111	-36.9141	-29.0069	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-18.8029	-39.5749	-78.6914	-118.2335	-156.3709	-157.1182	-155.2578	-131.4301	-96.3075	-56.5975	-25.1064	-14.8664	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1921.5449	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2695.5000	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	175.8004	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1767.5275	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3111.3177	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1921.5449	0.2100	403.5244	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2695.5000	0.2100	566.0550	(264)
Space and water heating			969.5794	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	175.8004	0.1443	25.3734	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	0.1346	-96.7689	
PV Unit electricity exported	-1048.3576	0.1259	-131.9744	
Total			-228.7433	(269)
Total CO2, kg/year			778.1388	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.8800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1921.5449	1.1300	2171.3457	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2695.5000	1.1300	3045.9150	(278)
Space and water heating			5217.2607	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	175.8004	1.5338	269.6485	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	1.4973	-1076.8103	
PV Unit electricity exported	-1048.3576	0.4621	-484.4365	
Total			-1561.2467	(283)
Total Primary energy kWh/year			4055.7633	(286)
Target Primary Energy Rate (TPER)			56.7100	(287)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.80	**TER**	10.88
Environmental	99 A	**% DER < TER**			83.46
CO_2 Emissions (t/year)	0.1	**DFEE**	24.15	**TFEE**	32.03
Compliance Check	See BREL	**% DFEE < TFEE**			24.60
% DPER < TPER	57.59	**DPER**	24.05	**TPER**	56.71

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2489	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3174	0.3112	0.3049	0.2738	0.2676	0.2365	0.2365	0.2303	0.2489	0.2676	0.2801	0.2925	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

Effective ac	0.5504	0.5484	0.5465	0.5375	0.5358	0.5280	0.5280	0.5265	0.5310	0.5358	0.5392	0.5428	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 12581.0601	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	175.9097	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.6151	(36)

Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss										(33) + (36) + (36a) =		30.3121	(37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	31.8245	31.7114	31.6006	31.0799	30.9825	30.5289	30.5289	30.4450	30.7036	30.9825	31.1795	31.3856	(38)
Heat transfer coeff	62.1367	62.0236	61.9127	61.3920	61.2946	60.8411	60.8411	60.7571	61.0158	61.2946	61.4917	61.6977	(39)
Average = Sum(39)m / 12 =												61.3916	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8688	0.8672	0.8657	0.8584	0.8570	0.8507	0.8507	0.8495	0.8531	0.8570	0.8598	0.8627	(40)
HLP (average)												0.8584	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												59.5787	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.0001	63.2172	61.2706	58.8477	56.6862	54.4399	53.9730	55.9157	57.9081	60.2149	62.6593	64.9088	(44)
Energy conte	102.9443	90.0205	94.1707	80.5595	76.3105	66.9402	65.2757	69.2353	71.4064	81.7111	89.2697	101.6316	(45)
Energy content (annual)										Total = Sum(45)m =		989.4754	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(64)
										Total per year (kWh/year) = Sum(64)m =		841.0541	(64)
12Total per year (kWh/year)												841	(64)
Electric shower(s)	50.0432	44.5889	48.6894	46.4637	47.3355	45.1535	46.6586	47.3355	46.4637	48.6894	47.7738	50.0432	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		569.2384	(64a)
Heat gains from water heating, kWh/month	34.3865	30.2766	32.1836	28.7348	28.0499	25.5132	25.5357	26.5464	26.7898	29.5359	30.9133	34.1075	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.6996	119.2388	107.6996	111.2896	107.6996	111.2896	107.6996	107.6996	111.2896	107.6996	111.2896	107.6996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	46.2184	45.0544	43.2575	39.9095	37.7014	35.4350	34.3222	35.6806	37.2080	39.6988	42.9351	45.8434	(72)
Total internal gains	411.9730	424.4322	405.8448	394.9074	374.9975	363.0578	349.4944	348.7689	359.1376	369.2178	390.1559	402.7375	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.8900	19.6403	0.6800	0.7000	0.7700	64.0743	(80)
West	2.0370	19.6403	0.6800	0.7000	0.7700	13.1971	(80)

Solar gains	77.2714	151.1592	248.9377	363.0608	444.9447	455.4800	433.6356	372.4865	289.5249	179.3632	96.3483	63.5442	(83)
Total gains	489.2444	575.5914	654.7825	757.9682	819.9421	818.5378	783.1300	721.2555	648.6625	548.5809	486.5042	466.2817	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.2428	56.3453	56.4462	56.9250	57.0154	57.4404	57.4404	57.5198	57.2760	57.0154	56.8327	56.6429	
alpha	4.7495	4.7564	4.7631	4.7950	4.8010	4.8294	4.8294	4.8347	4.8184	4.8010	4.7888	4.7762	
util living area	0.9849	0.9678	0.9281	0.8190	0.6531	0.4687	0.3406	0.3851	0.6182	0.8834	0.9699	0.9878	(86)

MIT	19.8341	20.0735	20.3912	20.7432	20.9274	20.9879	20.9979	20.9963	20.9578	20.6784	20.1949	19.7899 (87)
Th 2	20.1941	20.1955	20.1968	20.2030	20.2042	20.2096	20.2096	20.2106	20.2075	20.2042	20.2018	20.1994 (88)
util rest of house												
	0.9817	0.9613	0.9142	0.7890	0.6074	0.4134	0.2800	0.3201	0.5569	0.8555	0.9626	0.9851 (89)
MIT 2	19.1299	19.3657	19.6731	20.0013	20.1552	20.2034	20.2089	20.2093	20.1835	19.9530	19.4925	19.0905 (90)
Living area fraction										fLA = Living area / (4) =		0.3398 (91)
MIT	19.3691	19.6062	19.9171	20.2534	20.4176	20.4700	20.4770	20.4767	20.4466	20.1994	19.7312	19.3281 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3691	19.6062	19.9171	20.2534	20.4176	20.4700	20.4770	20.4767	20.4466	20.1994	19.7312	19.3281 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9776	0.9556	0.9086	0.7910	0.6200	0.4318	0.3006	0.3421	0.5759	0.8553	0.9574	0.9815	(94)
Useful gains	478.2776	550.0109	594.9630	599.5662	508.3514	353.4402	235.3777	246.7579	373.5646	469.1850	465.7776	457.6444	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	936.3469	912.1310	830.6888	697.0090	534.3408	357.1366	235.8797	247.6866	387.2400	588.3936	776.7123	933.3703	(97)
Space heating kWh													
	340.8035	243.3448	175.3800	70.1588	19.3361	0.0000	0.0000	0.0000	0.0000	88.6912	223.8729	353.9401	(98a)
Space heating requirement - total per year (kWh/year)												1515.5275	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	340.8035	243.3448	175.3800	70.1588	19.3361	0.0000	0.0000	0.0000	0.0000	88.6912	223.8729	353.9401	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1515.5275	
Space heating per m2											(98c) / (4) =	21.1903	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	571.9062	450.2240	461.7539	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9580	0.9797	0.9694	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	547.8683	441.0946	447.6135	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	911.3212	872.2100	802.0383	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	261.6861	320.7499	263.6921	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	65.4215	80.1875	65.9230	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												211.5320	(107)
Energy for space heating												21.1903	(99)
Energy for space cooling												2.9577	(108)
Total												24.1479	(109)
Fabric Energy Efficiency (DFEE)												24.1	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor		35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3264	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3020	0.3264	0.3509	0.3672	0.3836	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5866	0.5833	0.5800	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			11.9270	1.1450	13.6603			(27)
Heatloss floor			35.7600	0.1300	4.6488			(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.1800	6.3023			(29a)
500mm mineral wool	35.7600		35.7600	0.1100	3.9336			(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5850			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	175.9097	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.0600	0.0500	0.3530
E3 Sill	3.7400	0.0500	0.1870
E4 Jamb	23.3600	0.0500	1.1680
E5 Ground floor (normal)	11.1200	0.1600	1.7792
E6 Intermediate floor within a dwelling	4.0300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.3800	0.0600	0.3828
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	12.9900	0.0800	1.0392
P2 Party wall - Intermediate floor within a dwelling	15.4400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	15.4400	0.1200	1.8528
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.3500	0.0200	0.0470

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.3690	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	38.9540	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.9203	33.7259	33.5352	32.6398	32.4723	31.6925	31.6925	31.5481	31.9929	32.4723	32.8112	33.1655	(38)
Heat transfer coeff													
	72.8744	72.6799	72.4893	71.5939	71.4264	70.6465	70.6465	70.5021	70.9469	71.4264	71.7653	72.1196	(39)
Average = Sum(39)m / 12 =												71.5931	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0189	1.0162	1.0136	1.0010	0.9987	0.9878	0.9878	0.9858	0.9920	0.9987	1.0034	1.0084	(40)
HLP (average)												1.0010	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2825	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses													
	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												59.5787	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	65.0001	63.2172	61.2706	58.8477	56.6862	54.4399	53.9730	55.9157	57.9081	60.2149	62.6593	64.9088	(44)
Energy conte	102.9443	90.0205	94.1707	80.5595	76.3105	66.9402	65.2757	69.2353	71.4064	81.7111	89.2697	101.6316	(45)
Energy content (annual)										Total = Sum(45)m =		989.4754	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	87.5026	76.5174	80.0451	68.4756	64.8639	56.8992	55.4844	58.8500	60.6955	69.4544	75.8792	86.3868	(64)
										Total per year (kWh/year) = Sum(64)m =		841.0541	(64)
12Total per year (kWh/year)												841	(64)
Electric shower(s)													
	50.0432	44.5889	48.6894	46.4637	47.3355	45.1535	46.6586	47.3355	46.4637	48.6894	47.7738	50.0432	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		569.2384	(64a)
Heat gains from water heating, kWh/month													
	34.3865	30.2766	32.1836	28.7348	28.0499	25.5132	25.5357	26.5464	26.7898	29.5359	30.9133	34.1075	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	104.8362	116.0686	104.8362	108.3307	104.8362	108.3307	104.8362	104.8362	108.3307	104.8362	108.3307	104.8362 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982 (71)

Water heating gains (Table 5)

	46.2184	45.0544	43.2575	39.9095	37.7014	35.4350	34.3222	35.6806	37.2080	39.6988	42.9351	45.8434 (72)

Total internal gains

	409.1097	421.2621	402.9814	391.9486	372.1341	360.0989	346.6311	345.9056	356.1788	366.3544	387.1971	399.8741 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	11.9270	19.6403	0.6300	0.7000	0.7700	71.5897	(80)

Solar gains	71.5897	140.0446	230.6335	336.3652	412.2282	421.9889	401.7506	345.0978	268.2363	166.1747	89.2639	58.8719 (83)
Total gains	480.6993	561.3066	633.6149	728.3137	784.3622	782.0878	748.3817	691.0034	624.4151	532.5291	476.4610	458.7460 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.9557	48.0840	48.2104	48.8134	48.9279	49.4680	49.4680	49.5693	49.2585	48.9279	48.6968	48.4576	
alpha	4.1970	4.2056	4.2140	4.2542	4.2619	4.2979	4.2979	4.3046	4.2839	4.2619	4.2465	4.2305	
util living area	0.9876	0.9758	0.9493	0.8727	0.7373	0.5536	0.4097	0.4596	0.7015	0.9171	0.9769	0.9897	(86)
MIT	19.5003	19.7416	20.0904	20.5319	20.8255	20.9610	20.9914	20.9862	20.8952	20.4833	19.9208	19.4654	(87)
Th 2	20.0676	20.0698	20.0721	20.0825	20.0844	20.0935	20.0935	20.0952	20.0900	20.0844	20.0805	20.0764	(88)
util rest of house	0.9848	0.9704	0.9380	0.8459	0.6881	0.4836	0.3279	0.3735	0.6325	0.8932	0.9708	0.9874	(89)
MIT 2	18.7025	18.9420	19.2841	19.7080	19.9643	20.0734	20.0907	20.0902	20.0289	19.6747	19.1293	18.6745	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	18.9736	19.2137	19.5580	19.9879	20.2569	20.3750	20.3967	20.3947	20.3232	19.9494	19.3982	18.9432	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9736	19.2137	19.5580	19.9879	20.2569	20.3750	20.3967	20.3947	20.3232	19.9494	19.3982	18.9432	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9805	0.9642	0.9305	0.8428	0.6979	0.5059	0.3556	0.4025	0.6512	0.8891	0.9650	0.9836	(94)
Useful gains	471.3216	541.2028	589.5901	613.8489	547.4295	395.6872	266.1233	278.0989	406.6322	473.4699	459.8083	451.2075	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1069.3277	1040.3166	946.5684	793.8289	611.1905	407.9842	268.2243	281.6317	441.5202	667.7967	882.5843	1063.2751	(97)
Space heating kWh	444.9165	335.4045	265.5919	129.5856	47.4382	0.0000	0.0000	0.0000	0.0000	144.5791	304.3987	455.3783	(98a)
Space heating requirement - total per year (kWh/year)												2127.2927	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	444.9165	335.4045	265.5919	129.5856	47.4382	0.0000	0.0000	0.0000	0.0000	144.5791	304.3987	455.3783	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2127.2927	
Space heating per m2										(98c) / (4) =		29.7440	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	664.0772	522.7842	535.8159	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9032	0.9454	0.9251	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	599.7645	494.2384	495.6975	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	871.9251	834.6712	769.6736	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	195.9556	253.2820	203.8382	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	48.9889	63.3205	50.9596	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												163.2690	(107)
Energy for space heating												29.7440	(99)
Energy for space cooling												2.2828	(108)
Total												32.0269	(109)
Fabric Energy Efficiency (TFEE)												32.0	(109)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.80	**TER**	10.88
Environmental	99 A	**% DER < TER**			83.46
CO_2 Emissions (t/year)	0.1	**DFEE**	24.15	**TFEE**	32.03
Compliance Check	See BREL	**% DFEE < TFEE**			24.60
% DPER < TPER	57.59	**DPER**	24.05	**TPER**	56.71

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.2825 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day)		117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:		
Store volume		110.0000 (47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)		0.0152 (51)
Volume factor from Table 2a		1.0294 (52)
Temperature factor from Table 2b		0.6000 (53)
Enter (49) or (54) in (55)		1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
										Total per year (kWh/year) = Sum(64)m =		2597.3645	(64)
12Total per year (kWh/year)												2597	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)

Heat gains from water heating, kWh/month

111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.6996	119.2388	107.6996	111.2896	107.6996	111.2896	107.6996	107.6996	111.2896	107.6996	111.2896	107.6996	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains	515.4281	526.7231	505.4479	488.0289	464.3062	448.3397	432.0236	433.1332	445.7187	460.2911	487.4158	505.3106	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.8900	19.6403	0.6800	0.7000	0.7700	64.0743	(80)
West	2.0370	19.6403	0.6800	0.7000	0.7700	13.1971	(80)

Solar gains	77.2714	151.1592	248.9377	363.0608	444.9447	455.4800	433.6356	372.4865	289.5249	179.3632	96.3483	63.5442	(83)
Total gains	592.6994	677.8824	754.3856	851.0898	909.2509	903.8197	865.6592	805.6198	735.2435	639.6543	583.7641	568.8548	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9664	0.9381	0.8805	0.7530	0.5845	0.4160	0.3005	0.3371	0.5418	0.8154	0.9387	0.9718	(86)
MIT	20.1176	20.3268	20.5876	20.8394	20.9591	20.9936	20.9990	20.9982	20.9781	20.8000	20.4165	20.0628	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9599	0.9272	0.8610	0.7201	0.5415	0.3672	0.2481	0.2811	0.4859	0.7804	0.9259	0.9664	(89)
MIT 2	19.2106	19.4693	19.7842	20.0710	20.1944	20.2249	20.2286	20.2282	20.2135	20.0358	19.5843	19.1422	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.5188	19.7607	20.0572	20.3321	20.4542	20.4860	20.4904	20.4898	20.4733	20.2954	19.8670	19.4550	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5188	19.7607	20.0572	20.3321	20.4542	20.4860	20.4904	20.4898	20.4733	20.2954	19.8670	19.4550	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9528	0.9195	0.8563	0.7247	0.5543	0.3835	0.2659	0.3001	0.5039	0.7837	0.9189	0.9596	(94)
Useful gains	564.7170	623.3387	645.9790	616.7599	504.0057	346.6426	230.1559	241.7651	370.4730	501.2766	536.4375	545.8828	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	901.3170	880.1092	802.9129	677.0558	518.4613	348.5959	230.4025	242.2160	377.4510	574.2031	756.1163	903.4611	(97)
Space heating kWh													
	250.4305	172.5498	116.7588	43.4131	10.7550	0.0000	0.0000	0.0000	0.0000	54.2573	158.1687	266.0383	(98a)
Space heating requirement - total per year (kWh/year)												1072.3714	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	250.4305	172.5498	116.7588	43.4131	10.7550	0.0000	0.0000	0.0000	0.0000	54.2573	158.1687	266.0383	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1072.3714	
Space heating per m2											(98c) / (4) =	14.9940	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	250.4305	172.5498	116.7588	43.4131	10.7550	0.0000	0.0000	0.0000	0.0000	54.2573	158.1687	266.0383	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	375.6457	258.8247	175.1383	65.1196	16.1324	0.0000	0.0000	0.0000	0.0000	81.3860	237.2531	399.0574	
Space heating requirement													
	375.6457	258.8247	175.1383	65.1196	16.1324	0.0000	0.0000	0.0000	0.0000	81.3860	237.2531	399.0574	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.8619	-24.6522	-41.9801	-54.0165	-62.8534	-60.2005	-59.0498	-53.1061	-43.0156	-30.6311	-17.3392	-12.2904	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.6369	-11.9261	-30.0153	-54.8475	-81.1374	-84.9515	-82.6912	-64.6364	-40.4468	-18.8657	-6.6109	-3.4586	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1608.5572	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3896.0468	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												16.0856	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.6671	(330a)
Total electricity for the above, kWh/year												19.6671	(331)
Electricity for lighting (calculated in Appendix L)												174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4740.7643	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1467.8944	0.1572	67.4187	(367)
Electrical energy for heat distribution (space & water)	16.0856	0.0000	8.0162	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			221.7808	(373)
Space and water heating			221.7808	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	0.1320	-62.5726	
PV Unit electricity exported	-484.2242	0.1214	-58.7607	
Total			-121.3332	(380)
Total CO2, kg/year			128.3923	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.8000	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1467.8944	1.5818	678.5237	(467)
Electrical energy for heat distribution (space & water)	16.0856	0.0000	84.6976	(472)
Overall CO2 factor for heat network			0.4257	(486)
Total CO2 associated with community systems			2343.2993	(473)
Space and water heating			2343.2993	(476)
Pumps, fans and electric keep-hot	19.6671	1.5128	29.7525	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	1.4877	-705.1878	
PV Unit electricity exported	-484.2242	0.4452	-215.5829	
Total			-920.7707	(480)
Total Primary energy kWh/year			1720.2634	(483)
Dwelling Primary energy Rate (DPER)			24.0500	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b) x	2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c) x	2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1712	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4212	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3264	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3020	0.3264	0.3509	0.3672	0.3836	(22b)
Effective ac	0.5866	0.5833	0.5800	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.0400	1.0000	2.0400			(26)
TER Opening Type			11.9270	1.1450	13.6603			(27)
Heatloss floor			35.7600	0.1300	4.6488			(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.1800	6.3023			(29a)
500mm mineral wool	35.7600		35.7600	0.1100	3.9336			(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5850			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.9097 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.0600	0.0500	0.3530
E3 Sill	3.7400	0.0500	0.1870
E4 Jamb	23.3600	0.0500	1.1680
E5 Ground floor (normal)	11.1200	0.1600	1.7792
E6 Intermediate floor within a dwelling	4.0300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.3800	0.0600	0.3828
E16 Corner (normal)	10.4000	0.0900	0.9360
E18 Party wall between dwellings	10.4000	0.0600	0.6240
P1 Party wall - Ground floor	12.9900	0.0800	1.0392
P2 Party wall - Intermediate floor within a dwelling	15.4400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	15.4400	0.1200	1.8528
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.3500	0.0200	0.0470

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.3690 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 38.9540 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	33.9203	33.7259	33.5352	32.6398	32.4723	31.6925	31.6925	31.5481	31.9929	32.4723	32.8112	33.1655	(38)
Heat transfer coeff	72.8744	72.6799	72.4893	71.5939	71.4264	70.6465	70.6465	70.5021	70.9469	71.4264	71.7653	72.1196	(39)
Average = Sum(39)m / 12 =												71.5931	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0189	1.0162	1.0136	1.0010	0.9987	0.9878	0.9878	0.9858	0.9920	0.9987	1.0034	1.0084	(40)
HLP (average)												1.0010	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2825 (42)

Hot water usage for mixer showers

62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day) 117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	248.5063	219.7523	233.2621	204.4524	197.7953	177.7872	175.0641	182.2099	184.4398	206.2131	219.9654	245.6941	(62)
WWHRS	-28.5673	-25.2652	-26.4562	-21.9068	-20.4164	-17.4704	-16.3757	-17.4139	-18.0756	-21.3091	-24.1406	-28.0383	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
									Total per year (kWh/year) = Sum(64)m =			2229.7066	(64)
12Total per year (kWh/year)												2230	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	104.4115	92.7427	99.3428	89.0609	87.5501	80.1947	79.9919	82.3679	82.4067	90.3490	94.2189	103.4764	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	114.1227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.8362	116.0686	104.8362	108.3307	104.8362	108.3307	104.8362	104.8362	108.3307	104.8362	108.3307	104.8362	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8183	202.9022	197.6509	186.4716	172.3596	159.0964	150.2358	148.1519	153.4032	164.5826	178.6945	191.9577	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	34.4123	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	140.3380	138.0100	133.5252	123.6956	117.6748	111.3815	107.5160	110.7095	114.4537	121.4368	130.8596	139.0812	(72)
Total internal gains													

	506.2293	517.2176	496.2491	478.7347	455.1075	436.0455	419.8249	420.9345	433.4245	451.0924	478.1216	496.1119	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	11.9270	19.6403	0.6300	0.7000	0.7700	71.5897	(80)

Solar gains	71.5897	140.0446	230.6335	336.3652	412.2282	421.9889	401.7506	345.0978	268.2363	166.1747	89.2639	58.8719	(83)
Total gains	577.8190	657.2622	726.8826	815.0999	867.3356	858.0344	821.5755	766.0323	701.6608	617.2671	567.3855	554.9837	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.9557	48.0840	48.2104	48.8134	48.9279	49.4680	49.4680	49.5693	49.2585	48.9279	48.6968	48.4576	
alpha	4.1970	4.2056	4.2140	4.2542	4.2619	4.2979	4.2979	4.3046	4.2839	4.2619	4.2465	4.2305	
util living area													
	0.9765	0.9592	0.9236	0.8335	0.6896	0.5105	0.3747	0.4173	0.6446	0.8767	0.9586	0.9797	(86)
MIT	19.6811	19.9089	20.2318	20.6207	20.8657	20.9713	20.9939	20.9905	20.9243	20.5905	20.0799	19.6471	(87)
Th 2	20.0676	20.0698	20.0721	20.0825	20.0844	20.0935	20.0935	20.0952	20.0900	20.0844	20.0805	20.0764	(88)
util rest of house													
	0.9714	0.9508	0.9081	0.8023	0.6391	0.4440	0.2992	0.3379	0.5757	0.8456	0.9486	0.9754	(89)
MIT 2	18.5438	18.8308	19.2316	19.7007	19.9682	20.0749	20.0910	20.0909	20.0351	19.6793	19.0568	18.5072	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	18.9302	19.1971	19.5714	20.0133	20.2732	20.3795	20.3978	20.3965	20.3372	19.9889	19.4044	18.8945	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9302	19.1971	19.5714	20.0133	20.2732	20.3795	20.3978	20.3965	20.3372	19.9889	19.4044	18.8945	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9635	0.9410	0.8983	0.7998	0.6500	0.4654	0.3248	0.3647	0.5952	0.8419	0.9394	0.9681	(94)
Useful gains	556.7074	618.5041	652.9330	651.8923	563.7341	399.3278	266.8216	279.3473	417.6525	519.6993	533.0088	537.2541	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1066.1689	1039.1099	947.5387	795.6428	612.3498	408.2987	268.2979	281.7634	442.5112	670.6156	883.0306	1059.7608	(97)
Space heating kWh													
	379.0393	282.6471	219.1867	103.5004	36.1701	0.0000	0.0000	0.0000	0.0000	112.2818	252.0157	388.7449	(98a)
Space heating requirement - total per year (kWh/year)												1773.5859	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	379.0393	282.6471	219.1867	103.5004	36.1701	0.0000	0.0000	0.0000	0.0000	112.2818	252.0157	388.7449	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1773.5859	
Space heating per m2											(98c) / (4) =	24.7985	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	379.0393	282.6471	219.1867	103.5004	36.1701	0.0000	0.0000	0.0000	0.0000	112.2818	252.0157	388.7449	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	410.6601	306.2266	237.4720	112.1347	39.1875	0.0000	0.0000	0.0000	0.0000	121.6487	273.0398	421.1754	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	219.9390	194.4871	206.8059	182.5456	177.3790	160.3168	158.6884	164.7959	166.3643	184.9040	195.8247	217.6558	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.2688	84.8971	84.1904	82.8378	81.1938	79.8000	79.8000	79.8000	79.8000	82.9774	84.6266	85.3452	(217)
Fuel for water heating, kWh/month													
	257.9361	229.0856	245.6407	220.3650	218.4637	200.8982	198.8576	206.5112	208.4765	222.8366	231.3986	255.0301	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.7829	17.4750	15.7343	11.5277	8.9043	7.2749	8.1228	10.5583	13.7142	17.9938	20.3239	22.3883	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.5568	-47.3592	-68.1531	-76.7310	-82.8400	-77.3720	-76.4273	-72.1080	-64.4904	-54.2111	-36.9141	-29.0069	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-18.8029	-39.5749	-78.6914	-118.2335	-156.3709	-157.1182	-155.2578	-131.4301	-96.3075	-56.5975	-25.1064	-14.8664	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1921.5449	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2695.5000	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	175.8004	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1767.5275	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3111.3177	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1921.5449	0.2100	403.5244	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2695.5000	0.2100	566.0550	(264)
Space and water heating			969.5794	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	175.8004	0.1443	25.3734	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	0.1346	-96.7689	
PV Unit electricity exported	-1048.3576	0.1259	-131.9744	
Total			-228.7433	(269)
Total CO2, kg/year			778.1388	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.8800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1921.5449	1.1300	2171.3457	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2695.5000	1.1300	3045.9150	(278)
Space and water heating			5217.2607	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	175.8004	1.5338	269.6485	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-719.1699	1.4973	-1076.8103	
PV Unit electricity exported	-1048.3576	0.4621	-484.4365	
Total			-1561.2467	(283)
Total Primary energy kWh/year			4055.7633	(286)
Target Primary Energy Rate (TPER)			56.7100	(287)

Full SAP Calculation Printout

Property Reference	House Mid Terrace	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.80	**TER**	10.88
Environmental	99 A	**% DER < TER**			83.46
CO_2 Emissions (t/year)	0.1	**DFEE**	24.15	**TFEE**	32.03
Compliance Check	See BREL	**% DFEE < TFEE**			24.60
% DPER < TPER	57.59	**DPER**	24.05	**TPER**	56.71

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120	(1b) - (3b)
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12581.0601	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												175.9097	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6151	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	30.3121	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
										Total per year (kWh/year) = Sum(64)m =		2597.3645	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains	570.7610	568.7779	552.3532	521.4980	490.9997	463.3358	446.9330	449.7815	465.4657	493.4744	527.3747	556.9668	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.8900	19.6403	0.6800	0.7000	0.7700	64.0743	(80)
West	2.0370	19.6403	0.6800	0.7000	0.7700	13.1971	(80)

Solar gains	77.2714	151.1592	248.9377	363.0608	444.9447	455.4800	433.6356	372.4865	289.5249	179.3632	96.3483	63.5442	(83)
Total gains	648.0324	719.9372	801.2909	884.5588	935.9444	918.8159	880.5685	822.2681	754.9906	672.8376	623.7230	620.5110	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area	0.9534	0.9245	0.8589	0.7338	0.5700	0.4094	0.2954	0.3304	0.5289	0.7927	0.9237	0.9610	(86)
MIT	20.2131	20.3897	20.6386	20.8569	20.9633	20.9940	20.9990	20.9983	20.9803	20.8250	20.4762	20.1550	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house	0.9450	0.9118	0.8375	0.7004	0.5275	0.3613	0.2439	0.2754	0.4740	0.7562	0.9086	0.9538	(89)
MIT 2	19.3287	19.5452	19.8428	20.0892	20.1981	20.2252	20.2286	20.2283	20.2151	20.0618	19.6556	19.2567	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.6292	19.8322	20.1132	20.3501	20.4581	20.4864	20.4904	20.4899	20.4750	20.3211	19.9344	19.5619	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6292	19.8322	20.1132	20.3501	20.4581	20.4864	20.4904	20.4899	20.4750	20.3211	19.9344	19.5619	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9373	0.9044	0.8340	0.7059	0.5403	0.3774	0.2614	0.2941	0.4918	0.7608	0.9021	0.9463	(94)
Useful gains	607.3936	651.1154	668.2927	624.3678	505.7312	346.7966	230.1773	241.8109	371.2739	511.9078	562.6498	587.2096	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	907.8587	884.3433	806.2270	678.1206	518.6902	348.6161	230.4054	242.2221	377.5565	575.7256	760.1069	909.7955	(97)
Space heating kWh	223.5460	156.7291	102.6231	38.7020	9.6415	0.0000	0.0000	0.0000	0.0000	47.4804	142.1691	240.0039	(98a)
Space heating requirement - total per year (kWh/year)												960.8953	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	223.5460	156.7291	102.6231	38.7020	9.6415	0.0000	0.0000	0.0000	0.0000	47.4804	142.1691	240.0039	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												960.8953	
Space heating per m2											(98c) / (4) =	13.4353	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	223.5460	156.7291	102.6231	38.7020	9.6415	0.0000	0.0000	0.0000	0.0000	47.4804	142.1691	240.0039	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	335.3190	235.0937	153.9347	58.0530	14.4623	0.0000	0.0000	0.0000	0.0000	71.2207	213.2537	360.0058	
Space heating requirement													
	335.3190	235.0937	153.9347	58.0530	14.4623	0.0000	0.0000	0.0000	0.0000	71.2207	213.2537	360.0058	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-14.8619	-24.6522	-41.9801	-54.0165	-62.8534	-60.2005	-59.0498	-53.1061	-43.0156	-30.6311	-17.3392	-12.2904	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.6369	-11.9261	-30.0153	-54.8475	-81.1374	-84.9515	-82.6912	-64.6364	-40.4468	-18.8657	-6.6109	-3.4586	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1441.3429	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3896.0468	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												14.4134	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												19.6671	(330a)
Total electricity for the above, kWh/year												19.6671	(331)
Electricity for lighting (calculated in Appendix L)												174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4573.5501	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1441.3429	4.4400	63.9956	(340a)
Space heating total			63.9956	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3896.0468	4.4400	172.9845	(342a)
Water heating total			172.9845	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	16.4900	3.2431	(349)
Energy for lighting	174.7141	16.4900	28.8104	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	16.4900	-78.1621	
PV Unit electricity exported	-484.2242	5.5900	-27.0681	
Total			-105.2302	(352)
Total energy cost			255.8034	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.7903	(357)
SAP value	87.1888	
SAP rating (Section 12)	87	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1423.3039	0.1572	60.4274	(367)
Electrical energy for heat distribution (space & water)	14.4134	0.0000	7.7540	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			214.5274	(373)
Space and water heating			214.5274	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9968	0.1320	-62.5726	
PV Unit electricity exported	-484.2242	0.1214	-58.7607	
Total			-121.3332	(380)
Total CO2, kg/year			121.1389	(383)
CO2 emissions per m2			1.6900	(384)
EI value			98.6069	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600	(1b)	x 2.4500	(2b) =	87.6120	(1b) - (3b)
First floor	35.7600	(1c)	x 2.4500	(2c) =	87.6120	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.2240	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =		0.7750	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =		0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation 0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)										Total = Sum(45)m =		1946.5248	
Distribution loss (46)m = 0.15 x (45)m	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
									Total per year (kWh/year) = Sum(64)m =			2597.3645	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)													
	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains													
	570.7610	568.7779	552.3532	521.4980	490.9997	463.3358	446.9330	449.7815	465.4657	493.4744	527.3747	556.9668	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.8900	23.7835	0.6800	0.7000	0.7700	77.5911	(80)
West	2.0370	23.7835	0.6800	0.7000	0.7700	15.9811	(80)

Solar gains	93.5722	162.6475	263.5188	387.8277	457.1329	501.7079	468.7900	411.0428	323.2212	203.5286	114.9325	77.3917	(83)
Total gains	664.3333	731.4254	815.8720	909.3257	948.1326	965.0438	915.7229	860.8244	788.6869	697.0030	642.3072	634.3585	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9458	0.9157	0.8381	0.7028	0.5364	0.3545	0.2520	0.2817	0.4877	0.7525	0.9082	0.9549	(86)
MIT	20.2730	20.4362	20.6919	20.8858	20.9733	20.9971	20.9996	20.9993	20.9867	20.8689	20.5418	20.2126	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9361	0.9017	0.8142	0.6676	0.4931	0.3080	0.2023	0.2289	0.4335	0.7119	0.8905	0.9466	(89)
MIT 2	19.4029	19.6019	19.9048	20.1197	20.2073	20.2274	20.2289	20.2288	20.2200	20.1080	19.7343	19.3286	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.6986	19.8853	20.1723	20.3800	20.4675	20.4889	20.4908	20.4906	20.4805	20.3666	20.0087	19.6290	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6986	19.8853	20.1723	20.3800	20.4675	20.4889	20.4908	20.4906	20.4805	20.3666	20.0087	19.6290	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9284	0.8946	0.8123	0.6747	0.5066	0.3237	0.2192	0.2468	0.4514	0.7195	0.8849	0.9390	(94)
Useful gains	616.7542	654.3562	662.7445	613.5164	480.3688	312.4086	200.7270	212.4866	355.9841	501.4699	568.3460	595.6609	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	894.1989	869.7259	780.1151	656.2023	489.6376	313.2306	200.8149	212.6482	360.1136	548.8046	740.8152	895.9997	(97)
Space heating kWh													
	206.4188	144.7284	87.3238	30.7339	6.8960	0.0000	0.0000	0.0000	0.0000	35.2170	124.1778	223.4521	(98a)
Space heating requirement - total per year (kWh/year)												858.9478	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	206.4188	144.7284	87.3238	30.7339	6.8960	0.0000	0.0000	0.0000	0.0000	35.2170	124.1778	223.4521	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												858.9478	
Space heating per m2											(98c) / (4) =	12.0099	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	206.4188	144.7284	87.3238	30.7339	6.8960	0.0000	0.0000	0.0000	0.0000	35.2170	124.1778	223.4521	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	309.6282	217.0926	130.9856	46.1008	10.3441	0.0000	0.0000	0.0000	0.0000	52.8255	186.2667	335.1781	
Space heating requirement													
	309.6282	217.0926	130.9856	46.1008	10.3441	0.0000	0.0000	0.0000	0.0000	52.8255	186.2667	335.1781	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	
Water heating fuel													
	385.7824	341.3910	362.9160	319.2814	309.7159	279.2836	275.6190	286.3377	289.2625	322.3426	342.5508	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.6704	1.5087	1.6704	1.6165	1.6704	1.6165	1.6704	1.6704	1.6165	1.6704	1.6165	1.6704	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.7439	-26.4473	-44.1602	-56.7208	-64.1553	-63.6776	-61.8747	-56.5668	-46.5864	-34.0293	-20.3275	-14.7878	(333a)

Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.2546	-13.5179	-33.0849	-60.8523	-85.0852	-97.4411	-92.6154	-74.6748	-47.7624	-22.9670	-8.7029	-4.7110	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1288.4217	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3896.0468	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	12.8842	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(330a)
Total electricity for the above, kWh/year	19.6671	(331)
Electricity for lighting (calculated in Appendix L)	174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4324.1028	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1288.4217	6.5500	84.3916	(340a)
Space heating total			84.3916	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	3896.0468	6.5500	255.1911	(342a)
Water heating total			255.1911	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	28.4300	5.5914	(349)
Energy for lighting	174.7141	28.4300	49.6712	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-507.0777	28.4300	-144.1622	
PV Unit electricity exported	-547.6693	5.8100	-31.8196	
Total			-175.9818	(352)
Total energy cost			322.8635	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1382.5249	0.1577	54.1726	(367)
Electrical energy for heat distribution (space & water)	12.8842	0.0000	7.5194	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			208.0380	(373)
Space and water heating			208.0380	(376)
Pumps, fans and electric keep-hot	19.6671	0.1387	2.7281	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-507.0777	0.1323	-67.0962	
PV Unit electricity exported	-547.6693	0.1214	-66.4868	
Total			-133.5830	(380)
Total CO2, kg/year			102.3997	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1382.5249	1.5837	544.1155	(467)
Electrical energy for heat distribution (space & water)	12.8842	0.0000	79.6573	(472)
Overall CO2 factor for heat network			0.4251	(486)
Total CO2 associated with community systems			2203.8508	(473)
Space and water heating			2203.8508	(476)
Pumps, fans and electric keep-hot	19.6671	1.5128	29.7525	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-507.0777	1.4889	-754.9866	
PV Unit electricity exported	-547.6693	0.4453	-243.8963	
Total			-998.8829	(480)
Total Primary energy kWh/year			1502.7027	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - West

Current energy efficiency rating: B 87
Current environmental impact rating: A 99

N Solar water heating	Recommended
U Solar photovoltaic panels	Already installed
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.4	-£ 47	-26 kg (25.3%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£47	0.36 kg/m²	B 89	A 99
Total Savings	£47	0.36 kg/m²		

Potential energy efficiency rating: B 89
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£55	£78	-£23
Community scheme	£444	£375	£69
Space heating	£194	£217	-£23
Water heating	£255	£187	£69
Lighting	£50	£50	£0
Generated (PV)	-£176	-£177	£1
Total cost of fuels	£323	£276	£47
Total cost of uses	£323	£277	£47
Delivered energy	60 kWh/m²	47 kWh/m²	14 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	21 kWh/m²	17 kWh/m²	4 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120 (1b) - (3b)	
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff													
	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)
Average = Sum(39)m / 12 =												59.2241	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2825	(42)
Hot water usage for mixer showers													
	62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)
Hot water usage for baths													
	26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)
Hot water usage for other uses													
	38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)
Average daily hot water use (litres/day)												117.1914	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	
Distribution loss (46)m = 0.15 x (45)m													
	30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												623.4568	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												623.4568	
Solar input	-0.0000	-16.2208	-58.0195	-79.9223	-105.1350	-97.1484	-96.5940	-84.1560	-57.6291	-28.6318	-0.0000	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	257.1882	211.3732	183.9246	132.9320	101.3423	89.0407	87.1521	106.7357	135.2126	186.2632	228.3672	254.3760	(64)
											Total per year (kWh/year) = Sum(64)m =	1973.9077	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
299.7288 302.8391 295.0013 278.3158 257.2532 237.4574 224.2325 221.1223 228.9600 245.6456 266.7082 286.5040 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 50.9772 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 -91.2982 (71)
Water heating gains (Table 5)
149.6734 147.3454 142.8606 133.0310 127.0102 120.7169 116.8514 120.0449 123.7891 130.7722 140.1950 148.4166 (72)
Total internal gains
570.7610 568.7779 552.3532 521.4980 490.9997 463.3358 446.9330 449.7815 465.4657 493.4744 527.3747 556.9668 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.8900	19.6403	0.6800	0.7000	0.7700	64.0743	(80)
West	2.0370	19.6403	0.6800	0.7000	0.7700	13.1971	(80)

Solar gains 77.2714 151.1592 248.9377 363.0608 444.9447 455.4800 433.6356 372.4865 289.5249 179.3632 96.3483 63.5442 (83)
Total gains 648.0324 719.9372 801.2909 884.5588 935.9444 918.8159 880.5685 822.2681 754.9906 672.8376 623.7230 620.5110 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area	0.9534	0.9245	0.8589	0.7338	0.5700	0.4094	0.2954	0.3304	0.5289	0.7927	0.9237	0.9610	(86)
MIT	20.2131	20.3897	20.6386	20.8569	20.9633	20.9940	20.9990	20.9983	20.9803	20.8250	20.4762	20.1550	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house	0.9450	0.9118	0.8375	0.7004	0.5275	0.3613	0.2439	0.2754	0.4740	0.7562	0.9086	0.9538	(89)
MIT 2	19.3287	19.5452	19.8428	20.0892	20.1981	20.2252	20.2286	20.2283	20.2151	20.0618	19.6556	19.2567	(90)
Living area fraction									fLA = Living area / (4) =			0.3398	(91)
MIT	19.6292	19.8322	20.1132	20.3501	20.4581	20.4864	20.4904	20.4899	20.4750	20.3211	19.9344	19.5619	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6292	19.8322	20.1132	20.3501	20.4581	20.4864	20.4904	20.4899	20.4750	20.3211	19.9344	19.5619	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9373	0.9044	0.8340	0.7059	0.5403	0.3774	0.2614	0.2941	0.4918	0.7608	0.9021	0.9463	(94)
Useful gains	607.3936	651.1154	668.2927	624.3678	505.7312	346.7966	230.1773	241.8109	371.2739	511.9078	562.6498	587.2096	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	907.8587	884.3433	806.2270	678.1206	518.6902	348.6161	230.4054	242.2221	377.5565	575.7256	760.1069	909.7955	(97)
Space heating kWh	223.5460	156.7291	102.6231	38.7020	9.6415	0.0000	0.0000	0.0000	0.0000	47.4804	142.1691	240.0039	(98a)
Space heating requirement - total per year (kWh/year)												960.8953	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	223.5460	156.7291	102.6231	38.7020	9.6415	0.0000	0.0000	0.0000	0.0000	47.4804	142.1691	240.0039	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												960.8953	
Space heating per m2											(98c) / (4) =	13.4353	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement
223.5460 156.7291 102.6231 38.7020 9.6415 0.0000 0.0000 0.0000 0.0000 47.4804 142.1691 240.0039 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50
307a 335.3190 235.0937 153.9347 58.0530 14.4623 0.0000 0.0000 0.0000 0.0000 71.2207 213.2537 360.0058
Space heating requirement
335.3190 235.0937 153.9347 58.0530 14.4623 0.0000 0.0000 0.0000 0.0000 71.2207 213.2537 360.0058 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)

Water heating
Annual water heating requirement
257.1882 211.3732 183.9246 132.9320 101.3423 89.0407 87.1521 106.7357 135.2126 186.2632 228.3672 254.3760 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50
310a 385.7824 317.0598 275.8868 199.3980 152.0134 133.5610 130.7281 160.1036 202.8189 279.3948 342.5508 381.5640
Water heating fuel
385.7824 317.0598 275.8868 199.3980 152.0134 133.5610 130.7281 160.1036 202.8189 279.3948 342.5508 381.5640 (310)
Cooling System Energy Efficiency Ratio 0.0000 (314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (315)
Pumps and Fa 8.4649 7.6457 8.4649 8.1918 8.4649 8.1918 8.4649 8.4649 8.1918 8.4649 8.1918 8.4649 (331)
Lighting 21.6483 17.3671 15.6371 11.4564 8.8493 7.2299 8.0726 10.4931 13.6295 17.8826 20.1983 22.2500 (332)
Electricity generated by PVs (Appendix M) (negative quantity)
(333a)m -14.9141 -24.7783 -42.2847 -54.5605 -63.6655 -61.0911 -59.9595 -53.8492 -43.4933 -30.8592 -17.4193 -12.3313 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)

(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.5846	-11.8000	-29.7107	-54.3035	-80.3253	-84.0609	-81.7814	-63.8933	-39.9691	-18.6376	-6.5308	-3.4177	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1441.3429	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2960.8616	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	14.4134	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.6671	(331)
Electricity for lighting (calculated in Appendix L)	174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3718.3648	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1441.3429	4.4400	63.9956	(340a)
Space heating total			63.9956	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2960.8616	4.4400	131.4623	(342a)
Water heating total			131.4623	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	16.4900	3.2431	(349)
Pump for solar water heating	80.0000	16.4900	13.1920	(349)
Energy for lighting	174.7141	16.4900	28.8104	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-479.2061	16.4900	-79.0211	
PV Unit electricity exported	-479.0149	5.5900	-26.7769	
Total			-105.7980	(352)
Total energy cost			226.9053	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.7010	(357)
SAP value	88.6360	
SAP rating (Section 12)	89	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1173.9212	0.1572	60.4274	(367)
Electrical energy for heat distribution (space & water)	14.4134	0.0000	6.5614	(372)
Overall CO2 factor for heat network			0.0412	(386)
Total CO2 associated with community systems			181.5312	(373)
Space and water heating			181.5312	(376)
Pumps, fans and electric keep-hot	99.6671	0.1387	13.8251	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-479.2061	0.1320	-63.2320	
PV Unit electricity exported	-479.0149	0.1214	-58.1324	
Total			-121.3643	(380)
Total CO2, kg/year			99.2085	(383)
CO2 emissions per m2			1.3900	(384)
EI value			98.8591	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.7600 (1b)	x	2.4500 (2b)	=	87.6120 (1b) - (3b)	
First floor	35.7600 (1c)	x	2.4500 (2c)	=	87.6120 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.2240	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8900	0.7752	7.6667			(27)
FD			2.0400	1.1000	2.2440			(26)
Balcony Door			2.0370	0.7752	1.5814			(27)
Heatloss floor			35.7600	0.1100	3.9336	100.0000	3576.0000	(28a)
100mm Full Fill Cavity	48.9800	13.9670	35.0130	0.2300	8.0530	50.0000	1750.6500	(29a)
500mm mineral wool	35.7600		35.7600	0.0900	3.2184	10.0000	357.6000	(30)
Total net area of external elements Aum(A, m2)			120.5030					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6971			(33)
Main dwelling								
Party Wall			69.6500	0.0000	0.0000	70.0000	4875.5001	(32)
Timber partitions			117.3100			9.0000	1055.7900	(32c)
Internal Floor 1			35.7600			18.0000	643.6800	(32d)
Internal Ceiling 1			35.7600			9.0000	321.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12581.0601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		175.9097 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6151 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	30.3121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	28.9120	(38)
Heat transfer coeff	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	59.2241	(39)

Average = Sum(39)m / 12 =	59.2241

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	0.8281	(40)
HLP (average)												0.8281	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2825 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
62.4889	61.5498	60.1814	57.5631	55.6309	53.4762	52.2514	53.6095	55.0982	57.4117	60.0862	62.2495	(42a)

Hot water usage for baths

26.9955	26.5946	26.0300	24.9890	24.2095	23.3452	22.8784	23.4390	24.0494	24.9743	26.0367	26.9042	(42b)

Hot water usage for other uses

38.0046	36.6226	35.2406	33.8587	32.4767	31.0947	31.0947	32.4767	33.8587	35.2406	36.6226	38.0046	(42c)

Average daily hot water use (litres/day)	117.1914 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4890	124.7670	121.4520	116.4108	112.3171	107.9161	106.2244	109.5251	113.0062	117.6266	122.7455	127.1583	(44)
Energy conte	201.9114	177.6666	186.6672	159.3606	151.2004	132.6954	128.4692	135.6150	139.3480	159.6182	174.8735	199.0992	(45)
Energy content (annual)											Total = Sum(45)m =	1946.5248	

Distribution loss (46)m = 0.15 x (45)m

30.2867	26.6500	28.0001	23.9041	22.6801	19.9043	19.2704	20.3422	20.9022	23.9427	26.2310	29.8649	(46)

Water storage loss:

Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	257.1882	227.5940	241.9440	212.8542	206.4772	186.1891	183.7460	190.8918	192.8417	214.8950	228.3672	254.3760	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												697.5235	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												697.5235	
Solar input	-0.3007	-19.8927	-63.0021	-86.8105	-108.5158	-108.4282	-105.5589	-94.8548	-67.4076	-37.8155	-4.9366	-0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	256.8875	207.7013	178.9419	126.0438	97.9614	77.7608	78.1872	96.0370	125.4340	177.0795	223.4306	254.3760	(64)
											Total per year (kWh/year) = Sum(64)m =	1899.8410	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	111.3570	99.0161	106.2883	95.7823	94.4956	86.9162	86.9375	89.3134	89.1281	97.2945	100.9404	110.4219	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	136.9472	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	24.7326	21.9673	17.8650	13.5249	10.1101	8.5353	9.2227	11.9881	16.0903	20.4304	23.8453	25.4200	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	299.7288	302.8391	295.0013	278.3158	257.2532	237.4574	224.2325	221.1223	228.9600	245.6456	266.7082	286.5040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	50.9772	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	-91.2982	(71)
Water heating gains (Table 5)													
	149.6734	147.3454	142.8606	133.0310	127.0102	120.7169	116.8514	120.0449	123.7891	130.7722	140.1950	148.4166	(72)
Total internal gains													
	570.7610	568.7779	552.3532	521.4980	490.9997	463.3358	446.9330	449.7815	465.4657	493.4744	527.3747	556.9668	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.8900	23.7835	0.6800	0.7000	0.7700	77.5911	(80)
West	2.0370	23.7835	0.6800	0.7000	0.7700	15.9811	(80)

Solar gains	93.5722	162.6475	263.5188	387.8277	457.1329	501.7079	468.7900	411.0428	323.2212	203.5286	114.9325	77.3917	(83)
Total gains	664.3333	731.4254	815.8720	909.3257	948.1326	965.0438	915.7229	860.8244	788.6869	697.0030	642.3072	634.3585	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	59.0087	
alpha	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	4.9339	
util living area													
	0.9458	0.9157	0.8381	0.7028	0.5364	0.3545	0.2520	0.2817	0.4877	0.7525	0.9082	0.9549	(86)
MIT	20.2730	20.4362	20.6919	20.8858	20.9733	20.9971	20.9996	20.9993	20.9867	20.8689	20.5418	20.2126	(87)
Th 2	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	20.2291	(88)
util rest of house													
	0.9361	0.9017	0.8142	0.6676	0.4931	0.3080	0.2023	0.2289	0.4335	0.7119	0.8905	0.9466	(89)
MIT 2	19.4029	19.6019	19.9048	20.1197	20.2073	20.2274	20.2289	20.2288	20.2200	20.1080	19.7343	19.3286	(90)
Living area fraction										fLA = Living area / (4) =		0.3398	(91)
MIT	19.6986	19.8853	20.1723	20.3800	20.4675	20.4889	20.4908	20.4906	20.4805	20.3666	20.0087	19.6290	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6986	19.8853	20.1723	20.3800	20.4675	20.4889	20.4908	20.4906	20.4805	20.3666	20.0087	19.6290	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9284	0.8946	0.8123	0.6747	0.5066	0.3237	0.2192	0.2468	0.4514	0.7195	0.8849	0.9390	(94)
Useful gains	616.7542	654.3562	662.7445	613.5164	480.3688	312.4086	200.7270	212.4866	355.9841	501.4699	568.3460	595.6609	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	894.1989	869.7259	780.1151	656.2023	489.6376	313.2306	200.8149	212.6482	360.1136	548.8046	740.8152	895.9997	(97)
Space heating kWh	206.4188	144.7284	87.3238	30.7339	6.8960	0.0000	0.0000	0.0000	0.0000	35.2170	124.1778	223.4521	(98a)
Space heating requirement - total per year (kWh/year)												858.9478	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	206.4188	144.7284	87.3238	30.7339	6.8960	0.0000	0.0000	0.0000	0.0000	35.2170	124.1778	223.4521	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												858.9478	
Space heating per m2											(98c) / (4) =	12.0099	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement													
	206.4188	144.7284	87.3238	30.7339	6.8960	0.0000	0.0000	0.0000	0.0000	35.2170	124.1778	223.4521	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	309.6282	217.0926	130.9856	46.1008	10.3441	0.0000	0.0000	0.0000	0.0000	52.8255	186.2667	335.1781	
Space heating requirement													
	309.6282	217.0926	130.9856	46.1008	10.3441	0.0000	0.0000	0.0000	0.0000	52.8255	186.2667	335.1781	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement													
	256.8875	207.7013	178.9419	126.0438	97.9614	77.7608	78.1872	96.0370	125.4340	177.0795	223.4306	254.3760	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	385.3312	311.5520	268.4128	189.0656	146.9421	116.6412	117.2807	144.0554	188.1511	265.6193	335.1459	381.5640	
Water heating fuel													
	385.3312	311.5520	268.4128	189.0656	146.9421	116.6412	117.2807	144.0554	188.1511	265.6193	335.1459	381.5640	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	8.4649	7.6457	8.4649	8.1918	8.4649	8.1918	8.4649	8.4649	8.1918	8.4649	8.1918	8.4649	(331)
Lighting	21.6483	17.3671	15.6371	11.4564	8.8493	7.2299	8.0726	10.4931	13.6295	17.8826	20.1983	22.2500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.8133	-26.5889	-44.4924	-57.3150	-64.9996	-64.6716	-62.8712	-57.4038	-47.1375	-34.3017	-20.4312	-14.8426	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.1852	-13.3763	-32.7527	-60.2581	-84.2408	-96.4471	-91.6189	-73.8378	-47.2113	-22.6946	-8.5992	-4.6561	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1288.4217	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2849.7616	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	12.8842	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	19.6671	(330a)
pump for solar water heating	80.0000	(330g)
Total electricity for the above, kWh/year	99.6671	(331)
Electricity for lighting (calculated in Appendix L)	174.7141	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3357.8175	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1288.4217	6.5500	84.3916	(340a)
Space heating total			84.3916	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2849.7616	6.5500	186.6594	(342a)
Water heating total			186.6594	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	19.6671	28.4300	5.5914	(349)
Pump for solar water heating	80.0000	28.4300	22.7440	(349)
Energy for lighting	174.7141	28.4300	49.6712	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-512.8689	28.4300	-145.8086	
PV Unit electricity exported	-541.8781	5.8100	-31.4831	
Total			-177.2917	(352)
Total energy cost			275.7659	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1103.5155	0.1577	54.1726	(367)
Electrical energy for heat distribution (space & water)	12.8842	0.0000	6.1833	(372)
Overall CO2 factor for heat network			0.0413	(386)
Total CO2 associated with community systems			171.0726	(373)
Space and water heating			171.0726	(376)
Pumps, fans and electric keep-hot	99.6671	0.1387	13.8251	(378)
Energy for lighting	174.7141	0.1443	25.2167	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-512.8689	0.1323	-67.8299	
PV Unit electricity exported	-541.8781	0.1214	-65.7869	
Total			-133.6168	(380)
Total CO2, kg/year			76.4974	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1103.5155	1.5837	544.1155	(467)
Electrical energy for heat distribution (space & water)	12.8842	0.0000	64.2599	(472)
Overall CO2 factor for heat network			0.4296	(486)
Total CO2 associated with community systems			1777.8559	(473)
Space and water heating			1777.8559	(476)
Pumps, fans and electric keep-hot	99.6671	1.5128	150.7765	(478)
Energy for lighting	174.7141	1.5338	267.9824	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-512.8689	1.4887	-763.4867	
PV Unit electricity exported	-541.8781	0.4454	-241.3296	
Total			-1004.8163	(480)
Total Primary energy kWh/year			1191.7985	(483)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	82 B	**DER**	3.41	**TER**	11.80
Environmental	97 A	**% DER < TER**			71.10
CO_2 Emissions (t/year)	0.26	**DFEE**	24.18	**TFEE**	30.94
Compliance Check	See BREL	**% DFEE < TFEE**			21.83
% DPER < TPER	42.34	**DPER**	36.03	**TPER**	62.49

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6723 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4625 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)		122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.6786	139.1442	125.6786	129.8679	125.6786	129.8679	125.6786	125.6786	129.8679	125.6786	129.8679	125.6786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	559.0481	572.3498	548.4455	530.1166	504.1979	487.2994	469.3775	470.4487	484.3003	499.6452	529.1302	548.0502	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	19.6403	0.6800	0.7000	0.7700	64.0095	(76)

Solar gains	64.0095	125.2162	206.2132	300.7496	368.5800	377.3072	359.2118	308.5577	239.8345	148.5795	79.8123	52.6383	(83)
Total gains	623.0576	697.5659	754.6587	830.8662	872.7779	864.6066	828.5894	779.0064	724.1348	648.2248	608.9425	600.6885	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)		21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9837	0.9681	0.9331	0.8347	0.6723	0.4836	0.3492	0.3879	0.6112	0.8755	0.9665	0.9866	(86)
MIT	20.2100	20.3754	20.5932	20.8324	20.9584	20.9946	20.9993	20.9988	20.9809	20.8096	20.4698	20.1665	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9797	0.9608	0.9183	0.8037	0.6251	0.4272	0.2886	0.3237	0.5493	0.8437	0.9575	0.9834	(89)
MIT 2	19.3195	19.5262	19.7931	20.0696	20.1992	20.2299	20.2329	20.2326	20.2204	20.0511	19.6465	19.2647	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.5708	19.7658	20.0189	20.2849	20.4134	20.4457	20.4492	20.4488	20.4350	20.2652	19.8788	19.5192	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5708	19.7658	20.0189	20.2849	20.4134	20.4457	20.4492	20.4488	20.4350	20.2652	19.8788	19.5192	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9755	0.9554	0.9136	0.8059	0.6365	0.4430	0.3057	0.3418	0.5659	0.8452	0.9525	0.9795	(94)
Useful gains	607.7719	666.4585	689.4700	669.6153	555.5383	382.9945	253.2911	266.2736	409.8086	547.8754	580.0350	588.3625	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1005.5988	978.9322	890.2326	749.7060	573.7879	384.9450	253.4721	266.6201	417.1663	636.4612	841.4986	1008.7841	(97)
Space heating kWh	295.9833	209.9823	149.3674	57.6653	13.5777	0.0000	0.0000	0.0000	0.0000	65.9078	188.2538	312.7936	(98a)
Space heating requirement - total per year (kWh/year)												1293.5312	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	295.9833	209.9823	149.3674	57.6653	13.5777	0.0000	0.0000	0.0000	0.0000	65.9078	188.2538	312.7936	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1293.5312	
Space heating per m2											(98c) / (4) =	16.1732	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	295.9833	209.9823	149.3674	57.6653	13.5777	0.0000	0.0000	0.0000	0.0000	65.9078	188.2538	312.7936 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	443.9749	314.9735	224.0511	86.4979	20.3665	0.0000	0.0000	0.0000	0.0000	98.8618	282.3807	469.1904
Space heating requirement												
	443.9749	314.9735	224.0511	86.4979	20.3665	0.0000	0.0000	0.0000	0.0000	98.8618	282.3807	469.1904 (307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement

	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948
Water heating fuel												
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948 (310)

Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679 (331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year		
Space heating fuel - community heating	1940.2968	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	19.4030	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	6195.5229	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1593.9798	0.1570	81.2437	(367)
Electrical energy for heat distribution (space & water)	19.4030	0.0000	8.7343	(372)
Overall CO2 factor for heat network			0.0404	(386)
Total CO2 associated with community systems			241.6503	(373)
Space and water heating			241.6503	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Total CO2, kg/year			273.0052	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.4100	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1593.9798	1.5813	818.1755	(467)
Electrical energy for heat distribution (space & water)	19.4030	0.0000	92.0839	(472)
Overall CO2 factor for heat network			0.4262	(486)
Total CO2 associated with community systems			2547.6553	(473)
Space and water heating			2547.6553	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)
Total Primary energy kWh/year			2881.7197	(483)
Dwelling Primary energy Rate (DPER)			36.0300	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Semi-glazed door			3.5800	1.0000	3.5800			(26a)
TER Opening Type			9.8800	1.1450	11.3130			(27)
Heatloss Floor			39.9900	0.1300	5.1987			(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.1800	7.0326			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.5045			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 213.7769 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.4500	0.0500	0.4225
E3 Sill	6.7500	0.0500	0.3375
E4 Jamb	22.0000	0.0500	1.1000
E6 Intermediate floor within a dwelling	19.5200	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	6.0900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E5 Ground floor (normal)	19.5200	0.1600	3.1232
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
P1 Party wall - Ground floor	6.0900	0.0800	0.4872
E7 Party floor between dwellings (in blocks of flats)	14.1200	0.0700	0.9884

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.7208 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.2253 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	77.7420	77.5795	77.4202	76.6720	76.5321	75.8805	75.8805	75.7598	76.1315	76.5321	76.8152	77.1113	(39)

Average = Sum(39)m / 12 = 76.6714

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9700	0.9680	0.9586	0.9569	0.9487	0.9487	0.9472	0.9519	0.9569	0.9604	0.9641	(40)
HLP (average)												0.9586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)
Hot water usage for mixer showers

65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)
Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS -29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)

Total per year (kWh/year) = Sum(64)m = 2310.9385 (64)
12Total per year (kWh/year) 2311 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	122.0433	135.1194	122.0433	126.1114	122.0433	126.1114	122.0433	122.0433	126.1114	122.0433	126.1114	122.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans 3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains	549.0775	561.9896	538.4748	520.0247	494.2273	474.2076	456.4069	457.4780	471.2084	489.6746	519.0383	538.0795	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

East				9.8800	19.6403	0.6300	0.7000		0.7700			59.3029	(76)
Solar gains	59.3029	116.0091	191.0505	278.6357	341.4785	349.5640	332.7992	285.8696	222.1996	137.6546	73.9438	48.7678	(83)
Total gains	608.3804	677.9987	729.5253	798.6604	835.7058	823.7716	789.2061	743.3476	693.4080	627.3291	592.9821	586.8473	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.0920	61.2199	61.3459	61.9445	62.0578	62.5907	62.5907	62.6904	62.3843	62.0578	61.8290	61.5917	
alpha	5.0728	5.0813	5.0897	5.1296	5.1372	5.1727	5.1727	5.1794	5.1590	5.1372	5.1219	5.1061	
util living area	0.9885	0.9790	0.9579	0.8926	0.7633	0.5732	0.4202	0.4638	0.7040	0.9188	0.9775	0.9903	(86)
MIT	19.9050	20.0800	20.3336	20.6615	20.8836	20.9787	20.9964	20.9942	20.9414	20.6539	20.2312	19.8758	(87)
Th 2	20.1067	20.1084	20.1101	20.1179	20.1194	20.1263	20.1263	20.1275	20.1236	20.1194	20.1164	20.1133	(88)
util rest of house	0.9855	0.9736	0.9470	0.8662	0.7128	0.5013	0.3382	0.3783	0.6326	0.8927	0.9708	0.9878	(89)
MIT 2	18.8380	19.0601	19.3779	19.7777	20.0210	20.1134	20.1249	20.1252	20.0832	19.7786	19.2591	18.8059	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.1391	19.3479	19.6476	20.0271	20.2644	20.3576	20.3709	20.3704	20.3254	20.0256	19.5334	19.1078	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1391	19.3479	19.6476	20.0271	20.2644	20.3576	20.3709	20.3704	20.3254	20.0256	19.5334	19.1078	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9812	0.9678	0.9401	0.8632	0.7216	0.5208	0.3613	0.4024	0.6499	0.8895	0.9651	0.9839	(94)
Useful gains	596.9506	656.1465	685.8487	689.3776	603.0790	429.0146	285.1742	299.1384	450.6478	558.0090	572.2933	577.4180	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1153.6230	1120.8598	1017.8906	853.1366	655.4525	436.8875	286.1350	300.7964	473.9480	721.3615	955.0754	1149.5584	(97)
Space heating kWh	414.1643	312.2873	247.0392	117.9065	38.9659	0.0000	0.0000	0.0000	0.0000	121.5343	275.6031	425.6725	(98a)
Space heating requirement - total per year (kWh/year)												1953.1730	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	414.1643	312.2873	247.0392	117.9065	38.9659	0.0000	0.0000	0.0000	0.0000	121.5343	275.6031	425.6725	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1953.1730	
Space heating per m2											(98c) / (4) =	24.4208	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	414.1643	312.2873	247.0392	117.9065	38.9659	0.0000	0.0000	0.0000	0.0000	121.5343	275.6031	425.6725	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	448.7154	338.3394	267.6481	127.7427	42.2166	0.0000	0.0000	0.0000	0.0000	131.6731	298.5949	461.1837	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.3781	85.0348	84.3768	83.0310	81.2409	79.8000	79.8000	79.8000	79.8000	83.0677	84.7448	85.4582	(217)
Fuel for water heating, kWh/month	267.4167	237.3749	254.2727	227.8515	226.1156	207.8751	205.6450	213.6686	215.8200	230.6400	239.6706	264.3653	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.3582	20.3433	18.3169	13.4197	10.3658	8.4689	9.4560	12.2913	15.9652	20.9471	23.6598	26.0630	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3424	-31.5676	-47.5704	-56.1485	-62.8691	-59.5233	-58.7993	-54.3654	-46.9365	-37.2699	-23.9846	-18.2835	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9342	-17.0411	-34.5369	-52.8648	-70.8844	-71.5905	-70.7461	-59.4418	-42.9727	-24.6882	-10.6939	-6.2480	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2116.1138	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2790.7159	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	204.6551	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4209.1818	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2116.1138	0.2100	444.3839	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2790.7159	0.2100	586.0503	(264)
Space and water heating			1030.4342	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	204.6551	0.1443	29.5381	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	0.1336	-69.2911	
PV Unit electricity exported	-469.6425	0.1253	-58.8667	
Total			-128.1578	(269)
Total CO2, kg/year			943.7437	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.8000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2116.1138	1.1300	2391.2086	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2790.7159	1.1300	3153.5090	(278)
Space and water heating			5544.7176	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	204.6551	1.5338	313.9068	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	1.4937	-774.7198	
PV Unit electricity exported	-469.6425	0.4601	-216.0686	
Total			-990.7884	(283)
Total Primary energy kWh/year			4997.9368	(286)
Target Primary Energy Rate (TPER)			62.4900	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	82 B	**DER**	3.41	**TER**	11.80
Environmental	97 A	**% DER < TER**			71.10
CO_2 Emissions (t/year)	0.26	**DFEE**	24.18	**TFEE**	30.94
Compliance Check	See BREL	**% DFEE < TFEE**			21.83
% DPER < TPER	42.34	**DPER**	36.03	**TPER**	62.49

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2122	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2705	0.2652	0.2599	0.2334	0.2281	0.2016	0.2016	0.1963	0.2122	0.2281	0.2387	0.2493	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5366	0.5352	0.5338	0.5272	0.5260	0.5203	0.5203	0.5193	0.5225	0.5260	0.5285	0.5311	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17097.8798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.6723	(36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.6979	34.6061	34.5160	34.0930	34.0139	33.6455	33.6455	33.5772	33.7874	34.0139	34.1740	34.3414	(38)
Heat transfer coeff	68.2172	68.1253	68.0352	67.6122	67.5331	67.1647	67.1647	67.0965	67.3066	67.5331	67.6932	67.8606	(39)
Average = Sum(39)m / 12 =												67.6118	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8529	0.8518	0.8507	0.8454	0.8444	0.8398	0.8398	0.8389	0.8415	0.8444	0.8464	0.8485	(40)
HLP (average)												0.8454	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												62.4583	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.6786	139.1442	125.6786	129.8679	125.6786	129.8679	125.6786	125.6786	129.8679	125.6786	129.8679	125.6786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains	453.4664	467.9883	446.9019	435.3676	413.4459	400.7688	385.7326	384.8800	396.4077	407.0433	430.0429	443.3929	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	19.6403	0.6800	0.7000	0.7700	64.0095	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	64.0095	125.2162	206.2132	300.7496	368.5800	377.3072	359.2118	308.5577	239.8345	148.5795	79.8123	52.6383	(83)
Total gains	517.4759	593.2045	653.1151	736.1172	782.0259	778.0760	744.9445	693.4377	636.2422	555.6229	509.8552	496.0312	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.6219	69.7158	69.8081	70.2449	70.3272	70.7129	70.7129	70.7848	70.5638	70.3272	70.1608	69.9878	
alpha	5.6415	5.6477	5.6539	5.6830	5.6885	5.7142	5.7142	5.7190	5.7043	5.6885	5.6774	5.6659	
util living area	0.9936	0.9855	0.9649	0.8914	0.7441	0.5440	0.3955	0.4427	0.6927	0.9304	0.9856	0.9949	(86)
MIT	19.9923	20.1740	20.4253	20.7385	20.9254	20.9893	20.9985	20.9973	20.9617	20.7005	20.2922	19.9566	(87)

Th 2	20.2077	20.2087	20.2096	20.2142	20.2150	20.2190	20.2190	20.2197	20.2175	20.2150	20.2133	20.2115	(88)
util rest of house	0.9919	0.9818	0.9559	0.8662	0.6965	0.4810	0.3259	0.3688	0.6270	0.9081	0.9813	0.9936	(89)
MIT 2	19.2857	19.4660	19.7122	20.0085	20.1660	20.2139	20.2186	20.2189	20.1967	19.9812	19.5879	19.2534	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.4851	19.6658	19.9134	20.2145	20.3803	20.4327	20.4387	20.4385	20.4126	20.1842	19.7866	19.4519	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4851	19.6658	19.9134	20.2145	20.3803	20.4327	20.4387	20.4385	20.4126	20.1842	19.7866	19.4519	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9899	0.9786	0.9519	0.8662	0.7070	0.4985	0.3456	0.3897	0.6440	0.9071	0.9783	0.9919	(94)
Useful gains	512.2622	580.4959	621.7092	637.6455	552.8697	387.8600	257.4299	270.2037	409.7656	504.0266	498.7822	491.9992	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1035.8841	1005.9254	912.5839	765.0005	586.2074	391.7542	257.8226	270.9705	424.8800	647.2523	858.7989	1034.9994	(97)
Space heating kWh	389.5747	285.8886	216.4107	91.6956	24.8033	0.0000	0.0000	0.0000	0.0000	106.5599	259.2120	403.9922	(98a)
Space heating requirement - total per year (kWh/year)												1778.1371	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	389.5747	285.8886	216.4107	91.6956	24.8033	0.0000	0.0000	0.0000	0.0000	106.5599	259.2120	403.9922	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1778.1371	
Space heating per m2											(98c) / (4) =	22.2323	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	631.3480	497.0186	509.9330	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9456	0.9759	0.9633	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	597.0031	485.0461	491.1981	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	850.0667	814.1870	756.5695	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	182.2058	244.8808	197.4363	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	45.5514	61.2202	49.3591	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												156.1307	(107)
Energy for space heating												22.2323	(99)
Energy for space cooling												1.9521	(108)
Total												24.1844	(109)
Fabric Energy Efficiency (DFEE)												24.2	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Semi-glazed door			3.5800	1.0000	3.5800			(26a)
TER Opening Type			9.8800	1.1450	11.3130			(27)
Heatloss Floor			39.9900	0.1300	5.1987			(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.1800	7.0326			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.5045			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 213.7769 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.4500	0.0500	0.4225
E3 Sill	6.7500	0.0500	0.3375
E4 Jamb	22.0000	0.0500	1.1000
E6 Intermediate floor within a dwelling	19.5200	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	6.0900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E5 Ground floor (normal)	19.5200	0.1600	3.1232
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
P1 Party wall - Ground floor	6.0900	0.0800	0.4872
E7 Party floor between dwellings (in blocks of flats)	14.1200	0.0700	0.9884

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.7208 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.2253 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	77.7420	77.5795	77.4202	76.6720	76.5321	75.8805	75.8805	75.7598	76.1315	76.5321	76.8152	77.1113	(39)

Average = Sum(39)m / 12 = 76.6714

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9700	0.9680	0.9586	0.9569	0.9487	0.9487	0.9472	0.9519	0.9569	0.9604	0.9641	(40)
HLP (average)												0.9586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	122.0433	135.1194	122.0433	126.1114	122.0433	126.1114	122.0433	122.0433	126.1114	122.0433	126.1114	122.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains													
	449.8311	463.9635	443.2666	431.6111	409.8106	397.0124	382.0973	381.2447	392.6512	403.4080	426.2864	439.7576	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	19.6403	0.6300	0.7000	0.7700	59.3029	(76)

Solar gains	59.3029	116.0091	191.0505	278.6357	341.4785	349.5640	332.7992	285.8696	222.1996	137.6546	73.9438	48.7678	(83)
Total gains	509.1340	579.9726	634.3170	710.2468	751.2891	746.5764	714.8965	667.1143	614.8508	541.0626	500.2302	488.5254	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.0920	61.2199	61.3459	61.9445	62.0578	62.5907	62.5907	62.6904	62.3843	62.0578	61.8290	61.5917	
alpha	5.0728	5.0813	5.0897	5.1296	5.1372	5.1727	5.1727	5.1794	5.1590	5.1372	5.1219	5.1061	
util living area													
	0.9947	0.9890	0.9754	0.9261	0.8136	0.6240	0.4621	0.5136	0.7654	0.9514	0.9890	0.9957	(86)
MIT	19.7558	19.9383	20.2077	20.5746	20.8416	20.9688	20.9945	20.9907	20.9137	20.5568	20.0974	19.7267	(87)
Th 2	20.1067	20.1084	20.1101	20.1179	20.1194	20.1263	20.1263	20.1275	20.1236	20.1194	20.1164	20.1133	(88)
util rest of house													
	0.9933	0.9860	0.9685	0.9055	0.7668	0.5489	0.3728	0.4205	0.6959	0.9335	0.9854	0.9945	(89)
MIT 2	18.9705	19.1527	19.4192	19.7761	20.0118	20.1112	20.1246	20.1245	20.0751	19.7672	19.3180	18.9467	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.1921	19.3744	19.6417	20.0014	20.2459	20.3532	20.3701	20.3690	20.3118	19.9900	19.5379	19.1668	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1921	19.3744	19.6417	20.0014	20.2459	20.3532	20.3701	20.3690	20.3118	19.9900	19.5379	19.1668	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9913	0.9829	0.9640	0.9024	0.7741	0.5690	0.3981	0.4467	0.7119	0.9303	0.9823	0.9928	(94)
Useful gains	504.6846	570.0264	611.4672	640.9187	581.5412	424.8309	284.5679	298.0052	437.7399	503.3443	491.3969	485.0121	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1157.7437	1122.9183	1017.4315	851.1676	654.0388	436.5542	286.0763	300.6879	472.9107	718.6344	955.4221	1154.1105	(97)
Space heating kWh													
	485.8759	371.5434	302.0375	151.3791	53.9383	0.0000	0.0000	0.0000	0.0000	160.1758	334.0982	497.8092	(98a)
Space heating requirement - total per year (kWh/year)												2356.8574	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	485.8759	371.5434	302.0375	151.3791	53.9383	0.0000	0.0000	0.0000	0.0000	160.1758	334.0982	497.8092	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2356.8574	
Space heating per m2										(98c) / (4) =		29.4681	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	713.2763	561.5154	575.7744	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8893	0.9419	0.9195	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	634.3061	528.8750	529.4361	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	817.3215	782.9714	729.6042	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	131.7711	189.0477	148.9251	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	32.9428	47.2619	37.2313	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												117.4360	(107)
Energy for space heating												29.4681	(99)
Energy for space cooling												1.4683	(108)
Total												30.9364	(109)
Fabric Energy Efficiency (TFEE)												30.9	(109)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	82 B	**DER**	3.41	**TER**	11.80
Environmental	97 A	**% DER < TER**			71.10
CO_2 Emissions (t/year)	0.26	**DFEE**	24.18	**TFEE**	30.94
Compliance Check	See BREL	**% DFEE < TFEE**			21.83
% DPER < TPER	42.34	**DPER**	36.03	**TPER**	62.49

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6723 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4625 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)		122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.6786	139.1442	125.6786	129.8679	125.6786	129.8679	125.6786	125.6786	129.8679	125.6786	129.8679	125.6786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	559.0481	572.3498	548.4455	530.1166	504.1979	487.2994	469.3775	470.4487	484.3003	499.6452	529.1302	548.0502	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	19.6403	0.6800	0.7000	0.7700	64.0095	(76)

Solar gains	64.0095	125.2162	206.2132	300.7496	368.5800	377.3072	359.2118	308.5577	239.8345	148.5795	79.8123	52.6383	(83)
Total gains	623.0576	697.5659	754.6587	830.8662	872.7779	864.6066	828.5894	779.0064	724.1348	648.2248	608.9425	600.6885	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)		21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9837	0.9681	0.9331	0.8347	0.6723	0.4836	0.3492	0.3879	0.6112	0.8755	0.9665	0.9866	(86)
MIT	20.2100	20.3754	20.5932	20.8324	20.9584	20.9946	20.9993	20.9988	20.9809	20.8096	20.4698	20.1665	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9797	0.9608	0.9183	0.8037	0.6251	0.4272	0.2886	0.3237	0.5493	0.8437	0.9575	0.9834	(89)
MIT 2	19.3195	19.5262	19.7931	20.0696	20.1992	20.2299	20.2329	20.2326	20.2204	20.0511	19.6465	19.2647	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.5708	19.7658	20.0189	20.2849	20.4134	20.4457	20.4492	20.4488	20.4350	20.2652	19.8788	19.5192	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5708	19.7658	20.0189	20.2849	20.4134	20.4457	20.4492	20.4488	20.4350	20.2652	19.8788	19.5192	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9755	0.9554	0.9136	0.8059	0.6365	0.4430	0.3057	0.3418	0.5659	0.8452	0.9525	0.9795	(94)
Useful gains	607.7719	666.4585	689.4700	669.6153	555.5383	382.9945	253.2911	266.2736	409.8086	547.8754	580.0350	588.3625	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1005.5988	978.9322	890.2326	749.7060	573.7879	384.9450	253.4721	266.6201	417.1663	636.4612	841.4986	1008.7841	(97)
Space heating kWh	295.9833	209.9823	149.3674	57.6653	13.5777	0.0000	0.0000	0.0000	0.0000	65.9078	188.2538	312.7936	(98a)
Space heating requirement - total per year (kWh/year)												1293.5312	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	295.9833	209.9823	149.3674	57.6653	13.5777	0.0000	0.0000	0.0000	0.0000	65.9078	188.2538	312.7936	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1293.5312	
Space heating per m2											(98c) / (4) =	16.1732	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	295.9833	209.9823	149.3674	57.6653	13.5777	0.0000	0.0000	0.0000	0.0000	65.9078	188.2538	312.7936 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	443.9749	314.9735	224.0511	86.4979	20.3665	0.0000	0.0000	0.0000	0.0000	98.8618	282.3807	469.1904
Space heating requirement												
	443.9749	314.9735	224.0511	86.4979	20.3665	0.0000	0.0000	0.0000	0.0000	98.8618	282.3807	469.1904 (307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement

	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948
Water heating fuel												
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948 (310)

Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679 (331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year		
Space heating fuel - community heating	1940.2968	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	19.4030	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	6195.5229	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1593.9798	0.1570	81.2437	(367)
Electrical energy for heat distribution (space & water)	19.4030	0.0000	8.7343	(372)
Overall CO2 factor for heat network			0.0404	(386)
Total CO2 associated with community systems			241.6503	(373)
Space and water heating			241.6503	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Total CO2, kg/year			273.0052	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.4100	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1593.9798	1.5813	818.1755	(467)
Electrical energy for heat distribution (space & water)	19.4030	0.0000	92.0839	(472)
Overall CO2 factor for heat network			0.4262	(486)
Total CO2 associated with community systems			2547.6553	(473)
Space and water heating			2547.6553	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)
Total Primary energy kWh/year			2881.7197	(483)
Dwelling Primary energy Rate (DPER)			36.0300	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Semi-glazed door			3.5800	1.0000	3.5800			(26a)
TER Opening Type			9.8800	1.1450	11.3130			(27)
Heatloss Floor			39.9900	0.1300	5.1987			(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.1800	7.0326			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.5045			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 213.7769 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.4500	0.0500	0.4225
E3 Sill	6.7500	0.0500	0.3375
E4 Jamb	22.0000	0.0500	1.1000
E6 Intermediate floor within a dwelling	19.5200	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	6.0900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E5 Ground floor (normal)	19.5200	0.1600	3.1232
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
P1 Party wall - Ground floor	6.0900	0.0800	0.4872
E7 Party floor between dwellings (in blocks of flats)	14.1200	0.0700	0.9884

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.7208 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.2253 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	77.7420	77.5795	77.4202	76.6720	76.5321	75.8805	75.8805	75.7598	76.1315	76.5321	76.8152	77.1113	(39)

Average = Sum(39)m / 12 = 76.6714

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9700	0.9680	0.9586	0.9569	0.9487	0.9487	0.9472	0.9519	0.9569	0.9604	0.9641	(40)
HLP (average)												0.9586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)
Hot water usage for mixer showers

65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)
Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS -29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)

Total per year (kWh/year) = Sum(64)m = 2310.9385 (64)
12Total per year (kWh/year) 2311 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	122.0433	135.1194	122.0433	126.1114	122.0433	126.1114	122.0433	122.0433	126.1114	122.0433	126.1114	122.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans 3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains	549.0775	561.9896	538.4748	520.0247	494.2273	474.2076	456.4069	457.4780	471.2084	489.6746	519.0383	538.0795	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

East				9.8800	19.6403	0.6300	0.7000		0.7700			59.3029	(76)
Solar gains	59.3029	116.0091	191.0505	278.6357	341.4785	349.5640	332.7992	285.8696	222.1996	137.6546	73.9438	48.7678	(83)
Total gains	608.3804	677.9987	729.5253	798.6604	835.7058	823.7716	789.2061	743.3476	693.4080	627.3291	592.9821	586.8473	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.0920	61.2199	61.3459	61.9445	62.0578	62.5907	62.5907	62.6904	62.3843	62.0578	61.8290	61.5917	
alpha	5.0728	5.0813	5.0897	5.1296	5.1372	5.1727	5.1727	5.1794	5.1590	5.1372	5.1219	5.1061	
util living area	0.9885	0.9790	0.9579	0.8926	0.7633	0.5732	0.4202	0.4638	0.7040	0.9188	0.9775	0.9903	(86)
MIT	19.9050	20.0800	20.3336	20.6615	20.8836	20.9787	20.9964	20.9942	20.9414	20.6539	20.2312	19.8758	(87)
Th 2	20.1067	20.1084	20.1101	20.1179	20.1194	20.1263	20.1263	20.1275	20.1236	20.1194	20.1164	20.1133	(88)
util rest of house	0.9855	0.9736	0.9470	0.8662	0.7128	0.5013	0.3382	0.3783	0.6326	0.8927	0.9708	0.9878	(89)
MIT 2	18.8380	19.0601	19.3779	19.7777	20.0210	20.1134	20.1249	20.1252	20.0832	19.7786	19.2591	18.8059	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.1391	19.3479	19.6476	20.0271	20.2644	20.3576	20.3709	20.3704	20.3254	20.0256	19.5334	19.1078	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1391	19.3479	19.6476	20.0271	20.2644	20.3576	20.3709	20.3704	20.3254	20.0256	19.5334	19.1078	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9812	0.9678	0.9401	0.8632	0.7216	0.5208	0.3613	0.4024	0.6499	0.8895	0.9651	0.9839	(94)
Useful gains	596.9506	656.1465	685.8487	689.3776	603.0790	429.0146	285.1742	299.1384	450.6478	558.0090	572.2933	577.4180	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1153.6230	1120.8598	1017.8906	853.1366	655.4525	436.8875	286.1350	300.7964	473.9480	721.3615	955.0754	1149.5584	(97)
Space heating kWh	414.1643	312.2873	247.0392	117.9065	38.9659	0.0000	0.0000	0.0000	0.0000	121.5343	275.6031	425.6725	(98a)
Space heating requirement - total per year (kWh/year)												1953.1730	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	414.1643	312.2873	247.0392	117.9065	38.9659	0.0000	0.0000	0.0000	0.0000	121.5343	275.6031	425.6725	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1953.1730	
Space heating per m2											(98c) / (4) =	24.4208	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	414.1643	312.2873	247.0392	117.9065	38.9659	0.0000	0.0000	0.0000	0.0000	121.5343	275.6031	425.6725	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	448.7154	338.3394	267.6481	127.7427	42.2166	0.0000	0.0000	0.0000	0.0000	131.6731	298.5949	461.1837	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.3781	85.0348	84.3768	83.0310	81.2409	79.8000	79.8000	79.8000	79.8000	83.0677	84.7448	85.4582	(217)
Fuel for water heating, kWh/month	267.4167	237.3749	254.2727	227.8515	226.1156	207.8751	205.6450	213.6686	215.8200	230.6400	239.6706	264.3653	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.3582	20.3433	18.3169	13.4197	10.3658	8.4689	9.4560	12.2913	15.9652	20.9471	23.6598	26.0630	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3424	-31.5676	-47.5704	-56.1485	-62.8691	-59.5233	-58.7993	-54.3654	-46.9365	-37.2699	-23.9846	-18.2835	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9342	-17.0411	-34.5369	-52.8648	-70.8844	-71.5905	-70.7461	-59.4418	-42.9727	-24.6882	-10.6939	-6.2480	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2116.1138	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2790.7159	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	204.6551	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4209.1818	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2116.1138	0.2100	444.3839	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2790.7159	0.2100	586.0503	(264)
Space and water heating			1030.4342	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	204.6551	0.1443	29.5381	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	0.1336	-69.2911	
PV Unit electricity exported	-469.6425	0.1253	-58.8667	
Total			-128.1578	(269)
Total CO2, kg/year			943.7437	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.8000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2116.1138	1.1300	2391.2086	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2790.7159	1.1300	3153.5090	(278)
Space and water heating			5544.7176	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	204.6551	1.5338	313.9068	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	1.4937	-774.7198	
PV Unit electricity exported	-469.6425	0.4601	-216.0686	
Total			-990.7884	(283)
Total Primary energy kWh/year			4997.9368	(286)
Target Primary Energy Rate (TPER)			62.4900	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	82 B	**DER**	3.41	**TER**	11.80
Environmental	97 A	**% DER < TER**			71.10
CO_2 Emissions (t/year)	0.26	**DFEE**	24.18	**TFEE**	30.94
Compliance Check	See BREL	**% DFEE < TFEE**			21.83
% DPER < TPER	42.34	**DPER**	36.03	**TPER**	62.49

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				4	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6723	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	33.5192	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
											Total per year (kWh/year) = Sum(64)m =	2691.4183	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	610.7421	608.5956	590.7266	557.3213	524.1652	494.1729	476.4438	479.4976	496.5901	527.0115	563.7339	595.7477	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	19.6403	0.6800	0.7000	0.7700	64.0095	(76)

Solar gains	64.0095	125.2162	206.2132	300.7496	368.5800	377.3072	359.2118	308.5577	239.8345	148.5795	79.8123	52.6383	(83)
Total gains	674.7516	733.8118	796.9398	858.0709	892.7452	871.4801	835.6556	788.0552	736.4246	675.5910	643.5462	648.3860	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)		

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area													
	0.9765	0.9604	0.9182	0.8197	0.6599	0.4799	0.3462	0.3835	0.6021	0.8589	0.9578	0.9809	(86)
MIT	20.2847	20.4233	20.6380	20.8484	20.9621	20.9948	20.9993	20.9988	20.9822	20.8302	20.5149	20.2369	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house													
	0.9711	0.9517	0.9013	0.7876	0.6129	0.4239	0.2862	0.3200	0.5407	0.8250	0.9469	0.9764	(89)
MIT 2	19.4128	19.5849	19.8457	20.0864	20.2024	20.2300	20.2329	20.2327	20.2214	20.0728	19.7013	19.3530	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.6588	19.8215	20.0693	20.3014	20.4168	20.4458	20.4492	20.4489	20.4361	20.2865	19.9309	19.6024	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6588	19.8215	20.0693	20.3014	20.4168	20.4458	20.4492	20.4489	20.4361	20.2865	19.9309	19.6024	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9661	0.9462	0.8972	0.7907	0.6244	0.4396	0.3031	0.3379	0.5573	0.8275	0.9419	0.9718	(94)
Useful gains	651.8976	694.3109	715.0211	678.4355	557.4294	383.0804	253.3003	266.2970	410.4249	559.0686	606.1333	630.1248	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1011.3973	982.5949	893.5518	750.7983	574.0090	384.9549	253.4732	266.6229	417.2377	637.8686	844.9268	1014.2654	(97)
Space heating kWh													
	267.4678	193.7268	132.8269	52.1012	12.3353	0.0000	0.0000	0.0000	0.0000	58.6272	171.9314	285.8006	(98a)
Space heating requirement - total per year (kWh/year)												1174.8171	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	267.4678	193.7268	132.8269	52.1012	12.3353	0.0000	0.0000	0.0000	0.0000	58.6272	171.9314	285.8006	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1174.8171	
Space heating per m2										(98c) / (4) =		14.6889	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	267.4678	193.7268	132.8269	52.1012	12.3353	0.0000	0.0000	0.0000	0.0000	58.6272	171.9314	285.8006	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	401.2017	290.5902	199.2403	78.1518	18.5029	0.0000	0.0000	0.0000	0.0000	87.9408	257.8970	428.7009	
Space heating requirement													
	401.2017	290.5902	199.2403	78.1518	18.5029	0.0000	0.0000	0.0000	0.0000	87.9408	257.8970	428.7009	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1762.2256	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												17.6223	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)
Total electricity for the above, kWh/year												21.9935	(331)
Electricity for lighting (calculated in Appendix L)												196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												6017.4517	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1762.2256	4.4400	78.2428	(340a)
Space heating total			78.2428	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	196.1051	16.4900	32.3377	(350)
Additional standing charges			92.0000	(351)
Total energy cost			385.4557	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1103	(357)
SAP value		82.0022	
SAP rating (Section 12)		82	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1546.4941	0.1571	73.8061	(367)
Electrical energy for heat distribution (space & water)	17.6223	0.0000	8.4554	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			233.9338	(373)
Space and water heating			233.9338	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Total CO2, kg/year			265.2887	(383)
CO2 emissions per m2			3.3200	(384)
EI value			97.1557	(384a)
EI rating			97	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17097.8798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6723 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains													

	610.7421	608.5956	590.7266	557.3213	524.1652	494.1729	476.4438	479.4976	496.5901	527.0115	563.7339	595.7477	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	23.7835	0.6800	0.7000	0.7700	77.5127	(76)

Solar gains	77.5127	134.7327	218.2918	321.2659	378.6764	415.6011	388.3328	340.4966	267.7476	168.5975	95.2070	64.1092	(83)
Total gains	688.2548	743.3283	809.0184	878.5872	902.8416	909.7739	864.7766	819.9942	764.3377	695.6090	658.9409	659.8569	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9722	0.9549	0.9027	0.7918	0.6235	0.4182	0.2968	0.3289	0.5592	0.8241	0.9477	0.9776	(86)
MIT	20.3333	20.4635	20.6890	20.8786	20.9730	20.9977	20.9997	20.9995	20.9883	20.8723	20.5708	20.2836	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9658	0.9450	0.8829	0.7567	0.5747	0.3637	0.2385	0.2676	0.4979	0.7846	0.9345	0.9723	(89)
MIT 2	19.4737	19.6345	19.9059	20.1184	20.2121	20.2319	20.2331	20.2330	20.2258	20.1173	19.7694	19.4118	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.7163	19.8684	20.1269	20.3329	20.4269	20.4480	20.4494	20.4493	20.4409	20.3303	19.9955	19.6578	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7163	19.8684	20.1269	20.3329	20.4269	20.4480	20.4494	20.4493	20.4409	20.3303	19.9955	19.6578	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9606	0.9395	0.8798	0.7615	0.5873	0.3790	0.2550	0.2849	0.5148	0.7900	0.9297	0.9674	(94)
Useful gains	661.1516	698.3616	711.7907	669.0781	530.2384	344.8103	220.5043	233.6117	393.4550	549.5130	612.6054	638.3648	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	995.4243	965.9336	864.4192	726.5318	541.7487	345.5865	220.5631	233.7257	397.8031	607.8286	822.8449	998.1572	(97)
Space heating kWh	248.6989	179.8084	113.5556	41.3667	8.5637	0.0000	0.0000	0.0000	0.0000	43.3868	151.3725	267.6856	(98a)
Space heating requirement - total per year (kWh/year)												1054.4381	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	248.6989	179.8084	113.5556	41.3667	8.5637	0.0000	0.0000	0.0000	0.0000	43.3868	151.3725	267.6856	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1054.4381	
Space heating per m2											(98c) / (4) =	13.1838	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	248.6989	179.8084	113.5556	41.3667	8.5637	0.0000	0.0000	0.0000	0.0000	43.3868	151.3725	267.6856	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	373.0484	269.7126	170.3334	62.0500	12.8455	0.0000	0.0000	0.0000	0.0000	65.0801	227.0587	401.5284	
Space heating requirement	373.0484	269.7126	170.3334	62.0500	12.8455	0.0000	0.0000	0.0000	0.0000	65.0801	227.0587	401.5284	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1581.6572	(307)

Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	15.8166	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5836.8833	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1581.6572	6.5500	103.5985	(340a)
Space heating total			103.5985	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	196.1051	28.4300	55.7527	(350)
Additional standing charges			104.0000	(351)
Total energy cost			534.0358	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1498.3426	0.1575	66.4471	(367)
Electrical energy for heat distribution (space & water)	15.8166	0.0000	8.1795	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			226.2989	(373)
Space and water heating			226.2989	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Total CO2, kg/year			257.6537	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1498.3426	1.5832	667.7562	(467)
Electrical energy for heat distribution (space & water)	15.8166	0.0000	86.4432	(472)
Overall CO2 factor for heat network			0.4256	(486)
Total CO2 associated with community systems			2391.5953	(473)
Space and water heating			2391.5953	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)
Total Primary energy kWh/year			2725.6597	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Be Clean

Current energy efficiency rating: B 82
Current environmental impact rating: A 97

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 82
Potential environmental impact rating: A 97

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

Current	Potential	Saving

Electricity	£62	£62	£0
Community scheme	£472	£472	£0
Space heating	£214	£214	£0
Water heating	£264	£264	£0
Lighting	£56	£56	£0
Total cost of fuels	£534	£534	£0
Total cost of uses	£534	£534	£0
Delivered energy	73 kWh/m²	73 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	3 kg/m²	3 kg/m²	0 kg/m²
Primary energy	34 kWh/m²	34 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17097.8798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6723 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)

Heat transfer coeff

	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =											65.8511	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.4625	(42)
Hot water usage for mixer showers												
	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths												
	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses												
	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m													
	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
									Total per year (kWh/year) = Sum(64)m =			2691.4183	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							0.0000	(64a)
Heat gains from water heating, kWh/month													
	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains													
	610.7421	608.5956	590.7266	557.3213	524.1652	494.1729	476.4438	479.4976	496.5901	527.0115	563.7339	595.7477	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	19.6403	0.6800	0.7000	0.7700	64.0095	(76)

Solar gains	64.0095	125.2162	206.2132	300.7496	368.5800	377.3072	359.2118	308.5577	239.8345	148.5795	79.8123	52.6383	(83)
Total gains	674.7516	733.8118	796.9398	858.0709	892.7452	871.4801	835.6556	788.0552	736.4246	675.5910	643.5462	648.3860	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)											21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area													
	0.9765	0.9604	0.9182	0.8197	0.6599	0.4799	0.3462	0.3835	0.6021	0.8589	0.9578	0.9809	(86)
MIT	20.2847	20.4233	20.6380	20.8484	20.9621	20.9948	20.9993	20.9988	20.9822	20.8302	20.5149	20.2369	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house													

	0.9711	0.9517	0.9013	0.7876	0.6129	0.4239	0.2862	0.3200	0.5407	0.8250	0.9469	0.9764	(89)
MIT 2	19.4128	19.5849	19.8457	20.0864	20.2024	20.2300	20.2329	20.2327	20.2214	20.0728	19.7013	19.3530	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.6588	19.8215	20.0693	20.3014	20.4168	20.4458	20.4492	20.4489	20.4361	20.2865	19.9309	19.6024	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6588	19.8215	20.0693	20.3014	20.4168	20.4458	20.4492	20.4489	20.4361	20.2865	19.9309	19.6024	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9661	0.9462	0.8972	0.7907	0.6244	0.4396	0.3031	0.3379	0.5573	0.8275	0.9419	0.9718	(94)
Useful gains	651.8976	694.3109	715.0211	678.4355	557.4294	383.0804	253.3003	266.2970	410.4249	559.0686	606.1333	630.1248	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1011.3973	982.5949	893.5518	750.7983	574.0090	384.9549	253.4732	266.6229	417.2377	637.8686	844.9268	1014.2654	(97)
Space heating kWh													
	267.4678	193.7268	132.8269	52.1012	12.3353	0.0000	0.0000	0.0000	0.0000	58.6272	171.9314	285.8006	(98a)
Space heating requirement - total per year (kWh/year)												1174.8171	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	267.4678	193.7268	132.8269	52.1012	12.3353	0.0000	0.0000	0.0000	0.0000	58.6272	171.9314	285.8006	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1174.8171	
Space heating per m2											(98c) / (4) =	14.6889	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	267.4678	193.7268	132.8269	52.1012	12.3353	0.0000	0.0000	0.0000	0.0000	58.6272	171.9314	285.8006	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	401.2017	290.5902	199.2403	78.1518	18.5029	0.0000	0.0000	0.0000	0.0000	87.9408	257.8970	428.7009	
Space heating requirement													
	401.2017	290.5902	199.2403	78.1518	18.5029	0.0000	0.0000	0.0000	0.0000	87.9408	257.8970	428.7009	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1762.2256	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												17.6223	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)
Total electricity for the above, kWh/year												21.9935	(331)
Electricity for lighting (calculated in Appendix L)												196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												6017.4517	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1762.2256	4.4400	78.2428	(340a)
Space heating total			78.2428	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)

Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	196.1051	16.4900	32.3377	(350)
Additional standing charges			92.0000	(351)
Total energy cost			385.4557	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1103	(357)
SAP value		82.0022	
SAP rating (Section 12)		82	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1546.4941	0.1571	73.8061	(367)
Electrical energy for heat distribution (space & water)	17.6223	0.0000	8.4554	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			233.9338	(373)
Space and water heating			233.9338	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Total CO2, kg/year			265.2887	(383)
CO2 emissions per m2			3.3200	(384)
EI value			97.1557	(384a)
EI rating			97	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	195.9510	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17097.8798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6723 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625 (42)
Hot water usage for mixer showers												
	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564 (42a)
Hot water usage for baths												
	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979 (42b)
Hot water usage for other uses												
	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483 (42c)
Average daily hot water use (litres/day)												122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m													
	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains													
	610.7421	608.5956	590.7266	557.3213	524.1652	494.1729	476.4438	479.4976	496.5901	527.0115	563.7339	595.7477	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

				m2		Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c		factor Table 6d		W	
East				9.8800		23.7835	0.6800	0.7000		0.7700		77.5127	(76)
Solar gains	77.5127	134.7327	218.2918	321.2659	378.6764	415.6011	388.3328	340.4966	267.7476	168.5975	95.2070	64.1092	(83)
Total gains	688.2548	743.3283	809.0184	878.5872	902.8416	909.7739	864.7766	819.9942	764.3377	695.6090	658.9409	659.8569	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9722	0.9549	0.9027	0.7918	0.6235	0.4182	0.2968	0.3289	0.5592	0.8241	0.9477	0.9776	(86)
MIT	20.3333	20.4635	20.6890	20.8786	20.9730	20.9977	20.9997	20.9995	20.9883	20.8723	20.5708	20.2836	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9658	0.9450	0.8829	0.7567	0.5747	0.3637	0.2385	0.2676	0.4979	0.7846	0.9345	0.9723	(89)
MIT 2	19.4737	19.6345	19.9059	20.1184	20.2121	20.2319	20.2331	20.2330	20.2258	20.1173	19.7694	19.4118	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.7163	19.8684	20.1269	20.3329	20.4269	20.4480	20.4494	20.4493	20.4409	20.3303	19.9955	19.6578	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7163	19.8684	20.1269	20.3329	20.4269	20.4480	20.4494	20.4493	20.4409	20.3303	19.9955	19.6578	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9606	0.9395	0.8798	0.7615	0.5873	0.3790	0.2550	0.2849	0.5148	0.7900	0.9297	0.9674	(94)
Useful gains	661.1516	698.3616	711.7907	669.0781	530.2384	344.8103	220.5043	233.6117	393.4550	549.5130	612.6054	638.3648	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	995.4243	965.9336	864.4192	726.5318	541.7487	345.5865	220.5631	233.7257	397.8031	607.8286	822.8449	998.1572	(97)
Space heating kWh	248.6989	179.8084	113.5556	41.3667	8.5637	0.0000	0.0000	0.0000	0.0000	43.3868	151.3725	267.6856	(98a)
Space heating requirement - total per year (kWh/year)												1054.4381	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	248.6989	179.8084	113.5556	41.3667	8.5637	0.0000	0.0000	0.0000	0.0000	43.3868	151.3725	267.6856	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1054.4381	
Space heating per m2											(98c) / (4) =	13.1838	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	248.6989	179.8084	113.5556	41.3667	8.5637	0.0000	0.0000	0.0000	0.0000	43.3868	151.3725	267.6856	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	373.0484	269.7126	170.3334	62.0500	12.8455	0.0000	0.0000	0.0000	0.0000	65.0801	227.0587	401.5284	
Space heating requirement	373.0484	269.7126	170.3334	62.0500	12.8455	0.0000	0.0000	0.0000	0.0000	65.0801	227.0587	401.5284	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1581.6572	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												15.8166	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)

Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5836.8833	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1581.6572	6.5500	103.5985	(340a)
Space heating total			103.5985	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	196.1051	28.4300	55.7527	(350)
Additional standing charges			104.0000	(351)
Total energy cost			534.0358	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1498.3426	0.1575	66.4471	(367)
Electrical energy for heat distribution (space & water)	15.8166	0.0000	8.1795	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			226.2989	(373)
Space and water heating			226.2989	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Total CO2, kg/year			257.6537	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1498.3426	1.5832	667.7562	(467)
Electrical energy for heat distribution (space & water)	15.8166	0.0000	86.4432	(472)
Overall CO2 factor for heat network			0.4256	(486)
Total CO2 associated with community systems			2391.5953	(473)
Space and water heating			2391.5953	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)
Total Primary energy kWh/year			2725.6597	(483)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.90	**TER**	11.80
Environmental	98 A	**% DER < TER**			83.90
CO_2 Emissions (t/year)	0.12	**DFEE**	24.18	**TFEE**	30.94
Compliance Check	See BREL	**% DFEE < TFEE**			21.83
% DPER < TPER	61.05	**DPER**	24.34	**TPER**	62.49

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6723 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4625 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)		122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.6786	139.1442	125.6786	129.8679	125.6786	129.8679	125.6786	125.6786	129.8679	125.6786	129.8679	125.6786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	559.0481	572.3498	548.4455	530.1166	504.1979	487.2994	469.3775	470.4487	484.3003	499.6452	529.1302	548.0502	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	19.6403	0.6800	0.7000	0.7700	64.0095	(76)

Solar gains	64.0095	125.2162	206.2132	300.7496	368.5800	377.3072	359.2118	308.5577	239.8345	148.5795	79.8123	52.6383	(83)
Total gains	623.0576	697.5659	754.6587	830.8662	872.7779	864.6066	828.5894	779.0064	724.1348	648.2248	608.9425	600.6885	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)		21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9837	0.9681	0.9331	0.8347	0.6723	0.4836	0.3492	0.3879	0.6112	0.8755	0.9665	0.9866	(86)
MIT	20.2100	20.3754	20.5932	20.8324	20.9584	20.9946	20.9993	20.9988	20.9809	20.8096	20.4698	20.1665	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9797	0.9608	0.9183	0.8037	0.6251	0.4272	0.2886	0.3237	0.5493	0.8437	0.9575	0.9834	(89)
MIT 2	19.3195	19.5262	19.7931	20.0696	20.1992	20.2299	20.2329	20.2326	20.2204	20.0511	19.6465	19.2647	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.5708	19.7658	20.0189	20.2849	20.4134	20.4457	20.4492	20.4488	20.4350	20.2652	19.8788	19.5192	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5708	19.7658	20.0189	20.2849	20.4134	20.4457	20.4492	20.4488	20.4350	20.2652	19.8788	19.5192	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9755	0.9554	0.9136	0.8059	0.6365	0.4430	0.3057	0.3418	0.5659	0.8452	0.9525	0.9795	(94)
Useful gains	607.7719	666.4585	689.4700	669.6153	555.5383	382.9945	253.2911	266.2736	409.8086	547.8754	580.0350	588.3625	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1005.5988	978.9322	890.2326	749.7060	573.7879	384.9450	253.4721	266.6201	417.1663	636.4612	841.4986	1008.7841	(97)
Space heating kWh	295.9833	209.9823	149.3674	57.6653	13.5777	0.0000	0.0000	0.0000	0.0000	65.9078	188.2538	312.7936	(98a)
Space heating requirement - total per year (kWh/year)												1293.5312	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	295.9833	209.9823	149.3674	57.6653	13.5777	0.0000	0.0000	0.0000	0.0000	65.9078	188.2538	312.7936	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1293.5312	
Space heating per m2										(98c) / (4) =		16.1732	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	295.9833	209.9823	149.3674	57.6653	13.5777	0.0000	0.0000	0.0000	0.0000	65.9078	188.2538	312.7936 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	443.9749	314.9735	224.0511	86.4979	20.3665	0.0000	0.0000	0.0000	0.0000	98.8618	282.3807	469.1904
Space heating requirement												
	443.9749	314.9735	224.0511	86.4979	20.3665	0.0000	0.0000	0.0000	0.0000	98.8618	282.3807	469.1904 (307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement

	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948
Water heating fuel												
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679 (331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												1940.2968 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												4037.1274 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												19.4030 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)												
mechanical ventilation fans (SFP = 0.0920)												21.9935 (330a)
Total electricity for the above, kWh/year												21.9935 (331)
Electricity for lighting (calculated in Appendix L)												196.1051 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-958.2209 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												
Energy saved or generated												-0.0000 (336)
Energy used												0.0000 (337)
Total delivered energy for all uses												5237.3020 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1593.9798	0.1570	81.2437	(367)
Electrical energy for heat distribution (space & water)	19.4030	0.0000	8.7343	(372)
Overall CO2 factor for heat network			0.0404	(386)
Total CO2 associated with community systems			241.6503	(373)
Space and water heating			241.6503	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			151.6085	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.9000	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1593.9798	1.5813	818.1755	(467)
Electrical energy for heat distribution (space & water)	19.4030	0.0000	92.0839	(472)
Overall CO2 factor for heat network			0.4262	(486)
Total CO2 associated with community systems			2547.6553	(473)
Space and water heating			2547.6553	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	1.4873	-725.8942	
PV Unit electricity exported	-470.1661	0.4450	-209.2081	
Total			-935.1023	(480)
Total Primary energy kWh/year			1946.6174	(483)
Dwelling Primary energy Rate (DPER)			24.3400	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Semi-glazed door			3.5800	1.0000	3.5800			(26a)
TER Opening Type			9.8800	1.1450	11.3130			(27)
Heatloss Floor			39.9900	0.1300	5.1987			(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.1800	7.0326			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.5045			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			213.7769 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.4500	0.0500	0.4225
E3 Sill	6.7500	0.0500	0.3375
E4 Jamb	22.0000	0.0500	1.1000
E6 Intermediate floor within a dwelling	19.5200	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	6.0900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E5 Ground floor (normal)	19.5200	0.1600	3.1232
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
P1 Party wall - Ground floor	6.0900	0.0800	0.4872
E7 Party floor between dwellings (in blocks of flats)	14.1200	0.0700	0.9884
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.7208 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	41.2253 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	77.7420	77.5795	77.4202	76.6720	76.5321	75.8805	75.8805	75.7598	76.1315	76.5321	76.8152	77.1113	(39)
Average = Sum(39)m / 12 =												76.6714	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9700	0.9680	0.9586	0.9569	0.9487	0.9487	0.9472	0.9519	0.9569	0.9604	0.9641	(40)
HLP (average)												0.9586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers													
	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths													
	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses													
	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m													
	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
										Total per year (kWh/year) = Sum(64)m =		2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	122.0433	135.1194	122.0433	126.1114	122.0433	126.1114	122.0433	122.0433	126.1114	122.0433	126.1114	122.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													
	549.0775	561.9896	538.4748	520.0247	494.2273	474.2076	456.4069	457.4780	471.2084	489.6746	519.0383	538.0795	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	19.6403	0.6300	0.7000	0.7700	59.3029	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	59.3029	116.0091	191.0505	278.6357	341.4785	349.5640	332.7992	285.8696	222.1996	137.6546	73.9438	48.7678	(83)
Total gains	608.3804	677.9987	729.5253	798.6604	835.7058	823.7716	789.2061	743.3476	693.4080	627.3291	592.9821	586.8473	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.0920	61.2199	61.3459	61.9445	62.0578	62.5907	62.5907	62.6904	62.3843	62.0578	61.8290	61.5917	
alpha	5.0728	5.0813	5.0897	5.1296	5.1372	5.1727	5.1727	5.1794	5.1590	5.1372	5.1219	5.1061	
util living area	0.9885	0.9790	0.9579	0.8926	0.7633	0.5732	0.4202	0.4638	0.7040	0.9188	0.9775	0.9903	(86)
MIT	19.9050	20.0800	20.3336	20.6615	20.8836	20.9787	20.9964	20.9942	20.9414	20.6539	20.2312	19.8758	(87)
Th 2	20.1067	20.1084	20.1101	20.1179	20.1194	20.1263	20.1263	20.1275	20.1236	20.1194	20.1164	20.1133	(88)
util rest of house	0.9855	0.9736	0.9470	0.8662	0.7128	0.5013	0.3382	0.3783	0.6326	0.8927	0.9708	0.9878	(89)
MIT 2	18.8380	19.0601	19.3779	19.7777	20.0210	20.1134	20.1249	20.1252	20.0832	19.7786	19.2591	18.8059	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.1391	19.3479	19.6476	20.0271	20.2644	20.3576	20.3709	20.3704	20.3254	20.0256	19.5334	19.1078	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1391	19.3479	19.6476	20.0271	20.2644	20.3576	20.3709	20.3704	20.3254	20.0256	19.5334	19.1078	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9812	0.9678	0.9401	0.8632	0.7216	0.5208	0.3613	0.4024	0.6499	0.8895	0.9651	0.9839	(94)
Useful gains	596.9506	656.1465	685.8487	689.3776	603.0790	429.0146	285.1742	299.1384	450.6478	558.0090	572.2933	577.4180	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1153.6230	1120.8598	1017.8906	853.1366	655.4525	436.8875	286.1350	300.7964	473.9480	721.3615	955.0754	1149.5584	(97)
Space heating kWh	414.1643	312.2873	247.0392	117.9065	38.9659	0.0000	0.0000	0.0000	0.0000	121.5343	275.6031	425.6725	(98a)
Space heating requirement - total per year (kWh/year)												1953.1730	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	414.1643	312.2873	247.0392	117.9065	38.9659	0.0000	0.0000	0.0000	0.0000	121.5343	275.6031	425.6725	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1953.1730	
Space heating per m2											(98c) / (4) =	24.4208	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	414.1643	312.2873	247.0392	117.9065	38.9659	0.0000	0.0000	0.0000	0.0000	121.5343	275.6031	425.6725	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	448.7154	338.3394	267.6481	127.7427	42.2166	0.0000	0.0000	0.0000	0.0000	131.6731	298.5949	461.1837	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.3781	85.0348	84.3768	83.0310	81.2409	79.8000	79.8000	79.8000	79.8000	83.0677	84.7448	85.4582	(217)
Fuel for water heating, kWh/month	267.4167	237.3749	254.2727	227.8515	226.1156	207.8751	205.6450	213.6686	215.8200	230.6400	239.6706	264.3653	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.3582	20.3433	18.3169	13.4197	10.3658	8.4689	9.4560	12.2913	15.9652	20.9471	23.6598	26.0630	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3424	-31.5676	-47.5704	-56.1485	-62.8691	-59.5233	-58.7993	-54.3654	-46.9365	-37.2699	-23.9846	-18.2835	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9342	-17.0411	-34.5369	-52.8648	-70.8844	-71.5905	-70.7461	-59.4418	-42.9727	-24.6882	-10.6939	-6.2480	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2116.1138	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2790.7159	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	204.6551	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4209.1818	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2116.1138	0.2100	444.3839	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2790.7159	0.2100	586.0503	(264)
Space and water heating			1030.4342	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	204.6551	0.1443	29.5381	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	0.1336	-69.2911	
PV Unit electricity exported	-469.6425	0.1253	-58.8667	
Total			-128.1578	(269)
Total CO2, kg/year			943.7437	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.8000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2116.1138	1.1300	2391.2086	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2790.7159	1.1300	3153.5090	(278)
Space and water heating			5544.7176	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	204.6551	1.5338	313.9068	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	1.4937	-774.7198	
PV Unit electricity exported	-469.6425	0.4601	-216.0686	
Total			-990.7884	(283)
Total Primary energy kWh/year			4997.9368	(286)
Target Primary Energy Rate (TPER)			62.4900	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.90	**TER**	11.80
Environmental	98 A	**% DER < TER**			83.90
CO_2 Emissions (t/year)	0.12	**DFEE**	24.18	**TFEE**	30.94
Compliance Check	See BREL	**% DFEE < TFEE**			21.83
% DPER < TPER	61.05	**DPER**	24.34	**TPER**	62.49

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		3 * 10 =	30.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1531	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.3031	(18)
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2122	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2705	0.2652	0.2599	0.2334	0.2281	0.2016	0.2016	0.1963	0.2122	0.2281	0.2387	0.2493	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5366	0.5352	0.5338	0.5272	0.5260	0.5203	0.5203	0.5193	0.5225	0.5260	0.5285	0.5311	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							3.6723	(36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.6979	34.6061	34.5160	34.0930	34.0139	33.6455	33.6455	33.5772	33.7874	34.0139	34.1740	34.3414	(38)
Heat transfer coeff	68.2172	68.1253	68.0352	67.6122	67.5331	67.1647	67.1647	67.0965	67.3066	67.5331	67.6932	67.8606	(39)
Average = Sum(39)m / 12 =												67.6118	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8529	0.8518	0.8507	0.8454	0.8444	0.8398	0.8398	0.8389	0.8415	0.8444	0.8464	0.8485	(40)
HLP (average)												0.8454	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												62.4583	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.6786	139.1442	125.6786	129.8679	125.6786	129.8679	125.6786	125.6786	129.8679	125.6786	129.8679	125.6786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains	453.4664	467.9883	446.9019	435.3676	413.4459	400.7688	385.7326	384.8800	396.4077	407.0433	430.0429	443.3929	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	19.6403	0.6800	0.7000	0.7700	64.0095	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	64.0095	125.2162	206.2132	300.7496	368.5800	377.3072	359.2118	308.5577	239.8345	148.5795	79.8123	52.6383	(83)
Total gains	517.4759	593.2045	653.1151	736.1172	782.0259	778.0760	744.9445	693.4377	636.2422	555.6229	509.8552	496.0312	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.6219	69.7158	69.8081	70.2449	70.3272	70.7129	70.7129	70.7848	70.5638	70.3272	70.1608	69.9878	
alpha	5.6415	5.6477	5.6539	5.6830	5.6885	5.7142	5.7142	5.7190	5.7043	5.6885	5.6774	5.6659	
util living area	0.9936	0.9855	0.9649	0.8914	0.7441	0.5440	0.3955	0.4427	0.6927	0.9304	0.9856	0.9949	(86)
MIT	19.9923	20.1740	20.4253	20.7385	20.9254	20.9893	20.9985	20.9973	20.9617	20.7005	20.2922	19.9566	(87)

Th 2	20.2077	20.2087	20.2096	20.2142	20.2150	20.2190	20.2190	20.2197	20.2175	20.2150	20.2133	20.2115	(88)
util rest of house	0.9919	0.9818	0.9559	0.8662	0.6965	0.4810	0.3259	0.3688	0.6270	0.9081	0.9813	0.9936	(89)
MIT 2	19.2857	19.4660	19.7122	20.0085	20.1660	20.2139	20.2186	20.2189	20.1967	19.9812	19.5879	19.2534	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.4851	19.6658	19.9134	20.2145	20.3803	20.4327	20.4387	20.4385	20.4126	20.1842	19.7866	19.4519	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4851	19.6658	19.9134	20.2145	20.3803	20.4327	20.4387	20.4385	20.4126	20.1842	19.7866	19.4519	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9899	0.9786	0.9519	0.8662	0.7070	0.4985	0.3456	0.3897	0.6440	0.9071	0.9783	0.9919	(94)
Useful gains	512.2622	580.4959	621.7092	637.6455	552.8697	387.8600	257.4299	270.2037	409.7656	504.0266	498.7822	491.9992	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1035.8841	1005.9254	912.5839	765.0005	586.2074	391.7542	257.8226	270.9705	424.8800	647.2523	858.7989	1034.9994	(97)
Space heating kWh	389.5747	285.8886	216.4107	91.6956	24.8033	0.0000	0.0000	0.0000	0.0000	106.5599	259.2120	403.9922	(98a)
Space heating requirement - total per year (kWh/year)												1778.1371	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	389.5747	285.8886	216.4107	91.6956	24.8033	0.0000	0.0000	0.0000	0.0000	106.5599	259.2120	403.9922	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1778.1371	
Space heating per m2											(98c) / (4) =	22.2323	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	631.3480	497.0186	509.9330	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9456	0.9759	0.9633	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	597.0031	485.0461	491.1981	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	850.0667	814.1870	756.5695	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	182.2058	244.8808	197.4363	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	45.5514	61.2202	49.3591	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												156.1307	(107)
Energy for space heating												22.2323	(99)
Energy for space cooling												1.9521	(108)
Total												24.1844	(109)
Fabric Energy Efficiency (DFEE)												24.2	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Semi-glazed door			3.5800	1.0000	3.5800			(26a)
TER Opening Type			9.8800	1.1450	11.3130			(27)
Heatloss Floor			39.9900	0.1300	5.1987			(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.1800	7.0326			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.5045			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 213.7769 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.4500	0.0500	0.4225
E3 Sill	6.7500	0.0500	0.3375
E4 Jamb	22.0000	0.0500	1.1000
E6 Intermediate floor within a dwelling	19.5200	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	6.0900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E5 Ground floor (normal)	19.5200	0.1600	3.1232
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
P1 Party wall - Ground floor	6.0900	0.0800	0.4872
E7 Party floor between dwellings (in blocks of flats)	14.1200	0.0700	0.9884

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.7208 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.2253 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	77.7420	77.5795	77.4202	76.6720	76.5321	75.8805	75.8805	75.7598	76.1315	76.5321	76.8152	77.1113	(39)

Average = Sum(39)m / 12 = 76.6714

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9700	0.9680	0.9586	0.9569	0.9487	0.9487	0.9472	0.9519	0.9569	0.9604	0.9641	(40)
HLP (average)												0.9586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	122.0433	135.1194	122.0433	126.1114	122.0433	126.1114	122.0433	122.0433	126.1114	122.0433	126.1114	122.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains													
	449.8311	463.9635	443.2666	431.6111	409.8106	397.0124	382.0973	381.2447	392.6512	403.4080	426.2864	439.7576	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	19.6403	0.6300	0.7000	0.7700	59.3029	(76)

Solar gains	59.3029	116.0091	191.0505	278.6357	341.4785	349.5640	332.7992	285.8696	222.1996	137.6546	73.9438	48.7678	(83)
Total gains	509.1340	579.9726	634.3170	710.2468	751.2891	746.5764	714.8965	667.1143	614.8508	541.0626	500.2302	488.5254	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.0920	61.2199	61.3459	61.9445	62.0578	62.5907	62.5907	62.6904	62.3843	62.0578	61.8290	61.5917	
alpha	5.0728	5.0813	5.0897	5.1296	5.1372	5.1727	5.1727	5.1794	5.1590	5.1372	5.1219	5.1061	
util living area													
	0.9947	0.9890	0.9754	0.9261	0.8136	0.6240	0.4621	0.5136	0.7654	0.9514	0.9890	0.9957	(86)
MIT	19.7558	19.9383	20.2077	20.5746	20.8416	20.9688	20.9945	20.9907	20.9137	20.5568	20.0974	19.7267	(87)
Th 2	20.1067	20.1084	20.1101	20.1179	20.1194	20.1263	20.1263	20.1275	20.1236	20.1194	20.1164	20.1133	(88)
util rest of house													
	0.9933	0.9860	0.9685	0.9055	0.7668	0.5489	0.3728	0.4205	0.6959	0.9335	0.9854	0.9945	(89)
MIT 2	18.9705	19.1527	19.4192	19.7761	20.0118	20.1112	20.1246	20.1245	20.0751	19.7672	19.3180	18.9467	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.1921	19.3744	19.6417	20.0014	20.2459	20.3532	20.3701	20.3690	20.3118	19.9900	19.5379	19.1668	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1921	19.3744	19.6417	20.0014	20.2459	20.3532	20.3701	20.3690	20.3118	19.9900	19.5379	19.1668	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9913	0.9829	0.9640	0.9024	0.7741	0.5690	0.3981	0.4467	0.7119	0.9303	0.9823	0.9928	(94)
Useful gains	504.6846	570.0264	611.4672	640.9187	581.5412	424.8309	284.5679	298.0052	437.7399	503.3443	491.3969	485.0121	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1157.7437	1122.9183	1017.4315	851.1676	654.0388	436.5542	286.0763	300.6879	472.9107	718.6344	955.4221	1154.1105	(97)
Space heating kWh													
	485.8759	371.5434	302.0375	151.3791	53.9383	0.0000	0.0000	0.0000	0.0000	160.1758	334.0982	497.8092	(98a)
Space heating requirement - total per year (kWh/year)												2356.8574	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	485.8759	371.5434	302.0375	151.3791	53.9383	0.0000	0.0000	0.0000	0.0000	160.1758	334.0982	497.8092	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2356.8574	
Space heating per m2										(98c) / (4) =		29.4681	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	713.2763	561.5154	575.7744	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8893	0.9419	0.9195	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	634.3061	528.8750	529.4361	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	817.3215	782.9714	729.6042	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	131.7711	189.0477	148.9251	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	32.9428	47.2619	37.2313	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												117.4360	(107)
Energy for space heating												29.4681	(99)
Energy for space cooling												1.4683	(108)
Total												30.9364	(109)
Fabric Energy Efficiency (TFEE)												30.9	(109)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.90	**TER**	11.80
Environmental	98 A	**% DER < TER**			83.90
CO_2 Emissions (t/year)	0.12	**DFEE**	24.18	**TFEE**	30.94
Compliance Check	See BREL	**% DFEE < TFEE**			21.83
% DPER < TPER	61.05	**DPER**	24.34	**TPER**	62.49

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6723 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4625 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)		122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.6786	139.1442	125.6786	129.8679	125.6786	129.8679	125.6786	125.6786	129.8679	125.6786	129.8679	125.6786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	559.0481	572.3498	548.4455	530.1166	504.1979	487.2994	469.3775	470.4487	484.3003	499.6452	529.1302	548.0502	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	19.6403	0.6800	0.7000	0.7700	64.0095	(76)

Solar gains	64.0095	125.2162	206.2132	300.7496	368.5800	377.3072	359.2118	308.5577	239.8345	148.5795	79.8123	52.6383	(83)
Total gains	623.0576	697.5659	754.6587	830.8662	872.7779	864.6066	828.5894	779.0064	724.1348	648.2248	608.9425	600.6885	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)		21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9837	0.9681	0.9331	0.8347	0.6723	0.4836	0.3492	0.3879	0.6112	0.8755	0.9665	0.9866	(86)
MIT	20.2100	20.3754	20.5932	20.8324	20.9584	20.9946	20.9993	20.9988	20.9809	20.8096	20.4698	20.1665	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9797	0.9608	0.9183	0.8037	0.6251	0.4272	0.2886	0.3237	0.5493	0.8437	0.9575	0.9834	(89)
MIT 2	19.3195	19.5262	19.7931	20.0696	20.1992	20.2299	20.2329	20.2326	20.2204	20.0511	19.6465	19.2647	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.5708	19.7658	20.0189	20.2849	20.4134	20.4457	20.4492	20.4488	20.4350	20.2652	19.8788	19.5192	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5708	19.7658	20.0189	20.2849	20.4134	20.4457	20.4492	20.4488	20.4350	20.2652	19.8788	19.5192	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9755	0.9554	0.9136	0.8059	0.6365	0.4430	0.3057	0.3418	0.5659	0.8452	0.9525	0.9795	(94)
Useful gains	607.7719	666.4585	689.4700	669.6153	555.5383	382.9945	253.2911	266.2736	409.8086	547.8754	580.0350	588.3625	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1005.5988	978.9322	890.2326	749.7060	573.7879	384.9450	253.4721	266.6201	417.1663	636.4612	841.4986	1008.7841	(97)
Space heating kWh	295.9833	209.9823	149.3674	57.6653	13.5777	0.0000	0.0000	0.0000	0.0000	65.9078	188.2538	312.7936	(98a)
Space heating requirement - total per year (kWh/year)												1293.5312	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	295.9833	209.9823	149.3674	57.6653	13.5777	0.0000	0.0000	0.0000	0.0000	65.9078	188.2538	312.7936	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1293.5312	
Space heating per m2										(98c) / (4) =		16.1732	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	295.9833	209.9823	149.3674	57.6653	13.5777	0.0000	0.0000	0.0000	0.0000	65.9078	188.2538	312.7936 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	443.9749	314.9735	224.0511	86.4979	20.3665	0.0000	0.0000	0.0000	0.0000	98.8618	282.3807	469.1904
Space heating requirement												
	443.9749	314.9735	224.0511	86.4979	20.3665	0.0000	0.0000	0.0000	0.0000	98.8618	282.3807	469.1904 (307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement

	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948
Water heating fuel												
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679 (331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												1940.2968 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												4037.1274 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												19.4030 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)												
mechanical ventilation fans (SFP = 0.0920)												21.9935 (330a)
Total electricity for the above, kWh/year												21.9935 (331)
Electricity for lighting (calculated in Appendix L)												196.1051 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-958.2209 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												
Energy saved or generated												-0.0000 (336)
Energy used												0.0000 (337)
Total delivered energy for all uses												5237.3020 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1593.9798	0.1570	81.2437	(367)
Electrical energy for heat distribution (space & water)	19.4030	0.0000	8.7343	(372)
Overall CO2 factor for heat network			0.0404	(386)
Total CO2 associated with community systems			241.6503	(373)
Space and water heating			241.6503	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			151.6085	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.9000	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1593.9798	1.5813	818.1755	(467)
Electrical energy for heat distribution (space & water)	19.4030	0.0000	92.0839	(472)
Overall CO2 factor for heat network			0.4262	(486)
Total CO2 associated with community systems			2547.6553	(473)
Space and water heating			2547.6553	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	1.4873	-725.8942	
PV Unit electricity exported	-470.1661	0.4450	-209.2081	
Total			-935.1023	(480)
Total Primary energy kWh/year			1946.6174	(483)
Dwelling Primary energy Rate (DPER)			24.3400	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Semi-glazed door			3.5800	1.0000	3.5800			(26a)
TER Opening Type			9.8800	1.1450	11.3130			(27)
Heatloss Floor			39.9900	0.1300	5.1987			(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.1800	7.0326			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.5045			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			213.7769 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.4500	0.0500	0.4225
E3 Sill	6.7500	0.0500	0.3375
E4 Jamb	22.0000	0.0500	1.1000
E6 Intermediate floor within a dwelling	19.5200	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	6.0900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E5 Ground floor (normal)	19.5200	0.1600	3.1232
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
P1 Party wall - Ground floor	6.0900	0.0800	0.4872
E7 Party floor between dwellings (in blocks of flats)	14.1200	0.0700	0.9884
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.7208 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	41.2253 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	77.7420	77.5795	77.4202	76.6720	76.5321	75.8805	75.8805	75.7598	76.1315	76.5321	76.8152	77.1113	(39)
Average = Sum(39)m / 12 =												76.6714	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9700	0.9680	0.9586	0.9569	0.9487	0.9487	0.9472	0.9519	0.9569	0.9604	0.9641	(40)
HLP (average)												0.9586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers													
	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths													
	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses													
	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m													
	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
										Total per year (kWh/year) = Sum(64)m =		2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	122.0433	135.1194	122.0433	126.1114	122.0433	126.1114	122.0433	122.0433	126.1114	122.0433	126.1114	122.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													
	549.0775	561.9896	538.4748	520.0247	494.2273	474.2076	456.4069	457.4780	471.2084	489.6746	519.0383	538.0795	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	19.6403	0.6300	0.7000	0.7700	59.3029	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	59.3029	116.0091	191.0505	278.6357	341.4785	349.5640	332.7992	285.8696	222.1996	137.6546	73.9438	48.7678	(83)
Total gains	608.3804	677.9987	729.5253	798.6604	835.7058	823.7716	789.2061	743.3476	693.4080	627.3291	592.9821	586.8473	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.0920	61.2199	61.3459	61.9445	62.0578	62.5907	62.5907	62.6904	62.3843	62.0578	61.8290	61.5917	
alpha	5.0728	5.0813	5.0897	5.1296	5.1372	5.1727	5.1727	5.1794	5.1590	5.1372	5.1219	5.1061	
util living area	0.9885	0.9790	0.9579	0.8926	0.7633	0.5732	0.4202	0.4638	0.7040	0.9188	0.9775	0.9903	(86)
MIT	19.9050	20.0800	20.3336	20.6615	20.8836	20.9787	20.9964	20.9942	20.9414	20.6539	20.2312	19.8758	(87)
Th 2	20.1067	20.1084	20.1101	20.1179	20.1194	20.1263	20.1263	20.1275	20.1236	20.1194	20.1164	20.1133	(88)
util rest of house	0.9855	0.9736	0.9470	0.8662	0.7128	0.5013	0.3382	0.3783	0.6326	0.8927	0.9708	0.9878	(89)
MIT 2	18.8380	19.0601	19.3779	19.7777	20.0210	20.1134	20.1249	20.1252	20.0832	19.7786	19.2591	18.8059	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.1391	19.3479	19.6476	20.0271	20.2644	20.3576	20.3709	20.3704	20.3254	20.0256	19.5334	19.1078	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1391	19.3479	19.6476	20.0271	20.2644	20.3576	20.3709	20.3704	20.3254	20.0256	19.5334	19.1078	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9812	0.9678	0.9401	0.8632	0.7216	0.5208	0.3613	0.4024	0.6499	0.8895	0.9651	0.9839	(94)
Useful gains	596.9506	656.1465	685.8487	689.3776	603.0790	429.0146	285.1742	299.1384	450.6478	558.0090	572.2933	577.4180	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1153.6230	1120.8598	1017.8906	853.1366	655.4525	436.8875	286.1350	300.7964	473.9480	721.3615	955.0754	1149.5584	(97)
Space heating kWh	414.1643	312.2873	247.0392	117.9065	38.9659	0.0000	0.0000	0.0000	0.0000	121.5343	275.6031	425.6725	(98a)
Space heating requirement - total per year (kWh/year)												1953.1730	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	414.1643	312.2873	247.0392	117.9065	38.9659	0.0000	0.0000	0.0000	0.0000	121.5343	275.6031	425.6725	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1953.1730	
Space heating per m2											(98c) / (4) =	24.4208	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	414.1643	312.2873	247.0392	117.9065	38.9659	0.0000	0.0000	0.0000	0.0000	121.5343	275.6031	425.6725	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	448.7154	338.3394	267.6481	127.7427	42.2166	0.0000	0.0000	0.0000	0.0000	131.6731	298.5949	461.1837	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.3781	85.0348	84.3768	83.0310	81.2409	79.8000	79.8000	79.8000	79.8000	83.0677	84.7448	85.4582	(217)
Fuel for water heating, kWh/month	267.4167	237.3749	254.2727	227.8515	226.1156	207.8751	205.6450	213.6686	215.8200	230.6400	239.6706	264.3653	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.3582	20.3433	18.3169	13.4197	10.3658	8.4689	9.4560	12.2913	15.9652	20.9471	23.6598	26.0630	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3424	-31.5676	-47.5704	-56.1485	-62.8691	-59.5233	-58.7993	-54.3654	-46.9365	-37.2699	-23.9846	-18.2835	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9342	-17.0411	-34.5369	-52.8648	-70.8844	-71.5905	-70.7461	-59.4418	-42.9727	-24.6882	-10.6939	-6.2480	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2116.1138	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2790.7159	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	204.6551	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4209.1818	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2116.1138	0.2100	444.3839	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2790.7159	0.2100	586.0503	(264)
Space and water heating			1030.4342	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	204.6551	0.1443	29.5381	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	0.1336	-69.2911	
PV Unit electricity exported	-469.6425	0.1253	-58.8667	
Total			-128.1578	(269)
Total CO2, kg/year			943.7437	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.8000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2116.1138	1.1300	2391.2086	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2790.7159	1.1300	3153.5090	(278)
Space and water heating			5544.7176	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	204.6551	1.5338	313.9068	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	1.4937	-774.7198	
PV Unit electricity exported	-469.6425	0.4601	-216.0686	
Total			-990.7884	(283)
Total Primary energy kWh/year			4997.9368	(286)
Target Primary Energy Rate (TPER)			62.4900	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.90	**TER**	11.80
Environmental	98 A	**% DER < TER**			83.90
CO_2 Emissions (t/year)	0.12	**DFEE**	24.18	**TFEE**	30.94
Compliance Check	See BREL	**% DFEE < TFEE**			21.83
% DPER < TPER	61.05	**DPER**	24.34	**TPER**	62.49

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 3.6723 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)
Hot water usage for mixer showers

65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	610.7421	608.5956	590.7266	557.3213	524.1652	494.1729	476.4438	479.4976	496.5901	527.0115	563.7339	595.7477	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	19.6403	0.6800	0.7000	0.7700	64.0095	(76)

Solar gains	64.0095	125.2162	206.2132	300.7496	368.5800	377.3072	359.2118	308.5577	239.8345	148.5795	79.8123	52.6383	(83)
Total gains	674.7516	733.8118	796.9398	858.0709	892.7452	871.4801	835.6556	788.0552	736.4246	675.5910	643.5462	648.3860	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9765	0.9604	0.9182	0.8197	0.6599	0.4799	0.3462	0.3835	0.6021	0.8589	0.9578	0.9809	(86)
MIT	20.2847	20.4233	20.6380	20.8484	20.9621	20.9948	20.9993	20.9988	20.9822	20.8302	20.5149	20.2369	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9711	0.9517	0.9013	0.7876	0.6129	0.4239	0.2862	0.3200	0.5407	0.8250	0.9469	0.9764	(89)
MIT 2	19.4128	19.5849	19.8457	20.0864	20.2024	20.2300	20.2329	20.2327	20.2214	20.0728	19.7013	19.3530	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.6588	19.8215	20.0693	20.3014	20.4168	20.4458	20.4492	20.4489	20.4361	20.2865	19.9309	19.6024	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6588	19.8215	20.0693	20.3014	20.4168	20.4458	20.4492	20.4489	20.4361	20.2865	19.9309	19.6024	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9661	0.9462	0.8972	0.7907	0.6244	0.4396	0.3031	0.3379	0.5573	0.8275	0.9419	0.9718	(94)
Useful gains	651.8976	694.3109	715.0211	678.4355	557.4294	383.0804	253.3003	266.2970	410.4249	559.0686	606.1333	630.1248	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1011.3973	982.5949	893.5518	750.7983	574.0090	384.9549	253.4732	266.6229	417.2377	637.8686	844.9268	1014.2654	(97)
Space heating kWh	267.4678	193.7268	132.8269	52.1012	12.3353	0.0000	0.0000	0.0000	0.0000	58.6272	171.9314	285.8006	(98a)
Space heating requirement - total per year (kWh/year)												1174.8171	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	267.4678	193.7268	132.8269	52.1012	12.3353	0.0000	0.0000	0.0000	0.0000	58.6272	171.9314	285.8006	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1174.8171	
Space heating per m2											(98c) / (4) =	14.6889	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	267.4678	193.7268	132.8269	52.1012	12.3353	0.0000	0.0000	0.0000	0.0000	58.6272	171.9314	285.8006	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	401.2017	290.5902	199.2403	78.1518	18.5029	0.0000	0.0000	0.0000	0.0000	87.9408	257.8970	428.7009	
Space heating requirement	401.2017	290.5902	199.2403	78.1518	18.5029	0.0000	0.0000	0.0000	0.0000	87.9408	257.8970	428.7009	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1762.2256	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												17.6223	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)
Total electricity for the above, kWh/year												21.9935	(331)
Electricity for lighting (calculated in Appendix L)												196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5059.2308	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1762.2256	4.4400	78.2428	(340a)
Space heating total			78.2428	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	196.1051	16.4900	32.3377	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	16.4900	-80.4802	
PV Unit electricity exported	-470.1661	5.5900	-26.2823	
Total			-106.7625	(352)
Total energy cost			278.6932	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8028 (357)
SAP value		86.9872
SAP rating (Section 12)		87 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1546.4941	0.1571	73.8061	(367)
Electrical energy for heat distribution (space & water)	17.6223	0.0000	8.4554	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			233.9338	(373)
Space and water heating			233.9338	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			143.8920	(383)
CO2 emissions per m2			1.8000	(384)
EI value			98.4572	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 79.9800						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate													
	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17097.8798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.6723	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 33.5192	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff													
	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m													
	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
327.4608 330.8588 322.2959 304.0665 281.0552 259.4278 244.9794 241.5813 250.1442 268.3736 291.3850 313.0124 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 (71)
Water heating gains (Table 5)
154.0336 151.5930 146.8914 136.5869 130.2751 123.6777 119.6256 122.9734 126.8986 134.2191 144.0972 152.7161 (72)
Total internal gains
610.7421 608.5956 590.7266 557.3213 524.1652 494.1729 476.4438 479.4976 496.5901 527.0115 563.7339 595.7477 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	23.7835	0.6800	0.7000	0.7700	77.5127	(76)

Solar gains 77.5127 134.7327 218.2918 321.2659 378.6764 415.6011 388.3328 340.4966 267.7476 168.5975 95.2070 64.1092 (83)
Total gains 688.2548 743.3283 809.0184 878.5872 902.8416 909.7739 864.7766 819.9942 764.3377 695.6090 658.9409 659.8569 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9722	0.9549	0.9027	0.7918	0.6235	0.4182	0.2968	0.3289	0.5592	0.8241	0.9477	0.9776	(86)
MIT	20.3333	20.4635	20.6890	20.8786	20.9730	20.9977	20.9997	20.9995	20.9883	20.8723	20.5708	20.2836	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9658	0.9450	0.8829	0.7567	0.5747	0.3637	0.2385	0.2676	0.4979	0.7846	0.9345	0.9723	(89)
MIT 2	19.4737	19.6345	19.9059	20.1184	20.2121	20.2319	20.2331	20.2330	20.2258	20.1173	19.7694	19.4118	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.7163	19.8684	20.1269	20.3329	20.4269	20.4480	20.4494	20.4493	20.4409	20.3303	19.9955	19.6578	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7163	19.8684	20.1269	20.3329	20.4269	20.4480	20.4494	20.4493	20.4409	20.3303	19.9955	19.6578	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9606	0.9395	0.8798	0.7615	0.5873	0.3790	0.2550	0.2849	0.5148	0.7900	0.9297	0.9674	(94)
Useful gains	661.1516	698.3616	711.7907	669.0781	530.2384	344.8103	220.5043	233.6117	393.4550	549.5130	612.6054	638.3648	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	995.4243	965.9336	864.4192	726.5318	541.7487	345.5865	220.5631	233.7257	397.8031	607.8286	822.8449	998.1572	(97)
Space heating kWh	248.6989	179.8084	113.5556	41.3667	8.5637	0.0000	0.0000	0.0000	0.0000	43.3868	151.3725	267.6856	(98a)
Space heating requirement - total per year (kWh/year)												1054.4381	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	248.6989	179.8084	113.5556	41.3667	8.5637	0.0000	0.0000	0.0000	0.0000	43.3868	151.3725	267.6856	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1054.4381	
Space heating per m2										(98c) / (4) =		13.1838	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement
248.6989 179.8084 113.5556 41.3667 8.5637 0.0000 0.0000 0.0000 0.0000 43.3868 151.3725 267.6856 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50
307a 373.0484 269.7126 170.3334 62.0500 12.8455 0.0000 0.0000 0.0000 0.0000 65.0801 227.0587 401.5284
Space heating requirement
373.0484 269.7126 170.3334 62.0500 12.8455 0.0000 0.0000 0.0000 0.0000 65.0801 227.0587 401.5284 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)

Water heating
Annual water heating requirement
266.9446 236.1786 250.9634 220.5542 213.7828 192.6005 189.9534 197.4446 199.5749 222.6078 236.8171 263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50
310a 400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948
Water heating fuel
400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948 (310)
Cooling System Energy Efficiency Ratio 0.0000 (314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (315)
Pumps and Fa 1.8679 1.6872 1.8679 1.8077 1.8679 1.8077 1.8679 1.8679 1.8077 1.8679 1.8077 1.8679 (331)
Lighting 24.2988 19.4934 17.5516 12.8591 9.9327 8.1151 9.0610 11.7778 15.2982 20.0720 22.6713 24.9741 (332)
Electricity generated by PVs (Appendix M) (negative quantity)
(333a)m -17.9780 -26.9243 -45.2366 -58.5173 -66.4974 -66.2241 -64.3099 -58.6197 -48.0109 -34.7929 -20.6435 -14.9664 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(334a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (334a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.0204	-13.0409	-32.0085	-59.0559	-82.7431	-94.8946	-90.1802	-72.6219	-46.3379	-22.2034	-8.3869	-4.5323	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1581.6572	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	15.8166	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4782.1363	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1581.6572	6.5500	103.5985	(340a)
Space heating total			103.5985	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	196.1051	28.4300	55.7527	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	28.4300	-148.6096	
PV Unit electricity exported	-532.0259	5.8100	-30.9107	
Total			-179.5203	(352)
Total energy cost			354.5155	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1498.3426	0.1575	66.4471	(367)
Electrical energy for heat distribution (space & water)	15.8166	0.0000	8.1795	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			226.2989	(373)
Space and water heating			226.2989	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	0.1322	-69.1017	
PV Unit electricity exported	-532.0259	0.1213	-64.5494	
Total			-133.6511	(380)
Total CO2, kg/year			124.0026	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1498.3426	1.5832	667.7562	(467)
Electrical energy for heat distribution (space & water)	15.8166	0.0000	86.4432	(472)
Overall CO2 factor for heat network			0.4256	(486)
Total CO2 associated with community systems			2391.5953	(473)
Space and water heating			2391.5953	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	1.4884	-778.0360	
PV Unit electricity exported	-532.0259	0.4451	-236.7863	
Total			-1014.8223	(480)
Total Primary energy kWh/year			1710.8374	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Be Green

Current energy efficiency rating:	B 87
Current environmental impact rating:	A 98

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 87
Potential environmental impact rating: A 98

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£62	£62	£0
Community scheme	£472	£472	£0
Space heating	£214	£214	£0
Water heating	£264	£264	£0
Lighting	£56	£56	£0
Generated (PV)	-£180	-£180	£0
Total cost of fuels	£354	£354	£0
Total cost of uses	£354	£354	£0
Delivered energy	60 kWh/m²	60 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	2 kg/m²	2 kg/m²	0 kg/m²
Primary energy	21 kWh/m²	21 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17097.8798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6723 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
									Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)

Water heating gains (Table 5)

154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)

Total internal gains

610.7421	608.5956	590.7266	557.3213	524.1652	494.1729	476.4438	479.4976	496.5901	527.0115	563.7339	595.7477	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	19.6403	0.6800	0.7000	0.7700	64.0095	(76)

Solar gains	64.0095	125.2162	206.2132	300.7496	368.5800	377.3072	359.2118	308.5577	239.8345	148.5795	79.8123	52.6383	(83)
Total gains	674.7516	733.8118	796.9398	858.0709	892.7452	871.4801	835.6556	788.0552	736.4246	675.5910	643.5462	648.3860	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9765	0.9604	0.9182	0.8197	0.6599	0.4799	0.3462	0.3835	0.6021	0.8589	0.9578	0.9809	(86)
MIT	20.2847	20.4233	20.6380	20.8484	20.9621	20.9948	20.9993	20.9988	20.9822	20.8302	20.5149	20.2369	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9711	0.9517	0.9013	0.7876	0.6129	0.4239	0.2862	0.3200	0.5407	0.8250	0.9469	0.9764	(89)
MIT 2	19.4128	19.5849	19.8457	20.0864	20.2024	20.2300	20.2329	20.2327	20.2214	20.0728	19.7013	19.3530	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.6588	19.8215	20.0693	20.3014	20.4168	20.4458	20.4492	20.4489	20.4361	20.2865	19.9309	19.6024	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6588	19.8215	20.0693	20.3014	20.4168	20.4458	20.4492	20.4489	20.4361	20.2865	19.9309	19.6024	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9661	0.9462	0.8972	0.7907	0.6244	0.4396	0.3031	0.3379	0.5573	0.8275	0.9419	0.9718	(94)
Useful gains	651.8976	694.3109	715.0211	678.4355	557.4294	383.0804	253.3003	266.2970	410.4249	559.0686	606.1333	630.1248	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1011.3973	982.5949	893.5518	750.7983	574.0090	384.9549	253.4732	266.6229	417.2377	637.8686	844.9268	1014.2654	(97)
Space heating kWh	267.4678	193.7268	132.8269	52.1012	12.3353	0.0000	0.0000	0.0000	0.0000	58.6272	171.9314	285.8006	(98a)
Space heating requirement - total per year (kWh/year)												1174.8171	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	267.4678	193.7268	132.8269	52.1012	12.3353	0.0000	0.0000	0.0000	0.0000	58.6272	171.9314	285.8006	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1174.8171	
Space heating per m2											(98c) / (4) =	14.6889	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	267.4678	193.7268	132.8269	52.1012	12.3353	0.0000	0.0000	0.0000	0.0000	58.6272	171.9314	285.8006	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	401.2017	290.5902	199.2403	78.1518	18.5029	0.0000	0.0000	0.0000	0.0000	87.9408	257.8970	428.7009	
Space heating requirement	401.2017	290.5902	199.2403	78.1518	18.5029	0.0000	0.0000	0.0000	0.0000	87.9408	257.8970	428.7009	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1762.2256	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												17.6223	(313)
Space cooling fuel												0.0000	(321)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)

mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5059.2308	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1762.2256	4.4400	78.2428	(340a)
Space heating total			78.2428	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	196.1051	16.4900	32.3377	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	16.4900	-80.4802	
PV Unit electricity exported	-470.1661	5.5900	-26.2823	
Total			-106.7625	(352)
Total energy cost			278.6932	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8028	(357)
SAP value		86.9872	
SAP rating (Section 12)		87	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1546.4941	0.1571	73.8061	(367)
Electrical energy for heat distribution (space & water)	17.6223	0.0000	8.4554	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			233.9338	(373)
Space and water heating			233.9338	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			143.8920	(383)
CO2 emissions per m2			1.8000	(384)
EI value			98.4572	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)

Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17097.8798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.6723 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)
Total storage loss	

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)

											Total per year (kWh/year) = Sum(64)m =	2691.4183	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000		(64a)
Heat gains from water heating, kWh/month													
114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207		(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains													
	610.7421	608.5956	590.7266	557.3213	524.1652	494.1729	476.4438	479.4976	496.5901	527.0115	563.7339	595.7477	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	23.7835	0.6800	0.7000	0.7700	77.5127	(76)

Solar gains	77.5127	134.7327	218.2918	321.2659	378.6764	415.6011	388.3328	340.4966	267.7476	168.5975	95.2070	64.1092	(83)
Total gains	688.2548	743.3283	809.0184	878.5872	902.8416	909.7739	864.7766	819.9942	764.3377	695.6090	658.9409	659.8569	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area													
	0.9722	0.9549	0.9027	0.7918	0.6235	0.4182	0.2968	0.3289	0.5592	0.8241	0.9477	0.9776	(86)
MIT	20.3333	20.4635	20.6890	20.8786	20.9730	20.9977	20.9997	20.9995	20.9883	20.8723	20.5708	20.2836	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house													
	0.9658	0.9450	0.8829	0.7567	0.5747	0.3637	0.2385	0.2676	0.4979	0.7846	0.9345	0.9723	(89)
MIT 2	19.4737	19.6345	19.9059	20.1184	20.2121	20.2319	20.2331	20.2330	20.2258	20.1173	19.7694	19.4118	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.7163	19.8684	20.1269	20.3329	20.4269	20.4480	20.4494	20.4493	20.4409	20.3303	19.9955	19.6578	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7163	19.8684	20.1269	20.3329	20.4269	20.4480	20.4494	20.4493	20.4409	20.3303	19.9955	19.6578	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9606	0.9395	0.8798	0.7615	0.5873	0.3790	0.2550	0.2849	0.5148	0.7900	0.9297	0.9674	(94)
Useful gains	661.1516	698.3616	711.7907	669.0781	530.2384	344.8103	220.5043	233.6117	393.4550	549.5130	612.6054	638.3648	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	995.4243	965.9336	864.4192	726.5318	541.7487	345.5865	220.5631	233.7257	397.8031	607.8286	822.8449	998.1572	(97)
Space heating kWh													
	248.6989	179.8084	113.5556	41.3667	8.5637	0.0000	0.0000	0.0000	0.0000	43.3868	151.3725	267.6856	(98a)
Space heating requirement - total per year (kWh/year)												1054.4381	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	248.6989	179.8084	113.5556	41.3667	8.5637	0.0000	0.0000	0.0000	0.0000	43.3868	151.3725	267.6856	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1054.4381	
Space heating per m2											(98c) / (4) =	13.1838	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	248.6989	179.8084	113.5556	41.3667	8.5637	0.0000	0.0000	0.0000	0.0000	43.3868	151.3725	267.6856	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	373.0484	269.7126	170.3334	62.0500	12.8455	0.0000	0.0000	0.0000	0.0000	65.0801	227.0587	401.5284	
Space heating requirement													
	373.0484	269.7126	170.3334	62.0500	12.8455	0.0000	0.0000	0.0000	0.0000	65.0801	227.0587	401.5284	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.9780	-26.9243	-45.2366	-58.5173	-66.4974	-66.2241	-64.3099	-58.6197	-48.0109	-34.7929	-20.6435	-14.9664	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.0204	-13.0409	-32.0085	-59.0559	-82.7431	-94.8946	-90.1802	-72.6219	-46.3379	-22.2034	-8.3869	-4.5323	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1581.6572	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	15.8166	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4782.1363	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1581.6572	6.5500	103.5985	(340a)
Space heating total			103.5985	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	196.1051	28.4300	55.7527	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	28.4300	-148.6096	
PV Unit electricity exported	-532.0259	5.8100	-30.9107	
Total			-179.5203	(352)
Total energy cost			354.5155	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1498.3426	0.1575	66.4471	(367)
Electrical energy for heat distribution (space & water)	15.8166	0.0000	8.1795	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			226.2989	(373)
Space and water heating			226.2989	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	0.1322	-69.1017	
PV Unit electricity exported	-532.0259	0.1213	-64.5494	
Total			-133.6511	(380)
Total CO2, kg/year			124.0026	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1498.3426	1.5832	667.7562	(467)
Electrical energy for heat distribution (space & water)	15.8166	0.0000	86.4432	(472)
Overall CO2 factor for heat network			0.4256	(486)
Total CO2 associated with community systems			2391.5953	(473)
Space and water heating			2391.5953	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)

Energy saving/generation technologies				
PV Unit electricity used in dwelling		-522.7211	1.4884	-778.0360
PV Unit electricity exported		-532.0259	0.4451	-236.7863
Total				-1014.8223 (480)
Total Primary energy kWh/year				1710.8374 (483)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	11.32	**TER**	12.25
Environmental	91 B	**% DER < TER**			7.59
CO_2 Emissions (t/year)	0.85	**DFEE**	24.18	**TFEE**	30.94
Compliance Check	See BREL	**% DFEE < TFEE**			21.83
% DPER < TPER	1.72	**DPER**	63.80	**TPER**	64.91

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 3.6723 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)

Average = Sum(39)m / 12 = 65.8511

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

Hot water usage for mixer showers

65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)

Energy content (annual) Total = Sum(45)m = 2040.5785

Distribution loss (46)m = 0.15 x (45)m												
31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2646	12.8723	14.2262	13.7137	14.1370	13.6467	14.0798	14.0978	13.6634	14.1582	13.7528	14.2575	(61)
Total heat required for water heating calculated for each month												
225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(64)

Total per year (kWh/year) = Sum(64)m = 2207.4483 (64)

12Total per year (kWh/year) 2207 (64)

Electric shower(s)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month												
73.9457	65.1466	68.6223	58.9761	56.2375	49.6647	48.2999	50.7952	51.9879	59.1771	64.3932	72.9637	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
125.6786	139.1442	125.6786	129.8679	125.6786	129.8679	125.6786	125.6786	129.8679	125.6786	129.8679	125.6786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
99.3893	96.9443	92.2343	81.9112	75.5880	68.9787	64.9192	68.2731	72.2054	79.5391	89.4350	98.0695	(72)
Total internal gains													
507.4039	520.7011	496.7884	478.4409	452.5108	432.6004	414.6712	415.7485	429.6071	447.9653	477.4681	496.4036	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	19.6403	0.6800	0.7000	0.7700	64.0095	(76)

Solar gains	64.0095	125.2162	206.2132	300.7496	368.5800	377.3072	359.2118	308.5577	239.8345	148.5795	79.8123	52.6383	(83)
Total gains	571.4134	645.9173	703.0016	779.1905	821.0908	809.9076	773.8831	724.3061	669.4416	596.5448	557.2804	549.0419	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area													
0.9892	0.9772	0.9491	0.8625	0.7059	0.5147	0.3736	0.4167	0.6540	0.9051	0.9773	0.9913	(86)	

MIT	20.1327	20.3039	20.5333	20.7975	20.9468	20.9925	20.9990	20.9982	20.9731	20.7648	20.3985	20.0880	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9864	0.9718	0.9371	0.8341	0.6585	0.4553	0.3089	0.3480	0.5902	0.8780	0.9708	0.9891	(89)
MIT 2	19.2221	19.4377	19.7219	20.0325	20.1890	20.2286	20.2328	20.2324	20.2148	20.0029	19.5589	19.1655	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.4791	19.6821	19.9508	20.2484	20.4028	20.4442	20.4490	20.4485	20.4288	20.2179	19.7958	19.4258	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.3291	19.5321	19.8008	20.0984	20.2528	20.2942	20.2990	20.2985	20.2788	20.0679	19.6458	19.2758	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9822	0.9654	0.9291	0.8286	0.6598	0.4601	0.3145	0.3539	0.5941	0.8713	0.9645	0.9854	(94)
Useful gains	561.2314	623.5879	653.1500	645.6527	541.7614	372.6588	243.3808	256.3193	397.7229	519.7506	537.4992	541.0337	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	989.6805	963.5405	875.8755	737.4254	563.2146	374.9697	243.5835	256.7205	406.8826	623.4715	826.1571	992.7602	(97)
Space heating kWh	318.7661	228.4481	165.7078	66.0764	15.9612	0.0000	0.0000	0.0000	0.0000	77.1683	207.8337	336.0845	(98a)
Space heating requirement - total per year (kWh/year)												1416.0460	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	318.7661	228.4481	165.7078	66.0764	15.9612	0.0000	0.0000	0.0000	0.0000	77.1683	207.8337	336.0845	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1416.0460	
Space heating per m2											(98c) / (4) =	17.7050	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	89.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	318.7661	228.4481	165.7078	66.0764	15.9612	0.0000	0.0000	0.0000	0.0000	77.1683	207.8337	336.0845	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	358.1642	256.6832	186.1885	74.2431	17.9339	0.0000	0.0000	0.0000	0.0000	86.7060	233.5210	377.6231	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.2869	88.2001	88.0419	87.7487	87.4413	87.3000	87.3000	87.3000	87.3000	87.8003	88.1644	88.3141	(217)
Fuel for water heating, kWh/month	255.9070	225.7632	238.4237	206.0137	197.4386	174.9753	170.3968	178.9983	182.9836	206.7066	223.5326	252.4820	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	9.1721	8.2844	9.1721	8.8762	9.1721	8.8762	9.1721	9.1721	8.8762	9.1721	8.8762	9.1721	(231)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1591.0629 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	87.3000
Water heating fuel used	2513.6214 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)	
mechanical ventilation fans (SFP = 0.0920)	21.9935 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	107.9935 (231)
Electricity for lighting (calculated in Appendix L)	196.1051 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4408.7831 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1591.0629	0.2100	334.1232	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2513.6214	0.2100	527.8605	(264)
Space and water heating			861.9837	(265)
Pumps, fans and electric keep-hot	107.9935	0.1387	14.9800	(267)
Energy for lighting	196.1051	0.1443	28.3040	(268)
Total CO2, kg/year			905.2678	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.3200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1591.0629	1.1300	1797.9011	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2513.6214	1.1300	2840.3922	(278)
Space and water heating			4638.2934	(279)
Pumps, fans and electric keep-hot	107.9935	1.5128	163.3726	(281)
Energy for lighting	196.1051	1.5338	300.7926	(282)
Total Primary energy kWh/year			5102.4586	(286)
Dwelling Primary energy Rate (DPER)			63.8000	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Semi-glazed door			3.5800	1.0000	3.5800			(26a)
TER Opening Type			9.8800	1.1450	11.3130			(27)
Heatloss Floor			39.9900	0.1300	5.1987			(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.1800	7.0326			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.5045			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							213.7769	(35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	8.4500	0.0500	0.4225
E3	Sill	6.7500	0.0500	0.3375
E4	Jamb	22.0000	0.0500	1.1000
E6	Intermediate floor within a dwelling	19.5200	0.0000	0.0000
E18	Party wall between dwellings	5.8000	0.0600	0.3480
P2	Party wall - Intermediate floor within a dwelling	6.0900	0.0000	0.0000
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E5	Ground floor (normal)	19.5200	0.1600	3.1232
E16	Corner (normal)	17.4000	0.0900	1.5660
E25	Staggered party wall between dwellings	5.8000	0.0600	0.3480
P1	Party wall - Ground floor	6.0900	0.0800	0.4872
E7	Party floor between dwellings (in blocks of flats)	14.1200	0.0700	0.9884

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.7208 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.2253 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	77.7420	77.5795	77.4202	76.6720	76.5321	75.8805	75.8805	75.7598	76.1315	76.5321	76.8152	77.1113	(39)

Average = Sum(39)m / 12 = 76.6714

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9700	0.9680	0.9586	0.9569	0.9487	0.9487	0.9472	0.9519	0.9569	0.9604	0.9641	(40)
HLP (average)												0.9586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)

Energy content (annual) Total = Sum(45)m = 2040.5785

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)

Total heat required for water heating calculated for each month

262.6267	232.2786	246.6455	216.3756	209.4649	188.4219	185.6355	193.1267	195.3963	218.2899	232.6384	259.6786	(62)
WWHRS -29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	232.6794	205.7930	218.9113	193.4106	188.0624	170.1075	168.4687	174.8715	176.4476	195.9515	207.3317	230.2859	(64)

Total per year (kWh/year) = Sum(64)m = 2362.3211 (64)

12Total per year (kWh/year) 2362 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

83.1193	73.4354	77.8055	67.8764	65.4430	58.5818	57.5197	60.0105	60.9008	68.3773	73.2838	82.1390	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	122.0433	135.1194	122.0433	126.1114	122.0433	126.1114	122.0433	122.0433	126.1114	122.0433	126.1114	122.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	111.7194	109.2788	104.5773	94.2728	87.9610	81.3636	77.3114	80.6593	84.5844	91.9049	101.7830	110.4019	(72)
Total internal gains	516.0987	529.0108	505.4961	487.0460	461.2485	441.2288	423.4281	424.4993	438.2297	456.6958	486.0596	505.1007	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	19.6403	0.6300	0.7000	0.7700	59.3029	(76)

Solar gains	59.3029	116.0091	191.0505	278.6357	341.4785	349.5640	332.7992	285.8696	222.1996	137.6546	73.9438	48.7678	(83)
Total gains	575.4016	645.0199	696.5465	765.6817	802.7270	790.7928	756.2273	710.3689	660.4293	594.3504	560.0034	553.8686	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.0920	61.2199	61.3459	61.9445	62.0578	62.5907	62.5907	62.6904	62.3843	62.0578	61.8290	61.5917	
alpha	5.0728	5.0813	5.0897	5.1296	5.1372	5.1727	5.1727	5.1794	5.1590	5.1372	5.1219	5.1061	
util living area	0.9910	0.9829	0.9646	0.9057	0.7829	0.5941	0.4379	0.4843	0.7293	0.9322	0.9822	0.9925	(86)
MIT	19.8560	20.0332	20.2913	20.6309	20.8687	20.9750	20.9957	20.9929	20.9311	20.6187	20.1846	19.8263	(87)
Th 2	20.1067	20.1084	20.1101	20.1179	20.1194	20.1263	20.1263	20.1275	20.1236	20.1194	20.1164	20.1133	(88)
util rest of house	0.9886	0.9784	0.9552	0.8814	0.7335	0.5207	0.3528	0.3955	0.6582	0.9093	0.9767	0.9905	(89)
MIT 2	18.7760	19.0015	19.3264	19.7434	20.0071	20.1110	20.1246	20.1246	20.0753	19.7389	19.2011	18.7431	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.0808	19.2926	19.5987	19.9938	20.2503	20.3548	20.3704	20.3696	20.3168	19.9872	19.4786	19.0487	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0808	19.2926	19.5987	19.9938	20.2503	20.3548	20.3704	20.3696	20.3168	19.9872	19.4786	19.0487	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9848	0.9731	0.9485	0.8775	0.7414	0.5404	0.3768	0.4205	0.6749	0.9052	0.9716	0.9872	(94)
Useful gains	566.6704	627.6427	660.6637	671.8857	595.1358	427.3773	284.9346	298.7082	445.7066	537.9857	544.0907	546.7728	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1149.0872	1116.5732	1014.1021	850.5873	654.3685	436.6764	286.1031	300.7398	473.2934	718.4210	950.8676	1145.0055	(97)
Space heating kWh	433.3181	328.5613	262.9582	128.6651	44.0691	0.0000	0.0000	0.0000	0.0000	134.2439	292.8794	445.0851	(98a)
Space heating requirement - total per year (kWh/year)												2069.7803	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	433.3181	328.5613	262.9582	128.6651	44.0691	0.0000	0.0000	0.0000	0.0000	134.2439	292.8794	445.0851	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2069.7803	
Space heating per m2										(98c) / (4) =		25.8787	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.4000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	433.3181	328.5613	262.9582	128.6651	44.0691	0.0000	0.0000	0.0000	0.0000	134.2439	292.8794	445.0851	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	468.9590	355.5858	284.5868	139.2480	47.6938	0.0000	0.0000	0.0000	0.0000	145.2856	316.9691	481.6939	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	232.6794	205.7930	218.9113	193.4106	188.0624	170.1075	168.4687	174.8715	176.4476	195.9515	207.3317	230.2859	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.6936	85.3785	84.7753	83.5280	81.8023	80.3000	80.3000	80.3000	80.3000	83.5875	85.1214	85.7679	(217)
Fuel for water heating, kWh/month	271.5248	241.0362	258.2252	231.5518	229.8986	211.8400	209.7992	217.7728	219.7355	234.4268	243.5718	268.4989	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.3582	20.3433	18.3169	13.4197	10.3658	8.4689	9.4560	12.2913	15.9652	20.9471	23.6598	26.0630	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3424	-31.5676	-47.5704	-56.1485	-62.8691	-59.5233	-58.7993	-54.3654	-46.9365	-37.2699	-23.9846	-18.2835	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9342	-17.0411	-34.5369	-52.8648	-70.8844	-71.5905	-70.7461	-59.4418	-42.9727	-24.6882	-10.6939	-6.2480	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1	2240.0220	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2837.8817	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	204.6551	(232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4380.2557	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2240.0220	0.2100	470.4046	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2837.8817	0.2100	595.9551	(264)
Space and water heating			1066.3598	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	204.6551	0.1443	29.5381	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	0.1336	-69.2911	
PV Unit electricity exported	-469.6425	0.1253	-58.8667	
Total			-128.1578	(269)
Total CO2, kg/year			979.6693	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.2500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2240.0220	1.1300	2531.2248	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2837.8817	1.1300	3206.8063	(278)
Space and water heating			5738.0311	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	204.6551	1.5338	313.9068	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	1.4937	-774.7198	
PV Unit electricity exported	-469.6425	0.4601	-216.0686	
Total			-990.7884	(283)
Total Primary energy kWh/year			5191.2503	(286)
Target Primary Energy Rate (TPER)			64.9100	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	11.32	**TER**	12.25
Environmental	91 B	**% DER < TER**			7.59
CO_2 Emissions (t/year)	0.85	**DFEE**	24.18	**TFEE**	30.94
Compliance Check	See BREL	**% DFEE < TFEE**			21.83
% DPER < TPER	1.72	**DPER**	63.80	**TPER**	64.91

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		3 * 10 =	30.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1531	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.3031	(18)
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2122	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2705	0.2652	0.2599	0.2334	0.2281	0.2016	0.2016	0.1963	0.2122	0.2281	0.2387	0.2493	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5366	0.5352	0.5338	0.5272	0.5260	0.5203	0.5203	0.5193	0.5225	0.5260	0.5285	0.5311	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							3.6723	(36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.6979	34.6061	34.5160	34.0930	34.0139	33.6455	33.6455	33.5772	33.7874	34.0139	34.1740	34.3414	(38)
Heat transfer coeff	68.2172	68.1253	68.0352	67.6122	67.5331	67.1647	67.1647	67.0965	67.3066	67.5331	67.6932	67.8606	(39)
Average = Sum(39)m / 12 =												67.6118	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8529	0.8518	0.8507	0.8454	0.8444	0.8398	0.8398	0.8389	0.8415	0.8444	0.8464	0.8485	(40)
HLP (average)												0.8454	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												62.4583	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.6786	139.1442	125.6786	129.8679	125.6786	129.8679	125.6786	125.6786	129.8679	125.6786	129.8679	125.6786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains	453.4664	467.9883	446.9019	435.3676	413.4459	400.7688	385.7326	384.8800	396.4077	407.0433	430.0429	443.3929	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	19.6403	0.6800	0.7000	0.7700	64.0095	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	64.0095	125.2162	206.2132	300.7496	368.5800	377.3072	359.2118	308.5577	239.8345	148.5795	79.8123	52.6383	(83)
Total gains	517.4759	593.2045	653.1151	736.1172	782.0259	778.0760	744.9445	693.4377	636.2422	555.6229	509.8552	496.0312	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.6219	69.7158	69.8081	70.2449	70.3272	70.7129	70.7129	70.7848	70.5638	70.3272	70.1608	69.9878	
alpha	5.6415	5.6477	5.6539	5.6830	5.6885	5.7142	5.7142	5.7190	5.7043	5.6885	5.6774	5.6659	
util living area	0.9936	0.9855	0.9649	0.8914	0.7441	0.5440	0.3955	0.4427	0.6927	0.9304	0.9856	0.9949	(86)
MIT	19.9923	20.1740	20.4253	20.7385	20.9254	20.9893	20.9985	20.9973	20.9617	20.7005	20.2922	19.9566	(87)

Th 2	20.2077	20.2087	20.2096	20.2142	20.2150	20.2190	20.2190	20.2197	20.2175	20.2150	20.2133	20.2115	(88)
util rest of house	0.9919	0.9818	0.9559	0.8662	0.6965	0.4810	0.3259	0.3688	0.6270	0.9081	0.9813	0.9936	(89)
MIT 2	19.2857	19.4660	19.7122	20.0085	20.1660	20.2139	20.2186	20.2189	20.1967	19.9812	19.5879	19.2534	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.4851	19.6658	19.9134	20.2145	20.3803	20.4327	20.4387	20.4385	20.4126	20.1842	19.7866	19.4519	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4851	19.6658	19.9134	20.2145	20.3803	20.4327	20.4387	20.4385	20.4126	20.1842	19.7866	19.4519	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9899	0.9786	0.9519	0.8662	0.7070	0.4985	0.3456	0.3897	0.6440	0.9071	0.9783	0.9919	(94)
Useful gains	512.2622	580.4959	621.7092	637.6455	552.8697	387.8600	257.4299	270.2037	409.7656	504.0266	498.7822	491.9992	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1035.8841	1005.9254	912.5839	765.0005	586.2074	391.7542	257.8226	270.9705	424.8800	647.2523	858.7989	1034.9994	(97)
Space heating kWh	389.5747	285.8886	216.4107	91.6956	24.8033	0.0000	0.0000	0.0000	0.0000	106.5599	259.2120	403.9922	(98a)
Space heating requirement - total per year (kWh/year)												1778.1371	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	389.5747	285.8886	216.4107	91.6956	24.8033	0.0000	0.0000	0.0000	0.0000	106.5599	259.2120	403.9922	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1778.1371	
Space heating per m2											(98c) / (4) =	22.2323	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	631.3480	497.0186	509.9330	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9456	0.9759	0.9633	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	597.0031	485.0461	491.1981	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	850.0667	814.1870	756.5695	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	182.2058	244.8808	197.4363	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	45.5514	61.2202	49.3591	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												156.1307	(107)
Energy for space heating												22.2323	(99)
Energy for space cooling												1.9521	(108)
Total												24.1844	(109)
Fabric Energy Efficiency (DFEE)												24.2	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Semi-glazed door			3.5800	1.0000	3.5800			(26a)
TER Opening Type			9.8800	1.1450	11.3130			(27)
Heatloss Floor			39.9900	0.1300	5.1987			(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.1800	7.0326			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.5045			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 213.7769 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.4500	0.0500	0.4225
E3 Sill	6.7500	0.0500	0.3375
E4 Jamb	22.0000	0.0500	1.1000
E6 Intermediate floor within a dwelling	19.5200	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	6.0900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E5 Ground floor (normal)	19.5200	0.1600	3.1232
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
P1 Party wall - Ground floor	6.0900	0.0800	0.4872
E7 Party floor between dwellings (in blocks of flats)	14.1200	0.0700	0.9884

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.7208 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.2253 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	77.7420	77.5795	77.4202	76.6720	76.5321	75.8805	75.8805	75.7598	76.1315	76.5321	76.8152	77.1113	(39)

Average = Sum(39)m / 12 = 76.6714

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9700	0.9680	0.9586	0.9569	0.9487	0.9487	0.9472	0.9519	0.9569	0.9604	0.9641	(40)
HLP (average)												0.9586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	122.0433	135.1194	122.0433	126.1114	122.0433	126.1114	122.0433	122.0433	126.1114	122.0433	126.1114	122.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains													
	449.8311	463.9635	443.2666	431.6111	409.8106	397.0124	382.0973	381.2447	392.6512	403.4080	426.2864	439.7576	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	19.6403	0.6300	0.7000	0.7700	59.3029	(76)

Solar gains	59.3029	116.0091	191.0505	278.6357	341.4785	349.5640	332.7992	285.8696	222.1996	137.6546	73.9438	48.7678	(83)
Total gains	509.1340	579.9726	634.3170	710.2468	751.2891	746.5764	714.8965	667.1143	614.8508	541.0626	500.2302	488.5254	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.0920	61.2199	61.3459	61.9445	62.0578	62.5907	62.5907	62.6904	62.3843	62.0578	61.8290	61.5917	
alpha	5.0728	5.0813	5.0897	5.1296	5.1372	5.1727	5.1727	5.1794	5.1590	5.1372	5.1219	5.1061	
util living area													
	0.9947	0.9890	0.9754	0.9261	0.8136	0.6240	0.4621	0.5136	0.7654	0.9514	0.9890	0.9957	(86)
MIT	19.7558	19.9383	20.2077	20.5746	20.8416	20.9688	20.9945	20.9907	20.9137	20.5568	20.0974	19.7267	(87)
Th 2	20.1067	20.1084	20.1101	20.1179	20.1194	20.1263	20.1263	20.1275	20.1236	20.1194	20.1164	20.1133	(88)
util rest of house													
	0.9933	0.9860	0.9685	0.9055	0.7668	0.5489	0.3728	0.4205	0.6959	0.9335	0.9854	0.9945	(89)
MIT 2	18.9705	19.1527	19.4192	19.7761	20.0118	20.1112	20.1246	20.1245	20.0751	19.7672	19.3180	18.9467	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.1921	19.3744	19.6417	20.0014	20.2459	20.3532	20.3701	20.3690	20.3118	19.9900	19.5379	19.1668	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1921	19.3744	19.6417	20.0014	20.2459	20.3532	20.3701	20.3690	20.3118	19.9900	19.5379	19.1668	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9913	0.9829	0.9640	0.9024	0.7741	0.5690	0.3981	0.4467	0.7119	0.9303	0.9823	0.9928	(94)
Useful gains	504.6846	570.0264	611.4672	640.9187	581.5412	424.8309	284.5679	298.0052	437.7399	503.3443	491.3969	485.0121	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1157.7437	1122.9183	1017.4315	851.1676	654.0388	436.5542	286.0763	300.6879	472.9107	718.6344	955.4221	1154.1105	(97)
Space heating kWh													
	485.8759	371.5434	302.0375	151.3791	53.9383	0.0000	0.0000	0.0000	0.0000	160.1758	334.0982	497.8092	(98a)
Space heating requirement - total per year (kWh/year)												2356.8574	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	485.8759	371.5434	302.0375	151.3791	53.9383	0.0000	0.0000	0.0000	0.0000	160.1758	334.0982	497.8092	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2356.8574	
Space heating per m2										(98c) / (4) =		29.4681	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	713.2763	561.5154	575.7744	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8893	0.9419	0.9195	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	634.3061	528.8750	529.4361	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	817.3215	782.9714	729.6042	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	131.7711	189.0477	148.9251	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	32.9428	47.2619	37.2313	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												117.4360	(107)
Energy for space heating												29.4681	(99)
Energy for space cooling												1.4683	(108)
Total												30.9364	(109)
Fabric Energy Efficiency (TFEE)												30.9	(109)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	11.32	**TER**	12.25
Environmental	91 B	**% DER < TER**			7.59
CO_2 Emissions (t/year)	0.85	**DFEE**	24.18	**TFEE**	30.94
Compliance Check	See BREL	**% DFEE < TFEE**			21.83
% DPER < TPER	1.72	**DPER**	63.80	**TPER**	64.91

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 3.6723 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)

Average = Sum(39)m / 12 = 65.8511

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

Hot water usage for mixer showers

65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)

Energy content (annual) Total = Sum(45)m = 2040.5785

Distribution loss (46)m = 0.15 x (45)m												
31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2646	12.8723	14.2262	13.7137	14.1370	13.6467	14.0798	14.0978	13.6634	14.1582	13.7528	14.2575	(61)
Total heat required for water heating calculated for each month												
225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(64)

Total per year (kWh/year) = Sum(64)m = 2207.4483 (64)

12Total per year (kWh/year) 2207 (64)

Electric shower(s)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month												
73.9457	65.1466	68.6223	58.9761	56.2375	49.6647	48.2999	50.7952	51.9879	59.1771	64.3932	72.9637	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
125.6786	139.1442	125.6786	129.8679	125.6786	129.8679	125.6786	125.6786	129.8679	125.6786	129.8679	125.6786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
99.3893	96.9443	92.2343	81.9112	75.5880	68.9787	64.9192	68.2731	72.2054	79.5391	89.4350	98.0695	(72)
Total internal gains													
507.4039	520.7011	496.7884	478.4409	452.5108	432.6004	414.6712	415.7485	429.6071	447.9653	477.4681	496.4036	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	19.6403	0.6800	0.7000	0.7700	64.0095	(76)

Solar gains	64.0095	125.2162	206.2132	300.7496	368.5800	377.3072	359.2118	308.5577	239.8345	148.5795	79.8123	52.6383	(83)
Total gains	571.4134	645.9173	703.0016	779.1905	821.0908	809.9076	773.8831	724.3061	669.4416	596.5448	557.2804	549.0419	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area													
0.9892	0.9772	0.9491	0.8625	0.7059	0.5147	0.3736	0.4167	0.6540	0.9051	0.9773	0.9913	(86)	

MIT	20.1327	20.3039	20.5333	20.7975	20.9468	20.9925	20.9990	20.9982	20.9731	20.7648	20.3985	20.0880	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9864	0.9718	0.9371	0.8341	0.6585	0.4553	0.3089	0.3480	0.5902	0.8780	0.9708	0.9891	(89)
MIT 2	19.2221	19.4377	19.7219	20.0325	20.1890	20.2286	20.2328	20.2324	20.2148	20.0029	19.5589	19.1655	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.4791	19.6821	19.9508	20.2484	20.4028	20.4442	20.4490	20.4485	20.4288	20.2179	19.7958	19.4258	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.3291	19.5321	19.8008	20.0984	20.2528	20.2942	20.2990	20.2985	20.2788	20.0679	19.6458	19.2758	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9822	0.9654	0.9291	0.8286	0.6598	0.4601	0.3145	0.3539	0.5941	0.8713	0.9645	0.9854	(94)
Useful gains	561.2314	623.5879	653.1500	645.6527	541.7614	372.6588	243.3808	256.3193	397.7229	519.7506	537.4992	541.0337	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	989.6805	963.5405	875.8755	737.4254	563.2146	374.9697	243.5835	256.7205	406.8826	623.4715	826.1571	992.7602	(97)
Space heating kWh	318.7661	228.4481	165.7078	66.0764	15.9612	0.0000	0.0000	0.0000	0.0000	77.1683	207.8337	336.0845	(98a)
Space heating requirement - total per year (kWh/year)												1416.0460	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	318.7661	228.4481	165.7078	66.0764	15.9612	0.0000	0.0000	0.0000	0.0000	77.1683	207.8337	336.0845	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1416.0460	
Space heating per m2											(98c) / (4) =	17.7050	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	89.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	318.7661	228.4481	165.7078	66.0764	15.9612	0.0000	0.0000	0.0000	0.0000	77.1683	207.8337	336.0845	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	358.1642	256.6832	186.1885	74.2431	17.9339	0.0000	0.0000	0.0000	0.0000	86.7060	233.5210	377.6231	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.2869	88.2001	88.0419	87.7487	87.4413	87.3000	87.3000	87.3000	87.3000	87.8003	88.1644	88.3141	(217)
Fuel for water heating, kWh/month	255.9070	225.7632	238.4237	206.0137	197.4386	174.9753	170.3968	178.9983	182.9836	206.7066	223.5326	252.4820	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	9.1721	8.2844	9.1721	8.8762	9.1721	8.8762	9.1721	9.1721	8.8762	9.1721	8.8762	9.1721	(231)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1591.0629 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	87.3000
Water heating fuel used	2513.6214 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)	
mechanical ventilation fans (SFP = 0.0920)	21.9935 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	107.9935 (231)
Electricity for lighting (calculated in Appendix L)	196.1051 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4408.7831 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1591.0629	0.2100	334.1232	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2513.6214	0.2100	527.8605	(264)
Space and water heating			861.9837	(265)
Pumps, fans and electric keep-hot	107.9935	0.1387	14.9800	(267)
Energy for lighting	196.1051	0.1443	28.3040	(268)
Total CO2, kg/year			905.2678	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.3200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1591.0629	1.1300	1797.9011	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2513.6214	1.1300	2840.3922	(278)
Space and water heating			4638.2934	(279)
Pumps, fans and electric keep-hot	107.9935	1.5128	163.3726	(281)
Energy for lighting	196.1051	1.5338	300.7926	(282)
Total Primary energy kWh/year			5102.4586	(286)
Dwelling Primary energy Rate (DPER)			63.8000	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Semi-glazed door			3.5800	1.0000	3.5800			(26a)
TER Opening Type			9.8800	1.1450	11.3130			(27)
Heatloss Floor			39.9900	0.1300	5.1987			(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.1800	7.0326			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.5045			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							213.7769	(35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	8.4500	0.0500	0.4225
E3	Sill	6.7500	0.0500	0.3375
E4	Jamb	22.0000	0.0500	1.1000
E6	Intermediate floor within a dwelling	19.5200	0.0000	0.0000
E18	Party wall between dwellings	5.8000	0.0600	0.3480
P2	Party wall - Intermediate floor within a dwelling	6.0900	0.0000	0.0000
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E5	Ground floor (normal)	19.5200	0.1600	3.1232
E16	Corner (normal)	17.4000	0.0900	1.5660
E25	Staggered party wall between dwellings	5.8000	0.0600	0.3480
P1	Party wall - Ground floor	6.0900	0.0800	0.4872
E7	Party floor between dwellings (in blocks of flats)	14.1200	0.0700	0.9884

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.7208 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.2253 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	77.7420	77.5795	77.4202	76.6720	76.5321	75.8805	75.8805	75.7598	76.1315	76.5321	76.8152	77.1113	(39)

Average = Sum(39)m / 12 = 76.6714

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9700	0.9680	0.9586	0.9569	0.9487	0.9487	0.9472	0.9519	0.9569	0.9604	0.9641	(40)
HLP (average)												0.9586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)

Energy content (annual) Total = Sum(45)m = 2040.5785

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)

Total heat required for water heating calculated for each month

262.6267	232.2786	246.6455	216.3756	209.4649	188.4219	185.6355	193.1267	195.3963	218.2899	232.6384	259.6786	(62)
WWHRS -29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	232.6794	205.7930	218.9113	193.4106	188.0624	170.1075	168.4687	174.8715	176.4476	195.9515	207.3317	230.2859	(64)

Total per year (kWh/year) = Sum(64)m = 2362.3211 (64)

12Total per year (kWh/year) 2362 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

83.1193	73.4354	77.8055	67.8764	65.4430	58.5818	57.5197	60.0105	60.9008	68.3773	73.2838	82.1390	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	122.0433	135.1194	122.0433	126.1114	122.0433	126.1114	122.0433	122.0433	126.1114	122.0433	126.1114	122.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	111.7194	109.2788	104.5773	94.2728	87.9610	81.3636	77.3114	80.6593	84.5844	91.9049	101.7830	110.4019	(72)
Total internal gains	516.0987	529.0108	505.4961	487.0460	461.2485	441.2288	423.4281	424.4993	438.2297	456.6958	486.0596	505.1007	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	19.6403	0.6300	0.7000	0.7700	59.3029	(76)

Solar gains	59.3029	116.0091	191.0505	278.6357	341.4785	349.5640	332.7992	285.8696	222.1996	137.6546	73.9438	48.7678	(83)
Total gains	575.4016	645.0199	696.5465	765.6817	802.7270	790.7928	756.2273	710.3689	660.4293	594.3504	560.0034	553.8686	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.0920	61.2199	61.3459	61.9445	62.0578	62.5907	62.5907	62.6904	62.3843	62.0578	61.8290	61.5917	
alpha	5.0728	5.0813	5.0897	5.1296	5.1372	5.1727	5.1727	5.1794	5.1590	5.1372	5.1219	5.1061	
util living area	0.9910	0.9829	0.9646	0.9057	0.7829	0.5941	0.4379	0.4843	0.7293	0.9322	0.9822	0.9925	(86)
MIT	19.8560	20.0332	20.2913	20.6309	20.8687	20.9750	20.9957	20.9929	20.9311	20.6187	20.1846	19.8263	(87)
Th 2	20.1067	20.1084	20.1101	20.1179	20.1194	20.1263	20.1263	20.1275	20.1236	20.1194	20.1164	20.1133	(88)
util rest of house	0.9886	0.9784	0.9552	0.8814	0.7335	0.5207	0.3528	0.3955	0.6582	0.9093	0.9767	0.9905	(89)
MIT 2	18.7760	19.0015	19.3264	19.7434	20.0071	20.1110	20.1246	20.1246	20.0753	19.7389	19.2011	18.7431	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.0808	19.2926	19.5987	19.9938	20.2503	20.3548	20.3704	20.3696	20.3168	19.9872	19.4786	19.0487	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0808	19.2926	19.5987	19.9938	20.2503	20.3548	20.3704	20.3696	20.3168	19.9872	19.4786	19.0487	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9848	0.9731	0.9485	0.8775	0.7414	0.5404	0.3768	0.4205	0.6749	0.9052	0.9716	0.9872	(94)
Useful gains	566.6704	627.6427	660.6637	671.8857	595.1358	427.3773	284.9346	298.7082	445.7066	537.9857	544.0907	546.7728	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1149.0872	1116.5732	1014.1021	850.5873	654.3685	436.6764	286.1031	300.7398	473.2934	718.4210	950.8676	1145.0055	(97)
Space heating kWh	433.3181	328.5613	262.9582	128.6651	44.0691	0.0000	0.0000	0.0000	0.0000	134.2439	292.8794	445.0851	(98a)
Space heating requirement - total per year (kWh/year)												2069.7803	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	433.3181	328.5613	262.9582	128.6651	44.0691	0.0000	0.0000	0.0000	0.0000	134.2439	292.8794	445.0851	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2069.7803	
Space heating per m2										(98c) / (4) =		25.8787	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.4000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	433.3181	328.5613	262.9582	128.6651	44.0691	0.0000	0.0000	0.0000	0.0000	134.2439	292.8794	445.0851	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	468.9590	355.5858	284.5868	139.2480	47.6938	0.0000	0.0000	0.0000	0.0000	145.2856	316.9691	481.6939	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	232.6794	205.7930	218.9113	193.4106	188.0624	170.1075	168.4687	174.8715	176.4476	195.9515	207.3317	230.2859	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.6936	85.3785	84.7753	83.5280	81.8023	80.3000	80.3000	80.3000	80.3000	83.5875	85.1214	85.7679	(217)
Fuel for water heating, kWh/month	271.5248	241.0362	258.2252	231.5518	229.8986	211.8400	209.7992	217.7728	219.7355	234.4268	243.5718	268.4989	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.3582	20.3433	18.3169	13.4197	10.3658	8.4689	9.4560	12.2913	15.9652	20.9471	23.6598	26.0630	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3424	-31.5676	-47.5704	-56.1485	-62.8691	-59.5233	-58.7993	-54.3654	-46.9365	-37.2699	-23.9846	-18.2835	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9342	-17.0411	-34.5369	-52.8648	-70.8844	-71.5905	-70.7461	-59.4418	-42.9727	-24.6882	-10.6939	-6.2480	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1	2240.0220	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2837.8817	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	204.6551	(232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4380.2557	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2240.0220	0.2100	470.4046	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2837.8817	0.2100	595.9551	(264)
Space and water heating			1066.3598	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	204.6551	0.1443	29.5381	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	0.1336	-69.2911	
PV Unit electricity exported	-469.6425	0.1253	-58.8667	
Total			-128.1578	(269)
Total CO2, kg/year			979.6693	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.2500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2240.0220	1.1300	2531.2248	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2837.8817	1.1300	3206.8063	(278)
Space and water heating			5738.0311	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	204.6551	1.5338	313.9068	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	1.4937	-774.7198	
PV Unit electricity exported	-469.6425	0.4601	-216.0686	
Total			-990.7884	(283)
Total Primary energy kWh/year			5191.2503	(286)
Target Primary Energy Rate (TPER)			64.9100	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	11.32	**TER**	12.25
Environmental	91 B	**% DER < TER**			7.59
CO_2 Emissions (t/year)	0.85	**DFEE**	24.18	**TFEE**	30.94
Compliance Check	See BREL	**% DFEE < TFEE**			21.83
% DPER < TPER	1.72	**DPER**	63.80	**TPER**	64.91

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6723	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	33.5192	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers													
	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths													
	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses													
	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m													
	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2646	12.8723	14.2262	13.7137	14.1370	13.6467	14.0798	14.0978	13.6634	14.1582	13.7528	14.2575	(61)
Total heat required for water heating calculated for each month													
	225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(64)
										Total per year (kWh/year) = Sum(64)m =		2207.4483	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
	73.9457	65.1466	68.6223	58.9761	56.2375	49.6647	48.2999	50.7952	51.9879	59.1771	64.3932	72.9637	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	99.3893	96.9443	92.2343	81.9112	75.5880	68.9787	64.9192	68.2731	72.2054	79.5391	89.4350	98.0695	(72)
Total internal gains													
	559.0979	556.9470	539.0695	505.6456	472.4781	439.4739	421.7375	424.7973	441.8970	475.3315	512.0717	544.1011	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	19.6403	0.6800	0.7000	0.7700	64.0095	(76)

Solar gains	64.0095	125.2162	206.2132	300.7496	368.5800	377.3072	359.2118	308.5577	239.8345	148.5795	79.8123	52.6383	(83)
Total gains	623.1074	682.1631	745.2827	806.3952	841.0581	816.7811	780.9493	733.3549	681.7314	623.9110	591.8841	596.7394	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area													
	0.9837	0.9710	0.9361	0.8480	0.6927	0.5106	0.3703	0.4116	0.6440	0.8898	0.9704	0.9870	(86)

MIT	20.2101	20.3545	20.5827	20.8166	20.9516	20.9928	20.9991	20.9983	20.9751	20.7895	20.4467	20.1606	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house													
	0.9797	0.9643	0.9219	0.8181	0.6453	0.4516	0.3061	0.3437	0.5805	0.8601	0.9623	0.9839	(89)
MIT 2	19.3196	19.5004	19.7807	20.0529	20.1933	20.2288	20.2328	20.2324	20.2163	20.0297	19.6183	19.2572	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.5709	19.7414	20.0070	20.2684	20.4073	20.4444	20.4490	20.4486	20.4304	20.2441	19.8521	19.5121	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.4209	19.5914	19.8570	20.1184	20.2573	20.2944	20.2990	20.2986	20.2804	20.0941	19.7021	19.3621	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9744	0.9573	0.9138	0.8133	0.6469	0.4564	0.3117	0.3496	0.5846	0.8540	0.9552	0.9791	(94)
Useful gains	607.1303	653.0264	681.0078	655.8243	544.0706	372.7680	243.3921	256.3490	398.5389	532.8170	565.3903	584.2868	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	995.7269	967.4449	879.5764	738.7465	563.5064	374.9841	243.5852	256.7248	406.9882	625.1962	829.8605	998.4436	(97)
Space heating kWh													
	289.1159	211.2892	147.7350	59.7040	14.4602	0.0000	0.0000	0.0000	0.0000	68.7301	190.4185	308.1327	(98a)
Space heating requirement - total per year (kWh/year)												1289.5856	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	289.1159	211.2892	147.7350	59.7040	14.4602	0.0000	0.0000	0.0000	0.0000	68.7301	190.4185	308.1327	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1289.5856	
Space heating per m2											(98c) / (4) =	16.1238	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	289.1159	211.2892	147.7350	59.7040	14.4602	0.0000	0.0000	0.0000	0.0000	68.7301	190.4185	308.1327	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	324.8493	237.4036	165.9944	67.0831	16.2474	0.0000	0.0000	0.0000	0.0000	77.2248	213.9534	346.2165	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.2462	88.1670	87.9943	87.7160	87.4291	87.3000	87.3000	87.3000	87.3000	87.7605	88.1272	88.2783	(217)
Fuel for water heating, kWh/month													
	256.0250	225.8480	238.5527	206.0905	197.4664	174.9753	170.3968	178.9983	182.9836	206.8006	223.6269	252.5844	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	9.1721	8.2844	9.1721	8.8762	9.1721	8.8762	9.1721	9.1721	8.8762	9.1721	8.8762	9.1721	(231)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1448.9725	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2514.3485	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	107.9935	(231)
Electricity for lighting (calculated in Appendix L)	196.1051	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4267.4197	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1448.9725	3.6400	52.7426	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2514.3485	3.6400	91.5223	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	107.9935	16.4900	17.8081	(249)
Energy for lighting	196.1051	16.4900	32.3377	(250)
Additional standing charges			92.0000	(251)
Total energy cost			286.4108	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8250	(257)
SAP value		86.6268	
SAP rating (Section 12)		87	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1448.9725	0.2100	304.2842	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2514.3485	0.2100	528.0132	(264)
Space and water heating			832.2974	(265)
Pumps, fans and electric keep-hot	107.9935	0.1387	14.9800	(267)
Energy for lighting	196.1051	0.1443	28.3040	(268)
Total CO2, kg/year			875.5815	(272)
CO2 emissions per m2			10.9500	(273)
EI value			90.6123	
EI rating			91	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17097.8798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6723 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625 (42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564 (42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979 (42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483 (42c)
Average daily hot water use (litres/day)												122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2646	12.8723	14.2262	13.7137	14.1370	13.6467	14.0798	14.0978	13.6634	14.1582	13.7528	14.2575	(61)
Total heat required for water heating calculated for each month	225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(64)
										Total per year (kWh/year) = Sum(64)m =		2207.4483	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	73.9457	65.1466	68.6223	58.9761	56.2375	49.6647	48.2999	50.7952	51.9879	59.1771	64.3932	72.9637	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	99.3893	96.9443	92.2343	81.9112	75.5880	68.9787	64.9192	68.2731	72.2054	79.5391	89.4350	98.0695	(72)
Total internal gains	559.0979	556.9470	539.0695	505.6456	472.4781	439.4739	421.7375	424.7973	441.8970	475.3315	512.0717	544.1011	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

				m2		Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c		factor Table 6d		W	
East				9.8800		23.7835	0.6800	0.7000		0.7700		77.5127	(76)
Solar gains	77.5127	134.7327	218.2918	321.2659	378.6764	415.6011	388.3328	340.4966	267.7476	168.5975	95.2070	64.1092	(83)
Total gains	636.6105	691.6797	757.3613	826.9115	851.1545	855.0749	810.0703	765.2939	709.6445	643.9290	607.2787	608.2103	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9804	0.9666	0.9228	0.8213	0.6557	0.4444	0.3168	0.3523	0.5982	0.8583	0.9626	0.9846	(86)
MIT	20.2603	20.3966	20.6381	20.8519	20.9653	20.9968	20.9996	20.9993	20.9836	20.8390	20.5060	20.2086	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9757	0.9589	0.9058	0.7882	0.6060	0.3866	0.2546	0.2867	0.5341	0.8225	0.9524	0.9808	(89)
MIT 2	19.3829	19.5528	19.8471	20.0911	20.2058	20.2314	20.2330	20.2329	20.2226	20.0836	19.6915	19.3179	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.6305	19.7909	20.0703	20.3058	20.4201	20.4474	20.4494	20.4492	20.4373	20.2968	19.9213	19.5693	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.4805	19.6409	19.9203	20.1558	20.2701	20.2974	20.2994	20.2992	20.2873	20.1468	19.7713	19.4193	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9698	0.9515	0.8979	0.7845	0.6085	0.3915	0.2600	0.2923	0.5388	0.8180	0.9448	0.9756	(94)
Useful gains	617.3749	658.1603	680.0110	648.7508	517.9351	334.7761	210.6194	223.7153	382.3503	526.7219	573.7735	593.3438	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	979.8979	950.9524	850.8175	714.8645	531.4245	335.6704	210.6819	223.8408	387.6884	595.7405	808.0802	982.4505	(97)
Space heating kWh	269.7171	196.7563	127.0800	47.6019	10.0361	0.0000	0.0000	0.0000	0.0000	51.3498	168.7008	289.4954	(98a)
Space heating requirement - total per year (kWh/year)												1160.7374	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	269.7171	196.7563	127.0800	47.6019	10.0361	0.0000	0.0000	0.0000	0.0000	51.3498	168.7008	289.4954	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1160.7374	
Space heating per m2											(98c) / (4) =	14.5128	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	269.7171	196.7563	127.0800	47.6019	10.0361	0.0000	0.0000	0.0000	0.0000	51.3498	168.7008	289.4954	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	303.0529	221.0745	142.7866	53.4853	11.2765	0.0000	0.0000	0.0000	0.0000	57.6964	189.5515	325.2757	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.2169	88.1367	87.9334	87.6490	87.3917	87.3000	87.3000	87.3000	87.3000	87.6693	88.0759	88.2523	(217)
Fuel for water heating, kWh/month	256.1099	225.9256	238.7179	206.2480	197.5508	174.9753	170.3968	178.9983	182.9836	207.0156	223.7571	252.6589	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	9.1721	8.2844	9.1721	8.8762	9.1721	8.8762	9.1721	9.1721	8.8762	9.1721	8.8762	9.1721	(231)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1304.1993	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.3000	

Water heating fuel used	2515.3378	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	107.9935	(231)
Electricity for lighting (calculated in Appendix L)	196.1051	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4123.6359	(238)

10a. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1304.1993	6.5500	85.4251	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2515.3378	6.5500	164.7546	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	107.9935	28.4300	30.7026	(249)
Energy for lighting	196.1051	28.4300	55.7527	(250)
Additional standing charges			104.0000	(251)
Total energy cost			440.6349	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1304.1993	0.2100	273.8819	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2515.3378	0.2100	528.2209	(264)
Space and water heating			802.1028	(265)
Pumps, fans and electric keep-hot	107.9935	0.1387	14.9800	(267)
Energy for lighting	196.1051	0.1443	28.3040	(268)
Total CO2, kg/year			845.3869	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1304.1993	1.1300	1473.7453	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2515.3378	1.1300	2842.3318	(278)
Space and water heating			4316.0770	(279)
Pumps, fans and electric keep-hot	107.9935	1.5128	163.3726	(281)
Energy for lighting	196.1051	1.5338	300.7926	(282)
Total Primary energy kWh/year			4780.2423	(286)

SAP 10 EPC IMPROVEMENTS

Rev C - Be Lean

Current energy efficiency rating: B 87
Current environmental impact rating: B 91

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 87
Potential environmental impact rating: B 91

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£86	£86	£0
Mains gas	£354	£354	£0
Space heating	£220	£220	£0
Water heating	£165	£165	£0
Lighting	£56	£56	£0
Total cost of fuels	£440	£440	£0

Total cost of uses	£441	£441	£0
Delivered energy	52 kWh/m²	52 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.8 tonnes	0.0 tonnes
CO2 emissions per m²	11 kg/m²	11 kg/m²	0 kg/m²
Primary energy	60 kWh/m²	60 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							3.6723	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		33.5192	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

Hot water usage for mixer showers

	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564 (42a)

Hot water usage for baths

	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979 (42b)

Hot water usage for other uses

	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483 (42c)

Average daily hot water use (litres/day) 122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2646	12.8723	14.2262	13.7137	14.1370	13.6467	14.0798	14.0978	13.6634	14.1582	13.7528	14.2575	(61)
Total heat required for water heating calculated for each month	225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(64)
										Total per year (kWh/year) = Sum(64)m =		2207.4483	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	73.9457	65.1466	68.6223	58.9761	56.2375	49.6647	48.2999	50.7952	51.9879	59.1771	64.3932	72.9637	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	99.3893	96.9443	92.2343	81.9112	75.5880	68.9787	64.9192	68.2731	72.2054	79.5391	89.4350	98.0695	(72)
Total internal gains	559.0979	556.9470	539.0695	505.6456	472.4781	439.4739	421.7375	424.7973	441.8970	475.3315	512.0717	544.1011	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	19.6403	0.6800	0.7000	0.7700	64.0095	(76)
Solar gains	64.0095	125.2162	206.2132	300.7496	368.5800	377.3072	359.2118	308.5577	239.8345	148.5795	79.8123	52.6383	(83)
Total gains	623.1074	682.1631	745.2827	806.3952	841.0581	816.7811	780.9493	733.3549	681.7314	623.9110	591.8841	596.7394	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9837	0.9710	0.9361	0.8480	0.6927	0.5106	0.3703	0.4116	0.6440	0.8898	0.9704	0.9870	(86)
MIT	20.2101	20.3545	20.5827	20.8166	20.9516	20.9928	20.9991	20.9983	20.9751	20.7895	20.4467	20.1606	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9797	0.9643	0.9219	0.8181	0.6453	0.4516	0.3061	0.3437	0.5805	0.8601	0.9623	0.9839	(89)
MIT 2	19.3196	19.5004	19.7807	20.0529	20.1933	20.2288	20.2328	20.2324	20.2163	20.0297	19.6183	19.2572	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.5709	19.7414	20.0070	20.2684	20.4073	20.4444	20.4490	20.4486	20.4304	20.2441	19.8521	19.5121	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.4209	19.5914	19.8570	20.1184	20.2573	20.2944	20.2990	20.2986	20.2804	20.0941	19.7021	19.3621	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Utilisation	0.9744	0.9573	0.9138	0.8133	0.6469	0.4564	0.3117	0.3496	0.5846	0.8540	0.9552	0.9791	(94)
Useful gains	607.1303	653.0264	681.0078	655.8243	544.0706	372.7680	243.3921	256.3490	398.5389	532.8170	565.3903	584.2868	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	995.7269	967.4449	879.5764	738.7465	563.5064	374.9841	243.5852	256.7248	406.9882	625.1962	829.8605	998.4436	(97)
Space heating kWh	289.1159	211.2892	147.7350	59.7040	14.4602	0.0000	0.0000	0.0000	0.0000	68.7301	190.4185	308.1327	(98a)
Space heating requirement - total per year (kWh/year)												1289.5856	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	289.1159	211.2892	147.7350	59.7040	14.4602	0.0000	0.0000	0.0000	0.0000	68.7301	190.4185	308.1327	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1289.5856	
Space heating per m2											(98c) / (4) =	16.1238	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	289.1159	211.2892	147.7350	59.7040	14.4602	0.0000	0.0000	0.0000	0.0000	68.7301	190.4185	308.1327	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	324.8493	237.4036	165.9944	67.0831	16.2474	0.0000	0.0000	0.0000	0.0000	77.2248	213.9534	346.2165	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.2462	88.1670	87.9943	87.7160	87.4291	87.3000	87.3000	87.3000	87.3000	87.7605	88.1272	88.2783	(217)
Fuel for water heating, kWh/month	256.0250	225.8480	238.5527	206.0905	197.4664	174.9753	170.3968	178.9983	182.9836	206.8006	223.6269	252.5844	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	9.1721	8.2844	9.1721	8.8762	9.1721	8.8762	9.1721	9.1721	8.8762	9.1721	8.8762	9.1721	(231)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1448.9725	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.3000	
Water heating fuel used												2514.3485	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												107.9935	(231)
Electricity for lighting (calculated in Appendix L)												196.1051	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												4267.4197	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1448.9725	3.6400	52.7426	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2514.3485	3.6400	91.5223	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	107.9935	16.4900	17.8081	(249)
Energy for lighting	196.1051	16.4900	32.3377	(250)
Additional standing charges			92.0000	(251)
Total energy cost			286.4108	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8250	(257)
SAP value		86.6268	
SAP rating (Section 12)		87	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1448.9725	0.2100	304.2842	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2514.3485	0.2100	528.0132	(264)
Space and water heating			832.2974	(265)
Pumps, fans and electric keep-hot	107.9935	0.1387	14.9800	(267)
Energy for lighting	196.1051	0.1443	28.3040	(268)
Total CO2, kg/year			875.5815	(272)
CO2 emissions per m2			10.9500	(273)
EI value			90.6123	
EI rating			91	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)

Timber partitions	151.9500	9.0000	1367.5500	(32c)
Internal Floor 1	39.9900	18.0000	719.8200	(32d)
Internal Ceiling 1	39.9900	9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17097.8798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6723	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	33.5192	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2646	12.8723	14.2262	13.7137	14.1370	13.6467	14.0798	14.0978	13.6634	14.1582	13.7528	14.2575	(61)
Total heat required for water heating calculated for each month	225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(64)
									Total per year (kWh/year) = Sum(64)m =			2207.4483	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							0.0000	(64a)
Heat gains from water heating, kWh/month	73.9457	65.1466	68.6223	58.9761	56.2375	49.6647	48.2999	50.7952	51.9879	59.1771	64.3932	72.9637	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	99.3893	96.9443	92.2343	81.9112	75.5880	68.9787	64.9192	68.2731	72.2054	79.5391	89.4350	98.0695	(72)
Total internal gains	559.0979	556.9470	539.0695	505.6456	472.4781	439.4739	421.7375	424.7973	441.8970	475.3315	512.0717	544.1011	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	23.7835	0.6800	0.7000	0.7700	77.5127	(76)

Solar gains	77.5127	134.7327	218.2918	321.2659	378.6764	415.6011	388.3328	340.4966	267.7476	168.5975	95.2070	64.1092	(83)
Total gains	636.6105	691.6797	757.3613	826.9115	851.1545	855.0749	810.0703	765.2939	709.6445	643.9290	607.2787	608.2103	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area													
	0.9804	0.9666	0.9228	0.8213	0.6557	0.4444	0.3168	0.3523	0.5982	0.8583	0.9626	0.9846	(86)
MIT	20.2603	20.3966	20.6381	20.8519	20.9653	20.9968	20.9996	20.9993	20.9836	20.8390	20.5060	20.2086	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house													
	0.9757	0.9589	0.9058	0.7882	0.6060	0.3866	0.2546	0.2867	0.5341	0.8225	0.9524	0.9808	(89)
MIT 2	19.3829	19.5528	19.8471	20.0911	20.2058	20.2314	20.2330	20.2329	20.2226	20.0836	19.6915	19.3179	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.6305	19.7909	20.0703	20.3058	20.4201	20.4474	20.4494	20.4492	20.4373	20.2968	19.9213	19.5693	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.4805	19.6409	19.9203	20.1558	20.2701	20.2974	20.2994	20.2992	20.2873	20.1468	19.7713	19.4193	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9698	0.9515	0.8979	0.7845	0.6085	0.3915	0.2600	0.2923	0.5388	0.8180	0.9448	0.9756	(94)
Useful gains	617.3749	658.1603	680.0110	648.7508	517.9351	334.7761	210.6194	223.7153	382.3503	526.7219	573.7735	593.3438	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	979.8979	950.9524	850.8175	714.8645	531.4245	335.6704	210.6819	223.8408	387.6884	595.7405	808.0802	982.4505	(97)
Space heating kWh													
	269.7171	196.7563	127.0800	47.6019	10.0361	0.0000	0.0000	0.0000	0.0000	51.3498	168.7008	289.4954	(98a)
Space heating requirement - total per year (kWh/year)												1160.7374	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	269.7171	196.7563	127.0800	47.6019	10.0361	0.0000	0.0000	0.0000	0.0000	51.3498	168.7008	289.4954	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1160.7374	
Space heating per m2											(98c) / (4) =	14.5128	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	269.7171	196.7563	127.0800	47.6019	10.0361	0.0000	0.0000	0.0000	0.0000	51.3498	168.7008	289.4954	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	303.0529	221.0745	142.7866	53.4853	11.2765	0.0000	0.0000	0.0000	0.0000	57.6964	189.5515	325.2757	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.2169	88.1367	87.9334	87.6490	87.3917	87.3000	87.3000	87.3000	87.3000	87.6693	88.0759	88.2523	(217)
Fuel for water heating, kWh/month													
	256.1099	225.9256	238.7179	206.2480	197.5508	174.9753	170.3968	178.9983	182.9836	207.0156	223.7571	252.6589	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	9.1721	8.2844	9.1721	8.8762	9.1721	8.8762	9.1721	9.1721	8.8762	9.1721	8.8762	9.1721	(231)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1304.1993	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2515.3378	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	107.9935	(231)
Electricity for lighting (calculated in Appendix L)	196.1051	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		

Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4123.6359 (238)

10a. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1304.1993	6.5500	85.4251	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2515.3378	6.5500	164.7546	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	107.9935	28.4300	30.7026	(249)
Energy for lighting	196.1051	28.4300	55.7527	(250)
Additional standing charges			104.0000	(251)
Total energy cost			440.6349	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1304.1993	0.2100	273.8819	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2515.3378	0.2100	528.2209	(264)
Space and water heating			802.1028	(265)
Pumps, fans and electric keep-hot	107.9935	0.1387	14.9800	(267)
Energy for lighting	196.1051	0.1443	28.3040	(268)
Total CO2, kg/year			845.3869	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1304.1993	1.1300	1473.7453	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2515.3378	1.1300	2842.3318	(278)
Space and water heating			4316.0770	(279)
Pumps, fans and electric keep-hot	107.9935	1.5128	163.3726	(281)
Energy for lighting	196.1051	1.5338	300.7926	(282)
Total Primary energy kWh/year			4780.2423	(286)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.90	**TER**	11.80
Environmental	98 A	**% DER < TER**			83.90
CO_2 Emissions (t/year)	0.12	**DFEE**	24.18	**TFEE**	30.94
Compliance Check	See BREL	**% DFEE < TFEE**			21.83
% DPER < TPER	61.05	**DPER**	24.34	**TPER**	62.49

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				4	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6723 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4625 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)		122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.6786	139.1442	125.6786	129.8679	125.6786	129.8679	125.6786	125.6786	129.8679	125.6786	129.8679	125.6786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	559.0481	572.3498	548.4455	530.1166	504.1979	487.2994	469.3775	470.4487	484.3003	499.6452	529.1302	548.0502	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	19.6403	0.6800	0.7000	0.7700	64.0095	(76)

Solar gains	64.0095	125.2162	206.2132	300.7496	368.5800	377.3072	359.2118	308.5577	239.8345	148.5795	79.8123	52.6383	(83)
Total gains	623.0576	697.5659	754.6587	830.8662	872.7779	864.6066	828.5894	779.0064	724.1348	648.2248	608.9425	600.6885	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)		21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9837	0.9681	0.9331	0.8347	0.6723	0.4836	0.3492	0.3879	0.6112	0.8755	0.9665	0.9866	(86)
MIT	20.2100	20.3754	20.5932	20.8324	20.9584	20.9946	20.9993	20.9988	20.9809	20.8096	20.4698	20.1665	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9797	0.9608	0.9183	0.8037	0.6251	0.4272	0.2886	0.3237	0.5493	0.8437	0.9575	0.9834	(89)
MIT 2	19.3195	19.5262	19.7931	20.0696	20.1992	20.2299	20.2329	20.2326	20.2204	20.0511	19.6465	19.2647	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.5708	19.7658	20.0189	20.2849	20.4134	20.4457	20.4492	20.4488	20.4350	20.2652	19.8788	19.5192	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5708	19.7658	20.0189	20.2849	20.4134	20.4457	20.4492	20.4488	20.4350	20.2652	19.8788	19.5192	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9755	0.9554	0.9136	0.8059	0.6365	0.4430	0.3057	0.3418	0.5659	0.8452	0.9525	0.9795	(94)
Useful gains	607.7719	666.4585	689.4700	669.6153	555.5383	382.9945	253.2911	266.2736	409.8086	547.8754	580.0350	588.3625	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1005.5988	978.9322	890.2326	749.7060	573.7879	384.9450	253.4721	266.6201	417.1663	636.4612	841.4986	1008.7841	(97)
Space heating kWh	295.9833	209.9823	149.3674	57.6653	13.5777	0.0000	0.0000	0.0000	0.0000	65.9078	188.2538	312.7936	(98a)
Space heating requirement - total per year (kWh/year)												1293.5312	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	295.9833	209.9823	149.3674	57.6653	13.5777	0.0000	0.0000	0.0000	0.0000	65.9078	188.2538	312.7936	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1293.5312	
Space heating per m2										(98c) / (4) =		16.1732	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	295.9833	209.9823	149.3674	57.6653	13.5777	0.0000	0.0000	0.0000	0.0000	65.9078	188.2538	312.7936 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	443.9749	314.9735	224.0511	86.4979	20.3665	0.0000	0.0000	0.0000	0.0000	98.8618	282.3807	469.1904
Space heating requirement												
	443.9749	314.9735	224.0511	86.4979	20.3665	0.0000	0.0000	0.0000	0.0000	98.8618	282.3807	469.1904 (307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement

	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948
Water heating fuel												
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679 (331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												1940.2968 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												4037.1274 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												19.4030 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)												
mechanical ventilation fans (SFP = 0.0920)												21.9935 (330a)
Total electricity for the above, kWh/year												21.9935 (331)
Electricity for lighting (calculated in Appendix L)												196.1051 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-958.2209 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												
Energy saved or generated												-0.0000 (336)
Energy used												0.0000 (337)
Total delivered energy for all uses												5237.3020 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1593.9798	0.1570	81.2437	(367)
Electrical energy for heat distribution (space & water)	19.4030	0.0000	8.7343	(372)
Overall CO2 factor for heat network			0.0404	(386)
Total CO2 associated with community systems			241.6503	(373)
Space and water heating			241.6503	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			151.6085	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.9000	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1593.9798	1.5813	818.1755	(467)
Electrical energy for heat distribution (space & water)	19.4030	0.0000	92.0839	(472)
Overall CO2 factor for heat network			0.4262	(486)
Total CO2 associated with community systems			2547.6553	(473)
Space and water heating			2547.6553	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	1.4873	-725.8942	
PV Unit electricity exported	-470.1661	0.4450	-209.2081	
Total			-935.1023	(480)
Total Primary energy kWh/year			1946.6174	(483)
Dwelling Primary energy Rate (DPER)			24.3400	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Semi-glazed door			3.5800	1.0000	3.5800			(26a)
TER Opening Type			9.8800	1.1450	11.3130			(27)
Heatloss Floor			39.9900	0.1300	5.1987			(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.1800	7.0326			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.5045			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			213.7769 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.4500	0.0500	0.4225
E3 Sill	6.7500	0.0500	0.3375
E4 Jamb	22.0000	0.0500	1.1000
E6 Intermediate floor within a dwelling	19.5200	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	6.0900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E5 Ground floor (normal)	19.5200	0.1600	3.1232
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
P1 Party wall - Ground floor	6.0900	0.0800	0.4872
E7 Party floor between dwellings (in blocks of flats)	14.1200	0.0700	0.9884
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.7208 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	41.2253 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	77.7420	77.5795	77.4202	76.6720	76.5321	75.8805	75.8805	75.7598	76.1315	76.5321	76.8152	77.1113	(39)
Average = Sum(39)m / 12 =												76.6714	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9700	0.9680	0.9586	0.9569	0.9487	0.9487	0.9472	0.9519	0.9569	0.9604	0.9641	(40)
HLP (average)												0.9586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers													
	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths													
	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses													
	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m													
	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
										Total per year (kWh/year) = Sum(64)m =		2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	122.0433	135.1194	122.0433	126.1114	122.0433	126.1114	122.0433	122.0433	126.1114	122.0433	126.1114	122.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													
	549.0775	561.9896	538.4748	520.0247	494.2273	474.2076	456.4069	457.4780	471.2084	489.6746	519.0383	538.0795	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	19.6403	0.6300	0.7000	0.7700	59.3029	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	59.3029	116.0091	191.0505	278.6357	341.4785	349.5640	332.7992	285.8696	222.1996	137.6546	73.9438	48.7678	(83)
Total gains	608.3804	677.9987	729.5253	798.6604	835.7058	823.7716	789.2061	743.3476	693.4080	627.3291	592.9821	586.8473	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.0920	61.2199	61.3459	61.9445	62.0578	62.5907	62.5907	62.6904	62.3843	62.0578	61.8290	61.5917	
alpha	5.0728	5.0813	5.0897	5.1296	5.1372	5.1727	5.1727	5.1794	5.1590	5.1372	5.1219	5.1061	
util living area	0.9885	0.9790	0.9579	0.8926	0.7633	0.5732	0.4202	0.4638	0.7040	0.9188	0.9775	0.9903	(86)
MIT	19.9050	20.0800	20.3336	20.6615	20.8836	20.9787	20.9964	20.9942	20.9414	20.6539	20.2312	19.8758	(87)
Th 2	20.1067	20.1084	20.1101	20.1179	20.1194	20.1263	20.1263	20.1275	20.1236	20.1194	20.1164	20.1133	(88)
util rest of house	0.9855	0.9736	0.9470	0.8662	0.7128	0.5013	0.3382	0.3783	0.6326	0.8927	0.9708	0.9878	(89)
MIT 2	18.8380	19.0601	19.3779	19.7777	20.0210	20.1134	20.1249	20.1252	20.0832	19.7786	19.2591	18.8059	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.1391	19.3479	19.6476	20.0271	20.2644	20.3576	20.3709	20.3704	20.3254	20.0256	19.5334	19.1078	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1391	19.3479	19.6476	20.0271	20.2644	20.3576	20.3709	20.3704	20.3254	20.0256	19.5334	19.1078	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9812	0.9678	0.9401	0.8632	0.7216	0.5208	0.3613	0.4024	0.6499	0.8895	0.9651	0.9839	(94)
Useful gains	596.9506	656.1465	685.8487	689.3776	603.0790	429.0146	285.1742	299.1384	450.6478	558.0090	572.2933	577.4180	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1153.6230	1120.8598	1017.8906	853.1366	655.4525	436.8875	286.1350	300.7964	473.9480	721.3615	955.0754	1149.5584	(97)
Space heating kWh	414.1643	312.2873	247.0392	117.9065	38.9659	0.0000	0.0000	0.0000	0.0000	121.5343	275.6031	425.6725	(98a)
Space heating requirement - total per year (kWh/year)												1953.1730	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	414.1643	312.2873	247.0392	117.9065	38.9659	0.0000	0.0000	0.0000	0.0000	121.5343	275.6031	425.6725	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1953.1730	
Space heating per m2											(98c) / (4) =	24.4208	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	414.1643	312.2873	247.0392	117.9065	38.9659	0.0000	0.0000	0.0000	0.0000	121.5343	275.6031	425.6725	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	448.7154	338.3394	267.6481	127.7427	42.2166	0.0000	0.0000	0.0000	0.0000	131.6731	298.5949	461.1837	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.3781	85.0348	84.3768	83.0310	81.2409	79.8000	79.8000	79.8000	79.8000	83.0677	84.7448	85.4582	(217)
Fuel for water heating, kWh/month	267.4167	237.3749	254.2727	227.8515	226.1156	207.8751	205.6450	213.6686	215.8200	230.6400	239.6706	264.3653	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.3582	20.3433	18.3169	13.4197	10.3658	8.4689	9.4560	12.2913	15.9652	20.9471	23.6598	26.0630	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3424	-31.5676	-47.5704	-56.1485	-62.8691	-59.5233	-58.7993	-54.3654	-46.9365	-37.2699	-23.9846	-18.2835	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9342	-17.0411	-34.5369	-52.8648	-70.8844	-71.5905	-70.7461	-59.4418	-42.9727	-24.6882	-10.6939	-6.2480	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2116.1138	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2790.7159	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	204.6551	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4209.1818	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2116.1138	0.2100	444.3839	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2790.7159	0.2100	586.0503	(264)
Space and water heating			1030.4342	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	204.6551	0.1443	29.5381	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	0.1336	-69.2911	
PV Unit electricity exported	-469.6425	0.1253	-58.8667	
Total			-128.1578	(269)
Total CO2, kg/year			943.7437	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.8000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2116.1138	1.1300	2391.2086	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2790.7159	1.1300	3153.5090	(278)
Space and water heating			5544.7176	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	204.6551	1.5338	313.9068	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	1.4937	-774.7198	
PV Unit electricity exported	-469.6425	0.4601	-216.0686	
Total			-990.7884	(283)
Total Primary energy kWh/year			4997.9368	(286)
Target Primary Energy Rate (TPER)			62.4900	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.90	**TER**	11.80
Environmental	98 A	**% DER < TER**			83.90
CO_2 Emissions (t/year)	0.12	**DFEE**	24.18	**TFEE**	30.94
Compliance Check	See BREL	**% DFEE < TFEE**			21.83
% DPER < TPER	61.05	**DPER**	24.34	**TPER**	62.49

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2122	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2705	0.2652	0.2599	0.2334	0.2281	0.2016	0.2016	0.1963	0.2122	0.2281	0.2387	0.2493	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5366	0.5352	0.5338	0.5272	0.5260	0.5203	0.5203	0.5193	0.5225	0.5260	0.5285	0.5311	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17097.8798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.6723	(36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.6979	34.6061	34.5160	34.0930	34.0139	33.6455	33.6455	33.5772	33.7874	34.0139	34.1740	34.3414	(38)
Heat transfer coeff	68.2172	68.1253	68.0352	67.6122	67.5331	67.1647	67.1647	67.0965	67.3066	67.5331	67.6932	67.8606	(39)
Average = Sum(39)m / 12 =												67.6118	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8529	0.8518	0.8507	0.8454	0.8444	0.8398	0.8398	0.8389	0.8415	0.8444	0.8464	0.8485	(40)
HLP (average)												0.8454	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												62.4583	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.6786	139.1442	125.6786	129.8679	125.6786	129.8679	125.6786	125.6786	129.8679	125.6786	129.8679	125.6786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains	453.4664	467.9883	446.9019	435.3676	413.4459	400.7688	385.7326	384.8800	396.4077	407.0433	430.0429	443.3929	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	19.6403	0.6800	0.7000	0.7700	64.0095	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	64.0095	125.2162	206.2132	300.7496	368.5800	377.3072	359.2118	308.5577	239.8345	148.5795	79.8123	52.6383	(83)
Total gains	517.4759	593.2045	653.1151	736.1172	782.0259	778.0760	744.9445	693.4377	636.2422	555.6229	509.8552	496.0312	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.6219	69.7158	69.8081	70.2449	70.3272	70.7129	70.7129	70.7848	70.5638	70.3272	70.1608	69.9878	
alpha	5.6415	5.6477	5.6539	5.6830	5.6885	5.7142	5.7142	5.7190	5.7043	5.6885	5.6774	5.6659	
util living area	0.9936	0.9855	0.9649	0.8914	0.7441	0.5440	0.3955	0.4427	0.6927	0.9304	0.9856	0.9949	(86)
MIT	19.9923	20.1740	20.4253	20.7385	20.9254	20.9893	20.9985	20.9973	20.9617	20.7005	20.2922	19.9566	(87)

Th 2	20.2077	20.2087	20.2096	20.2142	20.2150	20.2190	20.2190	20.2197	20.2175	20.2150	20.2133	20.2115	(88)
util rest of house	0.9919	0.9818	0.9559	0.8662	0.6965	0.4810	0.3259	0.3688	0.6270	0.9081	0.9813	0.9936	(89)
MIT 2	19.2857	19.4660	19.7122	20.0085	20.1660	20.2139	20.2186	20.2189	20.1967	19.9812	19.5879	19.2534	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.4851	19.6658	19.9134	20.2145	20.3803	20.4327	20.4387	20.4385	20.4126	20.1842	19.7866	19.4519	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4851	19.6658	19.9134	20.2145	20.3803	20.4327	20.4387	20.4385	20.4126	20.1842	19.7866	19.4519	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9899	0.9786	0.9519	0.8662	0.7070	0.4985	0.3456	0.3897	0.6440	0.9071	0.9783	0.9919	(94)
Useful gains	512.2622	580.4959	621.7092	637.6455	552.8697	387.8600	257.4299	270.2037	409.7656	504.0266	498.7822	491.9992	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1035.8841	1005.9254	912.5839	765.0005	586.2074	391.7542	257.8226	270.9705	424.8800	647.2523	858.7989	1034.9994	(97)
Space heating kWh	389.5747	285.8886	216.4107	91.6956	24.8033	0.0000	0.0000	0.0000	0.0000	106.5599	259.2120	403.9922	(98a)
Space heating requirement - total per year (kWh/year)												1778.1371	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	389.5747	285.8886	216.4107	91.6956	24.8033	0.0000	0.0000	0.0000	0.0000	106.5599	259.2120	403.9922	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1778.1371	
Space heating per m2											(98c) / (4) =	22.2323	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	631.3480	497.0186	509.9330	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9456	0.9759	0.9633	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	597.0031	485.0461	491.1981	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	850.0667	814.1870	756.5695	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	182.2058	244.8808	197.4363	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	45.5514	61.2202	49.3591	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												156.1307	(107)
Energy for space heating												22.2323	(99)
Energy for space cooling												1.9521	(108)
Total												24.1844	(109)
Fabric Energy Efficiency (DFEE)												24.2	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Semi-glazed door			3.5800	1.0000	3.5800			(26a)
TER Opening Type			9.8800	1.1450	11.3130			(27)
Heatloss Floor			39.9900	0.1300	5.1987			(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.1800	7.0326			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.5045			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 213.7769 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.4500	0.0500	0.4225
E3 Sill	6.7500	0.0500	0.3375
E4 Jamb	22.0000	0.0500	1.1000
E6 Intermediate floor within a dwelling	19.5200	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	6.0900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E5 Ground floor (normal)	19.5200	0.1600	3.1232
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
P1 Party wall - Ground floor	6.0900	0.0800	0.4872
E7 Party floor between dwellings (in blocks of flats)	14.1200	0.0700	0.9884

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.7208 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.2253 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	77.7420	77.5795	77.4202	76.6720	76.5321	75.8805	75.8805	75.7598	76.1315	76.5321	76.8152	77.1113	(39)

Average = Sum(39)m / 12 = 76.6714

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9700	0.9680	0.9586	0.9569	0.9487	0.9487	0.9472	0.9519	0.9569	0.9604	0.9641	(40)
HLP (average)												0.9586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	122.0433	135.1194	122.0433	126.1114	122.0433	126.1114	122.0433	122.0433	126.1114	122.0433	126.1114	122.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains													
	449.8311	463.9635	443.2666	431.6111	409.8106	397.0124	382.0973	381.2447	392.6512	403.4080	426.2864	439.7576	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	19.6403	0.6300	0.7000	0.7700	59.3029	(76)

Solar gains	59.3029	116.0091	191.0505	278.6357	341.4785	349.5640	332.7992	285.8696	222.1996	137.6546	73.9438	48.7678	(83)
Total gains	509.1340	579.9726	634.3170	710.2468	751.2891	746.5764	714.8965	667.1143	614.8508	541.0626	500.2302	488.5254	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.0920	61.2199	61.3459	61.9445	62.0578	62.5907	62.5907	62.6904	62.3843	62.0578	61.8290	61.5917	
alpha	5.0728	5.0813	5.0897	5.1296	5.1372	5.1727	5.1727	5.1794	5.1590	5.1372	5.1219	5.1061	
util living area													
	0.9947	0.9890	0.9754	0.9261	0.8136	0.6240	0.4621	0.5136	0.7654	0.9514	0.9890	0.9957	(86)
MIT	19.7558	19.9383	20.2077	20.5746	20.8416	20.9688	20.9945	20.9907	20.9137	20.5568	20.0974	19.7267	(87)
Th 2	20.1067	20.1084	20.1101	20.1179	20.1194	20.1263	20.1263	20.1275	20.1236	20.1194	20.1164	20.1133	(88)
util rest of house													
	0.9933	0.9860	0.9685	0.9055	0.7668	0.5489	0.3728	0.4205	0.6959	0.9335	0.9854	0.9945	(89)
MIT 2	18.9705	19.1527	19.4192	19.7761	20.0118	20.1112	20.1246	20.1245	20.0751	19.7672	19.3180	18.9467	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.1921	19.3744	19.6417	20.0014	20.2459	20.3532	20.3701	20.3690	20.3118	19.9900	19.5379	19.1668	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1921	19.3744	19.6417	20.0014	20.2459	20.3532	20.3701	20.3690	20.3118	19.9900	19.5379	19.1668	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9913	0.9829	0.9640	0.9024	0.7741	0.5690	0.3981	0.4467	0.7119	0.9303	0.9823	0.9928	(94)
Useful gains	504.6846	570.0264	611.4672	640.9187	581.5412	424.8309	284.5679	298.0052	437.7399	503.3443	491.3969	485.0121	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1157.7437	1122.9183	1017.4315	851.1676	654.0388	436.5542	286.0763	300.6879	472.9107	718.6344	955.4221	1154.1105	(97)
Space heating kWh													
	485.8759	371.5434	302.0375	151.3791	53.9383	0.0000	0.0000	0.0000	0.0000	160.1758	334.0982	497.8092	(98a)
Space heating requirement - total per year (kWh/year)												2356.8574	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	485.8759	371.5434	302.0375	151.3791	53.9383	0.0000	0.0000	0.0000	0.0000	160.1758	334.0982	497.8092	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2356.8574	
Space heating per m2										(98c) / (4) =		29.4681	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	713.2763	561.5154	575.7744	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8893	0.9419	0.9195	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	634.3061	528.8750	529.4361	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	817.3215	782.9714	729.6042	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	131.7711	189.0477	148.9251	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	32.9428	47.2619	37.2313	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												117.4360	(107)
Energy for space heating												29.4681	(99)
Energy for space cooling												1.4683	(108)
Total												30.9364	(109)
Fabric Energy Efficiency (TFEE)												30.9	(109)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.90	**TER**	11.80
Environmental	98 A	**% DER < TER**			83.90
CO_2 Emissions (t/year)	0.12	**DFEE**	24.18	**TFEE**	30.94
Compliance Check	See BREL	**% DFEE < TFEE**			21.83
% DPER < TPER	61.05	**DPER**	24.34	**TPER**	62.49

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				4	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6723 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4625 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)		122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.6786	139.1442	125.6786	129.8679	125.6786	129.8679	125.6786	125.6786	129.8679	125.6786	129.8679	125.6786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	559.0481	572.3498	548.4455	530.1166	504.1979	487.2994	469.3775	470.4487	484.3003	499.6452	529.1302	548.0502	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	19.6403	0.6800	0.7000	0.7700	64.0095	(76)

Solar gains	64.0095	125.2162	206.2132	300.7496	368.5800	377.3072	359.2118	308.5577	239.8345	148.5795	79.8123	52.6383	(83)
Total gains	623.0576	697.5659	754.6587	830.8662	872.7779	864.6066	828.5894	779.0064	724.1348	648.2248	608.9425	600.6885	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)		21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9837	0.9681	0.9331	0.8347	0.6723	0.4836	0.3492	0.3879	0.6112	0.8755	0.9665	0.9866	(86)
MIT	20.2100	20.3754	20.5932	20.8324	20.9584	20.9946	20.9993	20.9988	20.9809	20.8096	20.4698	20.1665	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9797	0.9608	0.9183	0.8037	0.6251	0.4272	0.2886	0.3237	0.5493	0.8437	0.9575	0.9834	(89)
MIT 2	19.3195	19.5262	19.7931	20.0696	20.1992	20.2299	20.2329	20.2326	20.2204	20.0511	19.6465	19.2647	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.5708	19.7658	20.0189	20.2849	20.4134	20.4457	20.4492	20.4488	20.4350	20.2652	19.8788	19.5192	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5708	19.7658	20.0189	20.2849	20.4134	20.4457	20.4492	20.4488	20.4350	20.2652	19.8788	19.5192	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9755	0.9554	0.9136	0.8059	0.6365	0.4430	0.3057	0.3418	0.5659	0.8452	0.9525	0.9795	(94)
Useful gains	607.7719	666.4585	689.4700	669.6153	555.5383	382.9945	253.2911	266.2736	409.8086	547.8754	580.0350	588.3625	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1005.5988	978.9322	890.2326	749.7060	573.7879	384.9450	253.4721	266.6201	417.1663	636.4612	841.4986	1008.7841	(97)
Space heating kWh	295.9833	209.9823	149.3674	57.6653	13.5777	0.0000	0.0000	0.0000	0.0000	65.9078	188.2538	312.7936	(98a)
Space heating requirement - total per year (kWh/year)												1293.5312	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	295.9833	209.9823	149.3674	57.6653	13.5777	0.0000	0.0000	0.0000	0.0000	65.9078	188.2538	312.7936	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1293.5312	
Space heating per m2										(98c) / (4) =		16.1732	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	295.9833	209.9823	149.3674	57.6653	13.5777	0.0000	0.0000	0.0000	0.0000	65.9078	188.2538	312.7936 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	443.9749	314.9735	224.0511	86.4979	20.3665	0.0000	0.0000	0.0000	0.0000	98.8618	282.3807	469.1904
Space heating requirement												
	443.9749	314.9735	224.0511	86.4979	20.3665	0.0000	0.0000	0.0000	0.0000	98.8618	282.3807	469.1904 (307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement

	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948
Water heating fuel												
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679 (331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												1940.2968 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												4037.1274 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												19.4030 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)												
mechanical ventilation fans (SFP = 0.0920)												21.9935 (330a)
Total electricity for the above, kWh/year												21.9935 (331)
Electricity for lighting (calculated in Appendix L)												196.1051 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-958.2209 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												
Energy saved or generated												-0.0000 (336)
Energy used												0.0000 (337)
Total delivered energy for all uses												5237.3020 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1593.9798	0.1570	81.2437	(367)
Electrical energy for heat distribution (space & water)	19.4030	0.0000	8.7343	(372)
Overall CO2 factor for heat network			0.0404	(386)
Total CO2 associated with community systems			241.6503	(373)
Space and water heating			241.6503	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			151.6085	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.9000	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1593.9798	1.5813	818.1755	(467)
Electrical energy for heat distribution (space & water)	19.4030	0.0000	92.0839	(472)
Overall CO2 factor for heat network			0.4262	(486)
Total CO2 associated with community systems			2547.6553	(473)
Space and water heating			2547.6553	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	1.4873	-725.8942	
PV Unit electricity exported	-470.1661	0.4450	-209.2081	
Total			-935.1023	(480)
Total Primary energy kWh/year			1946.6174	(483)
Dwelling Primary energy Rate (DPER)			24.3400	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Semi-glazed door			3.5800	1.0000	3.5800			(26a)
TER Opening Type			9.8800	1.1450	11.3130			(27)
Heatloss Floor			39.9900	0.1300	5.1987			(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.1800	7.0326			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.5045			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			213.7769 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.4500	0.0500	0.4225
E3 Sill	6.7500	0.0500	0.3375
E4 Jamb	22.0000	0.0500	1.1000
E6 Intermediate floor within a dwelling	19.5200	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	6.0900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E5 Ground floor (normal)	19.5200	0.1600	3.1232
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
P1 Party wall - Ground floor	6.0900	0.0800	0.4872
E7 Party floor between dwellings (in blocks of flats)	14.1200	0.0700	0.9884
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.7208 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	41.2253 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	77.7420	77.5795	77.4202	76.6720	76.5321	75.8805	75.8805	75.7598	76.1315	76.5321	76.8152	77.1113	(39)
Average = Sum(39)m / 12 =												76.6714	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9700	0.9680	0.9586	0.9569	0.9487	0.9487	0.9472	0.9519	0.9569	0.9604	0.9641	(40)
HLP (average)												0.9586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers													
	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths													
	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses													
	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m													
	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
										Total per year (kWh/year) = Sum(64)m =		2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	122.0433	135.1194	122.0433	126.1114	122.0433	126.1114	122.0433	122.0433	126.1114	122.0433	126.1114	122.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													
	549.0775	561.9896	538.4748	520.0247	494.2273	474.2076	456.4069	457.4780	471.2084	489.6746	519.0383	538.0795	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	19.6403	0.6300	0.7000	0.7700	59.3029	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	59.3029	116.0091	191.0505	278.6357	341.4785	349.5640	332.7992	285.8696	222.1996	137.6546	73.9438	48.7678	(83)
Total gains	608.3804	677.9987	729.5253	798.6604	835.7058	823.7716	789.2061	743.3476	693.4080	627.3291	592.9821	586.8473	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.0920	61.2199	61.3459	61.9445	62.0578	62.5907	62.5907	62.6904	62.3843	62.0578	61.8290	61.5917	
alpha	5.0728	5.0813	5.0897	5.1296	5.1372	5.1727	5.1727	5.1794	5.1590	5.1372	5.1219	5.1061	
util living area	0.9885	0.9790	0.9579	0.8926	0.7633	0.5732	0.4202	0.4638	0.7040	0.9188	0.9775	0.9903	(86)
MIT	19.9050	20.0800	20.3336	20.6615	20.8836	20.9787	20.9964	20.9942	20.9414	20.6539	20.2312	19.8758	(87)
Th 2	20.1067	20.1084	20.1101	20.1179	20.1194	20.1263	20.1263	20.1275	20.1236	20.1194	20.1164	20.1133	(88)
util rest of house	0.9855	0.9736	0.9470	0.8662	0.7128	0.5013	0.3382	0.3783	0.6326	0.8927	0.9708	0.9878	(89)
MIT 2	18.8380	19.0601	19.3779	19.7777	20.0210	20.1134	20.1249	20.1252	20.0832	19.7786	19.2591	18.8059	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.1391	19.3479	19.6476	20.0271	20.2644	20.3576	20.3709	20.3704	20.3254	20.0256	19.5334	19.1078	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1391	19.3479	19.6476	20.0271	20.2644	20.3576	20.3709	20.3704	20.3254	20.0256	19.5334	19.1078	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9812	0.9678	0.9401	0.8632	0.7216	0.5208	0.3613	0.4024	0.6499	0.8895	0.9651	0.9839	(94)
Useful gains	596.9506	656.1465	685.8487	689.3776	603.0790	429.0146	285.1742	299.1384	450.6478	558.0090	572.2933	577.4180	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1153.6230	1120.8598	1017.8906	853.1366	655.4525	436.8875	286.1350	300.7964	473.9480	721.3615	955.0754	1149.5584	(97)
Space heating kWh	414.1643	312.2873	247.0392	117.9065	38.9659	0.0000	0.0000	0.0000	0.0000	121.5343	275.6031	425.6725	(98a)
Space heating requirement - total per year (kWh/year)												1953.1730	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	414.1643	312.2873	247.0392	117.9065	38.9659	0.0000	0.0000	0.0000	0.0000	121.5343	275.6031	425.6725	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1953.1730	
Space heating per m2											(98c) / (4) =	24.4208	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	414.1643	312.2873	247.0392	117.9065	38.9659	0.0000	0.0000	0.0000	0.0000	121.5343	275.6031	425.6725	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	448.7154	338.3394	267.6481	127.7427	42.2166	0.0000	0.0000	0.0000	0.0000	131.6731	298.5949	461.1837	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.3781	85.0348	84.3768	83.0310	81.2409	79.8000	79.8000	79.8000	79.8000	83.0677	84.7448	85.4582	(217)
Fuel for water heating, kWh/month	267.4167	237.3749	254.2727	227.8515	226.1156	207.8751	205.6450	213.6686	215.8200	230.6400	239.6706	264.3653	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.3582	20.3433	18.3169	13.4197	10.3658	8.4689	9.4560	12.2913	15.9652	20.9471	23.6598	26.0630	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3424	-31.5676	-47.5704	-56.1485	-62.8691	-59.5233	-58.7993	-54.3654	-46.9365	-37.2699	-23.9846	-18.2835	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9342	-17.0411	-34.5369	-52.8648	-70.8844	-71.5905	-70.7461	-59.4418	-42.9727	-24.6882	-10.6939	-6.2480	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2116.1138	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2790.7159	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	204.6551	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4209.1818	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2116.1138	0.2100	444.3839	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2790.7159	0.2100	586.0503	(264)
Space and water heating			1030.4342	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	204.6551	0.1443	29.5381	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	0.1336	-69.2911	
PV Unit electricity exported	-469.6425	0.1253	-58.8667	
Total			-128.1578	(269)
Total CO2, kg/year			943.7437	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.8000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2116.1138	1.1300	2391.2086	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2790.7159	1.1300	3153.5090	(278)
Space and water heating			5544.7176	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	204.6551	1.5338	313.9068	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	1.4937	-774.7198	
PV Unit electricity exported	-469.6425	0.4601	-216.0686	
Total			-990.7884	(283)
Total Primary energy kWh/year			4997.9368	(286)
Target Primary Energy Rate (TPER)			62.4900	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.90	**TER**	11.80
Environmental	98 A	**% DER < TER**			83.90
CO_2 Emissions (t/year)	0.12	**DFEE**	24.18	**TFEE**	30.94
Compliance Check	See BREL	**% DFEE < TFEE**			21.83
% DPER < TPER	61.05	**DPER**	24.34	**TPER**	62.49

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 3.6723 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)
Hot water usage for mixer showers

65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	610.7421	608.5956	590.7266	557.3213	524.1652	494.1729	476.4438	479.4976	496.5901	527.0115	563.7339	595.7477	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	19.6403	0.6800	0.7000	0.7700	64.0095	(76)

Solar gains	64.0095	125.2162	206.2132	300.7496	368.5800	377.3072	359.2118	308.5577	239.8345	148.5795	79.8123	52.6383	(83)
Total gains	674.7516	733.8118	796.9398	858.0709	892.7452	871.4801	835.6556	788.0552	736.4246	675.5910	643.5462	648.3860	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9765	0.9604	0.9182	0.8197	0.6599	0.4799	0.3462	0.3835	0.6021	0.8589	0.9578	0.9809	(86)
MIT	20.2847	20.4233	20.6380	20.8484	20.9621	20.9948	20.9993	20.9988	20.9822	20.8302	20.5149	20.2369	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9711	0.9517	0.9013	0.7876	0.6129	0.4239	0.2862	0.3200	0.5407	0.8250	0.9469	0.9764	(89)
MIT 2	19.4128	19.5849	19.8457	20.0864	20.2024	20.2300	20.2329	20.2327	20.2214	20.0728	19.7013	19.3530	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.6588	19.8215	20.0693	20.3014	20.4168	20.4458	20.4492	20.4489	20.4361	20.2865	19.9309	19.6024	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6588	19.8215	20.0693	20.3014	20.4168	20.4458	20.4492	20.4489	20.4361	20.2865	19.9309	19.6024	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9661	0.9462	0.8972	0.7907	0.6244	0.4396	0.3031	0.3379	0.5573	0.8275	0.9419	0.9718	(94)
Useful gains	651.8976	694.3109	715.0211	678.4355	557.4294	383.0804	253.3003	266.2970	410.4249	559.0686	606.1333	630.1248	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1011.3973	982.5949	893.5518	750.7983	574.0090	384.9549	253.4732	266.6229	417.2377	637.8686	844.9268	1014.2654	(97)
Space heating kWh	267.4678	193.7268	132.8269	52.1012	12.3353	0.0000	0.0000	0.0000	0.0000	58.6272	171.9314	285.8006	(98a)
Space heating requirement - total per year (kWh/year)												1174.8171	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	267.4678	193.7268	132.8269	52.1012	12.3353	0.0000	0.0000	0.0000	0.0000	58.6272	171.9314	285.8006	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1174.8171	
Space heating per m2											(98c) / (4) =	14.6889	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	267.4678	193.7268	132.8269	52.1012	12.3353	0.0000	0.0000	0.0000	0.0000	58.6272	171.9314	285.8006	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	401.2017	290.5902	199.2403	78.1518	18.5029	0.0000	0.0000	0.0000	0.0000	87.9408	257.8970	428.7009	
Space heating requirement	401.2017	290.5902	199.2403	78.1518	18.5029	0.0000	0.0000	0.0000	0.0000	87.9408	257.8970	428.7009	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1762.2256	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												17.6223	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)
Total electricity for the above, kWh/year												21.9935	(331)
Electricity for lighting (calculated in Appendix L)												196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5059.2308	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1762.2256	4.4400	78.2428	(340a)
Space heating total			78.2428	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	196.1051	16.4900	32.3377	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	16.4900	-80.4802	
PV Unit electricity exported	-470.1661	5.5900	-26.2823	
Total			-106.7625	(352)
Total energy cost			278.6932	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8028 (357)
SAP value		86.9872
SAP rating (Section 12)		87 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1546.4941	0.1571	73.8061	(367)
Electrical energy for heat distribution (space & water)	17.6223	0.0000	8.4554	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			233.9338	(373)
Space and water heating			233.9338	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			143.8920	(383)
CO2 emissions per m2			1.8000	(384)
EI value			98.4572	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 79.9800						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate													
	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17097.8798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.6723	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 33.5192	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff													
	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m													
	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
327.4608 330.8588 322.2959 304.0665 281.0552 259.4278 244.9794 241.5813 250.1442 268.3736 291.3850 313.0124 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 (71)
Water heating gains (Table 5)
154.0336 151.5930 146.8914 136.5869 130.2751 123.6777 119.6256 122.9734 126.8986 134.2191 144.0972 152.7161 (72)
Total internal gains
610.7421 608.5956 590.7266 557.3213 524.1652 494.1729 476.4438 479.4976 496.5901 527.0115 563.7339 595.7477 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	23.7835	0.6800	0.7000	0.7700	77.5127	(76)

Solar gains 77.5127 134.7327 218.2918 321.2659 378.6764 415.6011 388.3328 340.4966 267.7476 168.5975 95.2070 64.1092 (83)
Total gains 688.2548 743.3283 809.0184 878.5872 902.8416 909.7739 864.7766 819.9942 764.3377 695.6090 658.9409 659.8569 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9722	0.9549	0.9027	0.7918	0.6235	0.4182	0.2968	0.3289	0.5592	0.8241	0.9477	0.9776	(86)
MIT	20.3333	20.4635	20.6890	20.8786	20.9730	20.9977	20.9997	20.9995	20.9883	20.8723	20.5708	20.2836	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9658	0.9450	0.8829	0.7567	0.5747	0.3637	0.2385	0.2676	0.4979	0.7846	0.9345	0.9723	(89)
MIT 2	19.4737	19.6345	19.9059	20.1184	20.2121	20.2319	20.2331	20.2330	20.2258	20.1173	19.7694	19.4118	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.7163	19.8684	20.1269	20.3329	20.4269	20.4480	20.4494	20.4493	20.4409	20.3303	19.9955	19.6578	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7163	19.8684	20.1269	20.3329	20.4269	20.4480	20.4494	20.4493	20.4409	20.3303	19.9955	19.6578	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9606	0.9395	0.8798	0.7615	0.5873	0.3790	0.2550	0.2849	0.5148	0.7900	0.9297	0.9674	(94)
Useful gains	661.1516	698.3616	711.7907	669.0781	530.2384	344.8103	220.5043	233.6117	393.4550	549.5130	612.6054	638.3648	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	995.4243	965.9336	864.4192	726.5318	541.7487	345.5865	220.5631	233.7257	397.8031	607.8286	822.8449	998.1572	(97)
Space heating kWh	248.6989	179.8084	113.5556	41.3667	8.5637	0.0000	0.0000	0.0000	0.0000	43.3868	151.3725	267.6856	(98a)
Space heating requirement - total per year (kWh/year)												1054.4381	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	248.6989	179.8084	113.5556	41.3667	8.5637	0.0000	0.0000	0.0000	0.0000	43.3868	151.3725	267.6856	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1054.4381	
Space heating per m2										(98c) / (4) =		13.1838	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement
248.6989 179.8084 113.5556 41.3667 8.5637 0.0000 0.0000 0.0000 0.0000 43.3868 151.3725 267.6856 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50
307a 373.0484 269.7126 170.3334 62.0500 12.8455 0.0000 0.0000 0.0000 0.0000 65.0801 227.0587 401.5284
Space heating requirement
373.0484 269.7126 170.3334 62.0500 12.8455 0.0000 0.0000 0.0000 0.0000 65.0801 227.0587 401.5284 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)

Water heating
Annual water heating requirement
266.9446 236.1786 250.9634 220.5542 213.7828 192.6005 189.9534 197.4446 199.5749 222.6078 236.8171 263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50
310a 400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948
Water heating fuel
400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948 (310)
Cooling System Energy Efficiency Ratio 0.0000 (314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (315)
Pumps and Fa 1.8679 1.6872 1.8679 1.8077 1.8679 1.8077 1.8679 1.8679 1.8077 1.8679 1.8077 1.8679 (331)
Lighting 24.2988 19.4934 17.5516 12.8591 9.9327 8.1151 9.0610 11.7778 15.2982 20.0720 22.6713 24.9741 (332)
Electricity generated by PVs (Appendix M) (negative quantity)
(333a)m -17.9780 -26.9243 -45.2366 -58.5173 -66.4974 -66.2241 -64.3099 -58.6197 -48.0109 -34.7929 -20.6435 -14.9664 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(334a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (334a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.0204	-13.0409	-32.0085	-59.0559	-82.7431	-94.8946	-90.1802	-72.6219	-46.3379	-22.2034	-8.3869	-4.5323	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1581.6572	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	15.8166	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4782.1363	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1581.6572	6.5500	103.5985	(340a)
Space heating total			103.5985	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	196.1051	28.4300	55.7527	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	28.4300	-148.6096	
PV Unit electricity exported	-532.0259	5.8100	-30.9107	
Total			-179.5203	(352)
Total energy cost			354.5155	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1498.3426	0.1575	66.4471	(367)
Electrical energy for heat distribution (space & water)	15.8166	0.0000	8.1795	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			226.2989	(373)
Space and water heating			226.2989	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	0.1322	-69.1017	
PV Unit electricity exported	-532.0259	0.1213	-64.5494	
Total			-133.6511	(380)
Total CO2, kg/year			124.0026	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1498.3426	1.5832	667.7562	(467)
Electrical energy for heat distribution (space & water)	15.8166	0.0000	86.4432	(472)
Overall CO2 factor for heat network			0.4256	(486)
Total CO2 associated with community systems			2391.5953	(473)
Space and water heating			2391.5953	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	1.4884	-778.0360	
PV Unit electricity exported	-532.0259	0.4451	-236.7863	
Total			-1014.8223	(480)
Total Primary energy kWh/year			1710.8374	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - East

Current energy efficiency rating:	B 87
Current environmental impact rating:	A 98

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 87
Potential environmental impact rating: A 98

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£62	£62	£0
Community scheme	£472	£472	£0
Space heating	£214	£214	£0
Water heating	£264	£264	£0
Lighting	£56	£56	£0
Generated (PV)	-£180	-£180	£0
Total cost of fuels	£354	£354	£0
Total cost of uses	£354	£354	£0
Delivered energy	60 kWh/m²	60 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	2 kg/m²	2 kg/m²	0 kg/m²
Primary energy	21 kWh/m²	21 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17097.8798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6723 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
									Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)

Water heating gains (Table 5)

154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)

Total internal gains

610.7421	608.5956	590.7266	557.3213	524.1652	494.1729	476.4438	479.4976	496.5901	527.0115	563.7339	595.7477	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	19.6403	0.6800	0.7000	0.7700	64.0095	(76)

Solar gains	64.0095	125.2162	206.2132	300.7496	368.5800	377.3072	359.2118	308.5577	239.8345	148.5795	79.8123	52.6383	(83)
Total gains	674.7516	733.8118	796.9398	858.0709	892.7452	871.4801	835.6556	788.0552	736.4246	675.5910	643.5462	648.3860	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9765	0.9604	0.9182	0.8197	0.6599	0.4799	0.3462	0.3835	0.6021	0.8589	0.9578	0.9809	(86)
MIT	20.2847	20.4233	20.6380	20.8484	20.9621	20.9948	20.9993	20.9988	20.9822	20.8302	20.5149	20.2369	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9711	0.9517	0.9013	0.7876	0.6129	0.4239	0.2862	0.3200	0.5407	0.8250	0.9469	0.9764	(89)
MIT 2	19.4128	19.5849	19.8457	20.0864	20.2024	20.2300	20.2329	20.2327	20.2214	20.0728	19.7013	19.3530	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.6588	19.8215	20.0693	20.3014	20.4168	20.4458	20.4492	20.4489	20.4361	20.2865	19.9309	19.6024	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6588	19.8215	20.0693	20.3014	20.4168	20.4458	20.4492	20.4489	20.4361	20.2865	19.9309	19.6024	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9661	0.9462	0.8972	0.7907	0.6244	0.4396	0.3031	0.3379	0.5573	0.8275	0.9419	0.9718	(94)
Useful gains	651.8976	694.3109	715.0211	678.4355	557.4294	383.0804	253.3003	266.2970	410.4249	559.0686	606.1333	630.1248	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1011.3973	982.5949	893.5518	750.7983	574.0090	384.9549	253.4732	266.6229	417.2377	637.8686	844.9268	1014.2654	(97)
Space heating kWh	267.4678	193.7268	132.8269	52.1012	12.3353	0.0000	0.0000	0.0000	0.0000	58.6272	171.9314	285.8006	(98a)
Space heating requirement - total per year (kWh/year)												1174.8171	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	267.4678	193.7268	132.8269	52.1012	12.3353	0.0000	0.0000	0.0000	0.0000	58.6272	171.9314	285.8006	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1174.8171	
Space heating per m2											(98c) / (4) =	14.6889	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	267.4678	193.7268	132.8269	52.1012	12.3353	0.0000	0.0000	0.0000	0.0000	58.6272	171.9314	285.8006	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	401.2017	290.5902	199.2403	78.1518	18.5029	0.0000	0.0000	0.0000	0.0000	87.9408	257.8970	428.7009	
Space heating requirement	401.2017	290.5902	199.2403	78.1518	18.5029	0.0000	0.0000	0.0000	0.0000	87.9408	257.8970	428.7009	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1762.2256	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												17.6223	(313)
Space cooling fuel												0.0000	(321)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)

mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5059.2308	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1762.2256	4.4400	78.2428	(340a)
Space heating total			78.2428	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	196.1051	16.4900	32.3377	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	16.4900	-80.4802	
PV Unit electricity exported	-470.1661	5.5900	-26.2823	
Total			-106.7625	(352)
Total energy cost			278.6932	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8028	(357)
SAP value		86.9872	
SAP rating (Section 12)		87	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1546.4941	0.1571	73.8061	(367)
Electrical energy for heat distribution (space & water)	17.6223	0.0000	8.4554	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			233.9338	(373)
Space and water heating			233.9338	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			143.8920	(383)
CO2 emissions per m2			1.8000	(384)
EI value			98.4572	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)

Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17097.8798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.6723 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)
Total storage loss	

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)

											Total per year (kWh/year) = Sum(64)m =	2691.4183	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000		(64a)
Heat gains from water heating, kWh/month													
114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207		(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains													
	610.7421	608.5956	590.7266	557.3213	524.1652	494.1729	476.4438	479.4976	496.5901	527.0115	563.7339	595.7477	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	9.8800	23.7835	0.6800	0.7000	0.7700	77.5127	(76)

Solar gains	77.5127	134.7327	218.2918	321.2659	378.6764	415.6011	388.3328	340.4966	267.7476	168.5975	95.2070	64.1092	(83)
Total gains	688.2548	743.3283	809.0184	878.5872	902.8416	909.7739	864.7766	819.9942	764.3377	695.6090	658.9409	659.8569	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area													
	0.9722	0.9549	0.9027	0.7918	0.6235	0.4182	0.2968	0.3289	0.5592	0.8241	0.9477	0.9776	(86)
MIT	20.3333	20.4635	20.6890	20.8786	20.9730	20.9977	20.9997	20.9995	20.9883	20.8723	20.5708	20.2836	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house													
	0.9658	0.9450	0.8829	0.7567	0.5747	0.3637	0.2385	0.2676	0.4979	0.7846	0.9345	0.9723	(89)
MIT 2	19.4737	19.6345	19.9059	20.1184	20.2121	20.2319	20.2331	20.2330	20.2258	20.1173	19.7694	19.4118	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.7163	19.8684	20.1269	20.3329	20.4269	20.4480	20.4494	20.4493	20.4409	20.3303	19.9955	19.6578	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7163	19.8684	20.1269	20.3329	20.4269	20.4480	20.4494	20.4493	20.4409	20.3303	19.9955	19.6578	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9606	0.9395	0.8798	0.7615	0.5873	0.3790	0.2550	0.2849	0.5148	0.7900	0.9297	0.9674	(94)
Useful gains	661.1516	698.3616	711.7907	669.0781	530.2384	344.8103	220.5043	233.6117	393.4550	549.5130	612.6054	638.3648	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	995.4243	965.9336	864.4192	726.5318	541.7487	345.5865	220.5631	233.7257	397.8031	607.8286	822.8449	998.1572	(97)
Space heating kWh													
	248.6989	179.8084	113.5556	41.3667	8.5637	0.0000	0.0000	0.0000	0.0000	43.3868	151.3725	267.6856	(98a)
Space heating requirement - total per year (kWh/year)												1054.4381	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	248.6989	179.8084	113.5556	41.3667	8.5637	0.0000	0.0000	0.0000	0.0000	43.3868	151.3725	267.6856	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1054.4381	
Space heating per m2											(98c) / (4) =	13.1838	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	248.6989	179.8084	113.5556	41.3667	8.5637	0.0000	0.0000	0.0000	0.0000	43.3868	151.3725	267.6856	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	373.0484	269.7126	170.3334	62.0500	12.8455	0.0000	0.0000	0.0000	0.0000	65.0801	227.0587	401.5284	
Space heating requirement													
	373.0484	269.7126	170.3334	62.0500	12.8455	0.0000	0.0000	0.0000	0.0000	65.0801	227.0587	401.5284	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.9780	-26.9243	-45.2366	-58.5173	-66.4974	-66.2241	-64.3099	-58.6197	-48.0109	-34.7929	-20.6435	-14.9664	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.0204	-13.0409	-32.0085	-59.0559	-82.7431	-94.8946	-90.1802	-72.6219	-46.3379	-22.2034	-8.3869	-4.5323	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1581.6572	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	15.8166	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4782.1363	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1581.6572	6.5500	103.5985	(340a)
Space heating total			103.5985	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	196.1051	28.4300	55.7527	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	28.4300	-148.6096	
PV Unit electricity exported	-532.0259	5.8100	-30.9107	
Total			-179.5203	(352)
Total energy cost			354.5155	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1498.3426	0.1575	66.4471	(367)
Electrical energy for heat distribution (space & water)	15.8166	0.0000	8.1795	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			226.2989	(373)
Space and water heating			226.2989	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	0.1322	-69.1017	
PV Unit electricity exported	-532.0259	0.1213	-64.5494	
Total			-133.6511	(380)
Total CO2, kg/year			124.0026	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1498.3426	1.5832	667.7562	(467)
Electrical energy for heat distribution (space & water)	15.8166	0.0000	86.4432	(472)
Overall CO2 factor for heat network			0.4256	(486)
Total CO2 associated with community systems			2391.5953	(473)
Space and water heating			2391.5953	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)

Energy saving/generation technologies				
PV Unit electricity used in dwelling		-522.7211	1.4884	-778.0360
PV Unit electricity exported		-532.0259	0.4451	-236.7863
Total				-1014.8223 (480)
Total Primary energy kWh/year				1710.8374 (483)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	86 B	**DER**	2.04	**TER**	12.36
Environmental	98 A	**% DER < TER**			83.50
CO_2 Emissions (t/year)	0.13	**DFEE**	26.31	**TFEE**	33.30
Compliance Check	See BREL	**% DFEE < TFEE**			20.99
% DPER < TPER	60.58	**DPER**	25.83	**TPER**	65.51

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				4	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6723	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	33.5192	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.6786	139.1442	125.6786	129.8679	125.6786	129.8679	125.6786	125.6786	129.8679	125.6786	129.8679	125.6786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	559.0481	572.3498	548.4455	530.1166	504.1979	487.2994	469.3775	470.4487	484.3003	499.6452	529.1302	548.0502	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.8800	10.6334	0.6800	0.7000	0.7700	34.6552	(74)

Solar gains	34.6552	66.2279	112.5375	180.7640	243.5057	260.6801	243.3782	193.0895	135.3065	78.8357	42.7517	28.8903	(83)
Total gains	593.7034	638.5777	660.9830	710.8806	747.7036	747.9795	712.7557	663.5382	619.6068	578.4810	571.8819	576.9405	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9870	0.9784	0.9604	0.8971	0.7565	0.5545	0.4052	0.4539	0.6966	0.9147	0.9745	0.9890	(86)
MIT	20.1663	20.2934	20.4807	20.7419	20.9241	20.9891	20.9985	20.9972	20.9631	20.7473	20.4191	20.1307	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9838	0.9731	0.9506	0.8730	0.7101	0.4916	0.3353	0.3795	0.6318	0.8894	0.9674	0.9862	(89)
MIT 2	19.2646	19.4246	19.6584	19.9714	20.1686	20.2265	20.2326	20.2320	20.2074	19.9836	19.5843	19.2195	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.5191	19.6698	19.8904	20.1889	20.3818	20.4417	20.4487	20.4479	20.4206	20.1991	19.8199	19.4766	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5191	19.6698	19.8904	20.1889	20.3818	20.4417	20.4487	20.4479	20.4206	20.1991	19.8199	19.4766	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9800	0.9684	0.9454	0.8715	0.7195	0.5090	0.3550	0.4005	0.6483	0.8881	0.9626	0.9827	(94)
Useful gains	581.8023	618.3824	624.8760	619.5250	537.9668	380.7108	253.0388	265.7587	401.7044	513.7667	550.5202	566.9735	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1002.1925	972.6087	881.7762	743.3842	571.7054	384.6813	253.4417	266.5587	416.2204	632.1125	837.6183	1005.9823	(97)
Space heating kWh	312.7703	238.0401	191.1338	89.1786	25.1015	0.0000	0.0000	0.0000	0.0000	88.0492	206.7106	326.6225	(98a)
Space heating requirement - total per year (kWh/year)												1477.6066	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	312.7703	238.0401	191.1338	89.1786	25.1015	0.0000	0.0000	0.0000	0.0000	88.0492	206.7106	326.6225	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1477.6066	
Space heating per m2										(98c) / (4) =		18.4747	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	312.7703	238.0401	191.1338	89.1786	25.1015	0.0000	0.0000	0.0000	0.0000	88.0492	206.7106	326.6225	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	469.1554	357.0601	286.7007	133.7679	37.6522	0.0000	0.0000	0.0000	0.0000	132.0738	310.0659	489.9338	
Space heating requirement													
	469.1554	357.0601	286.7007	133.7679	37.6522	0.0000	0.0000	0.0000	0.0000	132.0738	310.0659	489.9338	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2216.4099	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	22.1641	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5513.4150	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1667.6099	0.1562	92.3219	(367)
Electrical energy for heat distribution (space & water)	22.1641	0.0000	9.1498	(372)
Overall CO2 factor for heat network			0.0405	(386)
Total CO2 associated with community systems			253.1440	(373)
Space and water heating			253.1440	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			163.1022	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.0400	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1667.6099	1.5783	932.8426	(467)
Electrical energy for heat distribution (space & water)	22.1641	0.0000	96.3839	(472)
Overall CO2 factor for heat network			0.4264	(486)
Total CO2 associated with community systems			2666.6223	(473)
Space and water heating			2666.6223	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	1.4873	-725.8942	
PV Unit electricity exported	-470.1661	0.4450	-209.2081	
Total			-935.1023	(480)
Total Primary energy kWh/year			2065.5845	(483)
Dwelling Primary energy Rate (DPER)			25.8300	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Semi-glazed door			3.5800	1.0000	3.5800			(26a)
TER Opening Type			9.8800	1.1450	11.3130			(27)
Heatloss Floor			39.9900	0.1300	5.1987			(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.1800	7.0326			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.5045			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			213.7769 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.4500	0.0500	0.4225
E3 Sill	6.7500	0.0500	0.3375
E4 Jamb	22.0000	0.0500	1.1000
E6 Intermediate floor within a dwelling	19.5200	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	6.0900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E5 Ground floor (normal)	19.5200	0.1600	3.1232
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
P1 Party wall - Ground floor	6.0900	0.0800	0.4872
E7 Party floor between dwellings (in blocks of flats)	14.1200	0.0700	0.9884
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.7208 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	41.2253 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	77.7420	77.5795	77.4202	76.6720	76.5321	75.8805	75.8805	75.7598	76.1315	76.5321	76.8152	77.1113	(39)
Average = Sum(39)m / 12 =												76.6714	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9700	0.9680	0.9586	0.9569	0.9487	0.9487	0.9472	0.9519	0.9569	0.9604	0.9641	(40)
HLP (average)												0.9586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers													
	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths													
	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses													
	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m													
	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
										Total per year (kWh/year) = Sum(64)m =		2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	122.0433	135.1194	122.0433	126.1114	122.0433	126.1114	122.0433	122.0433	126.1114	122.0433	126.1114	122.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													
	549.0775	561.9896	538.4748	520.0247	494.2273	474.2076	456.4069	457.4780	471.2084	489.6746	519.0383	538.0795	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.8800	10.6334	0.6300	0.7000	0.7700	32.1071	(74)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	32.1071	61.3582	104.2626	167.4726	225.6009	241.5124	225.4827	178.8918	125.3575	73.0390	39.6082	26.7660	(83)
Total gains	581.1845	623.3478	642.7375	687.4973	719.8281	715.7200	681.8896	636.3698	596.5659	562.7135	558.6465	564.8455	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.0920	61.2199	61.3459	61.9445	62.0578	62.5907	62.5907	62.6904	62.3843	62.0578	61.8290	61.5917	
alpha	5.0728	5.0813	5.0897	5.1296	5.1372	5.1727	5.1727	5.1794	5.1590	5.1372	5.1219	5.1061	
util living area	0.9906	0.9851	0.9741	0.9338	0.8323	0.6462	0.4833	0.5364	0.7801	0.9440	0.9824	0.9918	(86)
MIT	19.8647	20.0019	20.2192	20.5497	20.8225	20.9635	20.9932	20.9887	20.9054	20.5827	20.1826	19.8428	(87)
Th 2	20.1067	20.1084	20.1101	20.1179	20.1194	20.1263	20.1263	20.1275	20.1236	20.1194	20.1164	20.1133	(88)
util rest of house	0.9881	0.9812	0.9669	0.9148	0.7874	0.5700	0.3905	0.4401	0.7117	0.9240	0.9770	0.9896	(89)
MIT 2	18.7870	18.9623	19.2378	19.6505	19.9626	20.1033	20.1237	20.1228	20.0547	19.6975	19.1987	18.7641	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.0911	19.2556	19.5148	19.9043	20.2052	20.3460	20.3690	20.3671	20.2948	19.9473	19.4763	19.0685	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0911	19.2556	19.5148	19.9043	20.2052	20.3460	20.3690	20.3671	20.2948	19.9473	19.4763	19.0685	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9842	0.9762	0.9607	0.9094	0.7922	0.5900	0.4167	0.4671	0.7262	0.9193	0.9718	0.9862	(94)
Useful gains	572.0179	608.5327	617.4955	625.2142	570.2704	422.2413	284.1331	297.2598	433.2000	517.3173	542.9120	557.0269	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1149.8875	1113.7035	1007.6075	843.7208	650.9234	436.0111	285.9965	300.5494	471.6169	715.3703	950.6919	1146.5278	(97)
Space heating kWh	429.9350	339.4748	290.2433	157.3248	60.0058	0.0000	0.0000	0.0000	0.0000	147.3514	293.6016	438.5887	(98a)
Space heating requirement - total per year (kWh/year)												2156.5251	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	429.9350	339.4748	290.2433	157.3248	60.0058	0.0000	0.0000	0.0000	0.0000	147.3514	293.6016	438.5887	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2156.5251	
Space heating per m2											(98c) / (4) =	26.9633	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	429.9350	339.4748	290.2433	157.3248	60.0058	0.0000	0.0000	0.0000	0.0000	147.3514	293.6016	438.5887	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	465.8017	367.7950	314.4564	170.4494	65.0117	0.0000	0.0000	0.0000	0.0000	159.6439	318.0949	475.1773	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4570	85.2163	84.7381	83.6492	81.8424	79.8000	79.8000	79.8000	79.8000	83.4782	84.8853	85.5208	(217)
Fuel for water heating, kWh/month	267.1698	236.8694	253.1887	226.1675	224.4538	207.8751	205.6450	213.6686	215.8200	229.5060	239.2740	264.1719	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.3582	20.3433	18.3169	13.4197	10.3658	8.4689	9.4560	12.2913	15.9652	20.9471	23.6598	26.0630	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3424	-31.5676	-47.5704	-56.1485	-62.8691	-59.5233	-58.7993	-54.3654	-46.9365	-37.2699	-23.9846	-18.2835	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9342	-17.0411	-34.5369	-52.8648	-70.8844	-71.5905	-70.7461	-59.4418	-42.9727	-24.6882	-10.6939	-6.2480	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2336.4303	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2783.8099	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	204.6551	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4422.5922	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2336.4303	0.2100	490.6504	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2783.8099	0.2100	584.6001	(264)
Space and water heating			1075.2504	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	204.6551	0.1443	29.5381	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	0.1336	-69.2911	
PV Unit electricity exported	-469.6425	0.1253	-58.8667	
Total			-128.1578	(269)
Total CO2, kg/year			988.5599	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.3600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2336.4303	1.1300	2640.1662	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2783.8099	1.1300	3145.7051	(278)
Space and water heating			5785.8714	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	204.6551	1.5338	313.9068	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	1.4937	-774.7198	
PV Unit electricity exported	-469.6425	0.4601	-216.0686	
Total			-990.7884	(283)
Total Primary energy kWh/year			5239.0905	(286)
Target Primary Energy Rate (TPER)			65.5100	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	86 B	**DER**	2.04	**TER**	12.36
Environmental	98 A	**% DER < TER**			83.50
CO_2 Emissions (t/year)	0.13	**DFEE**	26.31	**TFEE**	33.30
Compliance Check	See BREL	**% DFEE < TFEE**			20.99
% DPER < TPER	60.58	**DPER**	25.83	**TPER**	65.51

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.3031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2122 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2705	0.2652	0.2599	0.2334	0.2281	0.2016	0.2016	0.1963	0.2122	0.2281	0.2387	0.2493	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5366	0.5352	0.5338	0.5272	0.5260	0.5203	0.5203	0.5193	0.5225	0.5260	0.5285	0.5311	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							3.6723	(36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.6979	34.6061	34.5160	34.0930	34.0139	33.6455	33.6455	33.5772	33.7874	34.0139	34.1740	34.3414	(38)
Heat transfer coeff	68.2172	68.1253	68.0352	67.6122	67.5331	67.1647	67.1647	67.0965	67.3066	67.5331	67.6932	67.8606	(39)
Average = Sum(39)m / 12 =												67.6118	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8529	0.8518	0.8507	0.8454	0.8444	0.8398	0.8398	0.8389	0.8415	0.8444	0.8464	0.8485	(40)
HLP (average)												0.8454	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.6786	139.1442	125.6786	129.8679	125.6786	129.8679	125.6786	125.6786	129.8679	125.6786	129.8679	125.6786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains	453.4664	467.9883	446.9019	435.3676	413.4459	400.7688	385.7326	384.8800	396.4077	407.0433	430.0429	443.3929	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.8800	10.6334	0.6800	0.7000	0.7700	34.6552	(74)

Solar gains	34.6552	66.2279	112.5375	180.7640	243.5057	260.6801	243.3782	193.0895	135.3065	78.8357	42.7517	28.8903	(83)
Total gains	488.1216	534.2163	559.4393	616.1316	656.9516	661.4489	629.1108	577.9695	531.7142	485.8791	472.7946	472.2832	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.6219	69.7158	69.8081	70.2449	70.3272	70.7129	70.7129	70.7848	70.5638	70.3272	70.1608	69.9878	
alpha	5.6415	5.6477	5.6539	5.6830	5.6885	5.7142	5.7142	5.7190	5.7043	5.6885	5.6774	5.6659	
util living area	0.9952	0.9911	0.9821	0.9420	0.8307	0.6293	0.4664	0.5270	0.7878	0.9586	0.9899	0.9960	(86)
MIT	19.9465	20.0851	20.2950	20.6161	20.8670	20.9781	20.9966	20.9935	20.9264	20.6179	20.2365	19.9193	(87)

Th 2	20.2077	20.2087	20.2096	20.2142	20.2150	20.2190	20.2190	20.2197	20.2175	20.2150	20.2133	20.2115	(88)
util rest of house	0.9939	0.9887	0.9770	0.9256	0.7885	0.5604	0.3853	0.4411	0.7248	0.9435	0.9867	0.9949	(89)
MIT 2	19.2403	19.3786	19.5868	19.8998	20.1230	20.2081	20.2179	20.2175	20.1749	19.9067	19.5333	19.2164	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.4396	19.5780	19.7866	20.1019	20.3329	20.4254	20.4377	20.4365	20.3870	20.1074	19.7318	19.4147	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4396	19.5780	19.7866	20.1019	20.3329	20.4254	20.4377	20.4365	20.3870	20.1074	19.7318	19.4147	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9923	0.9863	0.9736	0.9229	0.7954	0.5791	0.4082	0.4653	0.7395	0.9410	0.9842	0.9935	(94)
Useful gains	484.3418	526.8878	544.6896	568.6151	522.5265	383.0651	256.8253	268.9370	393.1897	457.2274	465.3396	469.2180	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1032.7807	999.9425	903.9571	757.3875	583.0084	391.2612	257.7564	270.8341	423.1534	642.0628	855.0844	1032.4813	(97)
Space heating kWh	408.0385	317.8928	267.2950	135.9161	44.9986	0.0000	0.0000	0.0000	0.0000	137.5175	280.6162	419.0679	(98a)
Space heating requirement - total per year (kWh/year)												2011.3427	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	408.0385	317.8928	267.2950	135.9161	44.9986	0.0000	0.0000	0.0000	0.0000	137.5175	280.6162	419.0679	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2011.3427	
Space heating per m2											(98c) / (4) =	25.1481	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	631.3480	497.0186	509.9330	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8979	0.9485	0.9213	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	566.9129	471.4427	469.8077	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	713.7493	678.7970	621.6067	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	105.7222	154.2716	112.9385	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	26.4305	38.5679	28.2346	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												93.2331	(107)
Energy for space heating												25.1481	(99)
Energy for space cooling												1.1657	(108)
Total												26.3138	(109)
Fabric Energy Efficiency (DFEE)												26.3	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		3 * 10 =	30.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1531 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.4031 (18)
Number of sides sheltered			4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Semi-glazed door			3.5800	1.0000	3.5800			(26a)
TER Opening Type			9.8800	1.1450	11.3130			(27)
Heatloss Floor			39.9900	0.1300	5.1987			(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.1800	7.0326			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.5045			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 213.7769 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.4500	0.0500	0.4225
E3 Sill	6.7500	0.0500	0.3375
E4 Jamb	22.0000	0.0500	1.1000
E6 Intermediate floor within a dwelling	19.5200	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	6.0900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E5 Ground floor (normal)	19.5200	0.1600	3.1232
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
P1 Party wall - Ground floor	6.0900	0.0800	0.4872
E7 Party floor between dwellings (in blocks of flats)	14.1200	0.0700	0.9884

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.7208 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.2253 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	77.7420	77.5795	77.4202	76.6720	76.5321	75.8805	75.8805	75.7598	76.1315	76.5321	76.8152	77.1113	(39)

Average = Sum(39)m / 12 = 76.6714

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9700	0.9680	0.9586	0.9569	0.9487	0.9487	0.9472	0.9519	0.9569	0.9604	0.9641	(40)
HLP (average)												0.9586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	122.0433	135.1194	122.0433	126.1114	122.0433	126.1114	122.0433	122.0433	126.1114	122.0433	126.1114	122.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains													
	449.8311	463.9635	443.2666	431.6111	409.8106	397.0124	382.0973	381.2447	392.6512	403.4080	426.2864	439.7576	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.8800	10.6334	0.6300	0.7000	0.7700	32.1071	(74)

Solar gains	32.1071	61.3582	104.2626	167.4726	225.6009	241.5124	225.4827	178.8918	125.3575	73.0390	39.6082	26.7660	(83)
Total gains	481.9381	525.3218	547.5292	599.0837	635.4115	638.5248	607.5800	560.1365	518.0087	476.4470	465.8946	466.5236	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.0920	61.2199	61.3459	61.9445	62.0578	62.5907	62.5907	62.6904	62.3843	62.0578	61.8290	61.5917	
alpha	5.0728	5.0813	5.0897	5.1296	5.1372	5.1727	5.1727	5.1794	5.1590	5.1372	5.1219	5.1061	
util living area													
	0.9959	0.9929	0.9866	0.9597	0.8806	0.7063	0.5380	0.6009	0.8434	0.9700	0.9919	0.9965	(86)
MIT	19.7142	19.8565	20.0841	20.4441	20.7601	20.9453	20.9890	20.9812	20.8605	20.4738	20.0461	19.6928	(87)
Th 2	20.1067	20.1084	20.1101	20.1179	20.1194	20.1263	20.1263	20.1275	20.1236	20.1194	20.1164	20.1133	(88)
util rest of house													
	0.9947	0.9908	0.9825	0.9467	0.8429	0.6291	0.4368	0.4969	0.7827	0.9578	0.9892	0.9955	(89)
MIT 2	18.9292	19.0720	19.2991	19.6564	19.9479	20.0984	20.1228	20.1211	20.0397	19.6904	19.2675	18.9130	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.1507	19.2934	19.5206	19.8786	20.1771	20.3374	20.3673	20.3638	20.2714	19.9115	19.4872	19.1331	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1507	19.2934	19.5206	19.8786	20.1771	20.3374	20.3673	20.3638	20.2714	19.9115	19.4872	19.1331	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9930	0.9884	0.9790	0.9425	0.8456	0.6488	0.4654	0.5260	0.7942	0.9542	0.9867	0.9941	(94)
Useful gains	478.5821	519.2303	536.0558	564.6206	537.3297	414.2680	282.7690	294.6598	411.3906	454.6437	459.6828	463.7603	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1154.5232	1116.6313	1008.0574	841.7552	648.7706	435.3548	285.8621	300.2962	469.8347	712.6256	951.5254	1151.5086	(97)
Space heating kWh													
	502.9002	401.4535	351.1692	199.5369	82.9121	0.0000	0.0000	0.0000	0.0000	191.9385	354.1266	511.6848	(98a)
Space heating requirement - total per year (kWh/year)												2595.7218	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	502.9002	401.4535	351.1692	199.5369	82.9121	0.0000	0.0000	0.0000	0.0000	191.9385	354.1266	511.6848	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2595.7218	
Space heating per m2										(98c) / (4) =		32.4546	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	713.2763	561.5154	575.7744	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8244	0.8963	0.8579	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	588.0480	503.3088	493.9598	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	691.0275	657.5365	604.5652	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	74.1452	114.7454	82.2904	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	18.5363	28.6864	20.5726	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												67.7952	(107)
Energy for space heating												32.4546	(99)
Energy for space cooling												0.8477	(108)
Total												33.3023	(109)
Fabric Energy Efficiency (TFEE)												33.3	(109)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	86 B	**DER**	2.04	**TER**	12.36
Environmental	98 A	**% DER < TER**			83.50
CO_2 Emissions (t/year)	0.13	**DFEE**	26.31	**TFEE**	33.30
Compliance Check	See BREL	**% DFEE < TFEE**			20.99
% DPER < TPER	60.58	**DPER**	25.83	**TPER**	65.51

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				4	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6723	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	33.5192	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.6786	139.1442	125.6786	129.8679	125.6786	129.8679	125.6786	125.6786	129.8679	125.6786	129.8679	125.6786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	559.0481	572.3498	548.4455	530.1166	504.1979	487.2994	469.3775	470.4487	484.3003	499.6452	529.1302	548.0502	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.8800	10.6334	0.6800	0.7000	0.7700	34.6552	(74)

Solar gains	34.6552	66.2279	112.5375	180.7640	243.5057	260.6801	243.3782	193.0895	135.3065	78.8357	42.7517	28.8903	(83)
Total gains	593.7034	638.5777	660.9830	710.8806	747.7036	747.9795	712.7557	663.5382	619.6068	578.4810	571.8819	576.9405	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9870	0.9784	0.9604	0.8971	0.7565	0.5545	0.4052	0.4539	0.6966	0.9147	0.9745	0.9890	(86)
MIT	20.1663	20.2934	20.4807	20.7419	20.9241	20.9891	20.9985	20.9972	20.9631	20.7473	20.4191	20.1307	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9838	0.9731	0.9506	0.8730	0.7101	0.4916	0.3353	0.3795	0.6318	0.8894	0.9674	0.9862	(89)
MIT 2	19.2646	19.4246	19.6584	19.9714	20.1686	20.2265	20.2326	20.2320	20.2074	19.9836	19.5843	19.2195	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.5191	19.6698	19.8904	20.1889	20.3818	20.4417	20.4487	20.4479	20.4206	20.1991	19.8199	19.4766	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5191	19.6698	19.8904	20.1889	20.3818	20.4417	20.4487	20.4479	20.4206	20.1991	19.8199	19.4766	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9800	0.9684	0.9454	0.8715	0.7195	0.5090	0.3550	0.4005	0.6483	0.8881	0.9626	0.9827	(94)
Useful gains	581.8023	618.3824	624.8760	619.5250	537.9668	380.7108	253.0388	265.7587	401.7044	513.7667	550.5202	566.9735	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1002.1925	972.6087	881.7762	743.3842	571.7054	384.6813	253.4417	266.5587	416.2204	632.1125	837.6183	1005.9823	(97)
Space heating kWh	312.7703	238.0401	191.1338	89.1786	25.1015	0.0000	0.0000	0.0000	0.0000	88.0492	206.7106	326.6225	(98a)
Space heating requirement - total per year (kWh/year)												1477.6066	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	312.7703	238.0401	191.1338	89.1786	25.1015	0.0000	0.0000	0.0000	0.0000	88.0492	206.7106	326.6225	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1477.6066	
Space heating per m2										(98c) / (4) =		18.4747	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	312.7703	238.0401	191.1338	89.1786	25.1015	0.0000	0.0000	0.0000	0.0000	88.0492	206.7106	326.6225	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	469.1554	357.0601	286.7007	133.7679	37.6522	0.0000	0.0000	0.0000	0.0000	132.0738	310.0659	489.9338	
Space heating requirement													
	469.1554	357.0601	286.7007	133.7679	37.6522	0.0000	0.0000	0.0000	0.0000	132.0738	310.0659	489.9338	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2216.4099	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	22.1641	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5513.4150	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1667.6099	0.1562	92.3219	(367)
Electrical energy for heat distribution (space & water)	22.1641	0.0000	9.1498	(372)
Overall CO2 factor for heat network			0.0405	(386)
Total CO2 associated with community systems			253.1440	(373)
Space and water heating			253.1440	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			163.1022	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.0400	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1667.6099	1.5783	932.8426	(467)
Electrical energy for heat distribution (space & water)	22.1641	0.0000	96.3839	(472)
Overall CO2 factor for heat network			0.4264	(486)
Total CO2 associated with community systems			2666.6223	(473)
Space and water heating			2666.6223	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	1.4873	-725.8942	
PV Unit electricity exported	-470.1661	0.4450	-209.2081	
Total			-935.1023	(480)
Total Primary energy kWh/year			2065.5845	(483)
Dwelling Primary energy Rate (DPER)			25.8300	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Semi-glazed door			3.5800	1.0000	3.5800			(26a)
TER Opening Type			9.8800	1.1450	11.3130			(27)
Heatloss Floor			39.9900	0.1300	5.1987			(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.1800	7.0326			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.5045			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			213.7769 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.4500	0.0500	0.4225
E3 Sill	6.7500	0.0500	0.3375
E4 Jamb	22.0000	0.0500	1.1000
E6 Intermediate floor within a dwelling	19.5200	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	6.0900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E5 Ground floor (normal)	19.5200	0.1600	3.1232
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
P1 Party wall - Ground floor	6.0900	0.0800	0.4872
E7 Party floor between dwellings (in blocks of flats)	14.1200	0.0700	0.9884
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.7208 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	41.2253 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	77.7420	77.5795	77.4202	76.6720	76.5321	75.8805	75.8805	75.7598	76.1315	76.5321	76.8152	77.1113	(39)
Average = Sum(39)m / 12 =												76.6714	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9700	0.9680	0.9586	0.9569	0.9487	0.9487	0.9472	0.9519	0.9569	0.9604	0.9641	(40)
HLP (average)												0.9586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers													
	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths													
	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses													
	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m													
	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
										Total per year (kWh/year) = Sum(64)m =		2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	122.0433	135.1194	122.0433	126.1114	122.0433	126.1114	122.0433	122.0433	126.1114	122.0433	126.1114	122.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													
	549.0775	561.9896	538.4748	520.0247	494.2273	474.2076	456.4069	457.4780	471.2084	489.6746	519.0383	538.0795	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.8800	10.6334	0.6300	0.7000	0.7700	32.1071	(74)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	32.1071	61.3582	104.2626	167.4726	225.6009	241.5124	225.4827	178.8918	125.3575	73.0390	39.6082	26.7660	(83)
Total gains	581.1845	623.3478	642.7375	687.4973	719.8281	715.7200	681.8896	636.3698	596.5659	562.7135	558.6465	564.8455	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.0920	61.2199	61.3459	61.9445	62.0578	62.5907	62.5907	62.6904	62.3843	62.0578	61.8290	61.5917	
alpha	5.0728	5.0813	5.0897	5.1296	5.1372	5.1727	5.1727	5.1794	5.1590	5.1372	5.1219	5.1061	
util living area	0.9906	0.9851	0.9741	0.9338	0.8323	0.6462	0.4833	0.5364	0.7801	0.9440	0.9824	0.9918	(86)
MIT	19.8647	20.0019	20.2192	20.5497	20.8225	20.9635	20.9932	20.9887	20.9054	20.5827	20.1826	19.8428	(87)
Th 2	20.1067	20.1084	20.1101	20.1179	20.1194	20.1263	20.1263	20.1275	20.1236	20.1194	20.1164	20.1133	(88)
util rest of house	0.9881	0.9812	0.9669	0.9148	0.7874	0.5700	0.3905	0.4401	0.7117	0.9240	0.9770	0.9896	(89)
MIT 2	18.7870	18.9623	19.2378	19.6505	19.9626	20.1033	20.1237	20.1228	20.0547	19.6975	19.1987	18.7641	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.0911	19.2556	19.5148	19.9043	20.2052	20.3460	20.3690	20.3671	20.2948	19.9473	19.4763	19.0685	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0911	19.2556	19.5148	19.9043	20.2052	20.3460	20.3690	20.3671	20.2948	19.9473	19.4763	19.0685	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9842	0.9762	0.9607	0.9094	0.7922	0.5900	0.4167	0.4671	0.7262	0.9193	0.9718	0.9862	(94)
Useful gains	572.0179	608.5327	617.4955	625.2142	570.2704	422.2413	284.1331	297.2598	433.2000	517.3173	542.9120	557.0269	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1149.8875	1113.7035	1007.6075	843.7208	650.9234	436.0111	285.9965	300.5494	471.6169	715.3703	950.6919	1146.5278	(97)
Space heating kWh	429.9350	339.4748	290.2433	157.3248	60.0058	0.0000	0.0000	0.0000	0.0000	147.3514	293.6016	438.5887	(98a)
Space heating requirement - total per year (kWh/year)												2156.5251	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	429.9350	339.4748	290.2433	157.3248	60.0058	0.0000	0.0000	0.0000	0.0000	147.3514	293.6016	438.5887	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2156.5251	
Space heating per m2											(98c) / (4) =	26.9633	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	429.9350	339.4748	290.2433	157.3248	60.0058	0.0000	0.0000	0.0000	0.0000	147.3514	293.6016	438.5887	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	465.8017	367.7950	314.4564	170.4494	65.0117	0.0000	0.0000	0.0000	0.0000	159.6439	318.0949	475.1773	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4570	85.2163	84.7381	83.6492	81.8424	79.8000	79.8000	79.8000	79.8000	83.4782	84.8853	85.5208	(217)
Fuel for water heating, kWh/month	267.1698	236.8694	253.1887	226.1675	224.4538	207.8751	205.6450	213.6686	215.8200	229.5060	239.2740	264.1719	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.3582	20.3433	18.3169	13.4197	10.3658	8.4689	9.4560	12.2913	15.9652	20.9471	23.6598	26.0630	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3424	-31.5676	-47.5704	-56.1485	-62.8691	-59.5233	-58.7993	-54.3654	-46.9365	-37.2699	-23.9846	-18.2835	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9342	-17.0411	-34.5369	-52.8648	-70.8844	-71.5905	-70.7461	-59.4418	-42.9727	-24.6882	-10.6939	-6.2480	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2336.4303	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2783.8099	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	204.6551	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4422.5922	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2336.4303	0.2100	490.6504	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2783.8099	0.2100	584.6001	(264)
Space and water heating			1075.2504	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	204.6551	0.1443	29.5381	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	0.1336	-69.2911	
PV Unit electricity exported	-469.6425	0.1253	-58.8667	
Total			-128.1578	(269)
Total CO2, kg/year			988.5599	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.3600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2336.4303	1.1300	2640.1662	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2783.8099	1.1300	3145.7051	(278)
Space and water heating			5785.8714	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	204.6551	1.5338	313.9068	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	1.4937	-774.7198	
PV Unit electricity exported	-469.6425	0.4601	-216.0686	
Total			-990.7884	(283)
Total Primary energy kWh/year			5239.0905	(286)
Target Primary Energy Rate (TPER)			65.5100	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	86 B	**DER**	2.04	**TER**	12.36
Environmental	98 A	**% DER < TER**			83.50
CO_2 Emissions (t/year)	0.13	**DFEE**	26.31	**TFEE**	33.30
Compliance Check	See BREL	**% DFEE < TFEE**			20.99
% DPER < TPER	60.58	**DPER**	25.83	**TPER**	65.51

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6723	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	33.5192	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	610.7421	608.5956	590.7266	557.3213	524.1652	494.1729	476.4438	479.4976	496.5901	527.0115	563.7339	595.7477	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.8800	10.6334	0.6800	0.7000	0.7700	34.6552	(74)

Solar gains	34.6552	66.2279	112.5375	180.7640	243.5057	260.6801	243.3782	193.0895	135.3065	78.8357	42.7517	28.8903	(83)
Total gains	645.3973	674.8236	703.2641	738.0853	767.6709	754.8529	719.8220	672.5871	631.8966	605.8472	606.4856	624.6380	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)		

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area													
	0.9808	0.9724	0.9490	0.8837	0.7425	0.5498	0.4013	0.4480	0.6858	0.9000	0.9671	0.9839	(86)
MIT	20.2427	20.3444	20.5336	20.7654	20.9311	20.9896	20.9986	20.9974	20.9659	20.7735	20.4665	20.2021	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house													
	0.9762	0.9659	0.9370	0.8578	0.6956	0.4874	0.3320	0.3745	0.6212	0.8720	0.9582	0.9801	(89)
MIT 2	19.3604	19.4879	19.7222	19.9975	20.1750	20.2268	20.2326	20.2320	20.2095	20.0123	19.6425	19.3094	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.6094	19.7296	19.9512	20.2142	20.3884	20.4420	20.4487	20.4480	20.4229	20.2271	19.8750	19.5614	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6094	19.7296	19.9512	20.2142	20.3884	20.4420	20.4487	20.4480	20.4229	20.2271	19.8750	19.5614	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9717	0.9607	0.9319	0.8571	0.7055	0.5046	0.3516	0.3952	0.6378	0.8717	0.9532	0.9758	(94)
Useful gains	627.1055	648.3112	655.3716	632.6103	541.5865	380.9034	253.0620	265.8198	402.9993	528.1430	578.1272	609.5425	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1008.1381	976.5448	885.7771	745.0528	572.1383	384.7036	253.4445	266.5660	416.3724	633.9553	841.2478	1011.5623	(97)
Space heating kWh													
	283.4882	220.5730	171.4217	80.9586	22.7305	0.0000	0.0000	0.0000	0.0000	78.7243	189.4469	299.1027	(98a)
Space heating requirement - total per year (kWh/year)												1346.4459	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	283.4882	220.5730	171.4217	80.9586	22.7305	0.0000	0.0000	0.0000	0.0000	78.7243	189.4469	299.1027	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1346.4459	
Space heating per m2											(98c) / (4) =	16.8348	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	283.4882	220.5730	171.4217	80.9586	22.7305	0.0000	0.0000	0.0000	0.0000	78.7243	189.4469	299.1027	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	425.2323	330.8596	257.1325	121.4379	34.0957	0.0000	0.0000	0.0000	0.0000	118.0865	284.1703	448.6541	
Space heating requirement													
	425.2323	330.8596	257.1325	121.4379	34.0957	0.0000	0.0000	0.0000	0.0000	118.0865	284.1703	448.6541	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												2019.6689	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												20.1967	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)
Total electricity for the above, kWh/year												21.9935	(331)
Electricity for lighting (calculated in Appendix L)												196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5316.6741	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2019.6689	4.4400	89.6733	(340a)
Space heating total			89.6733	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	196.1051	16.4900	32.3377	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	16.4900	-80.4802	
PV Unit electricity exported	-470.1661	5.5900	-26.2823	
Total			-106.7625	(352)
Total energy cost			290.1237	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8357 (357)
SAP value		86.4535
SAP rating (Section 12)		86 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1615.1457	0.1562	84.1488	(367)
Electrical energy for heat distribution (space & water)	20.1967	0.0000	8.8433	(372)
Overall CO2 factor for heat network			0.0404	(386)
Total CO2 associated with community systems			244.6644	(373)
Space and water heating			244.6644	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			154.6226	(383)
CO2 emissions per m2			1.9300	(384)
EI value			98.3422	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 79.9800						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate													
	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17097.8798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.6723	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 33.5192	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff													
	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m													
	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
327.4608 330.8588 322.2959 304.0665 281.0552 259.4278 244.9794 241.5813 250.1442 268.3736 291.3850 313.0124 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 (71)
Water heating gains (Table 5)
154.0336 151.5930 146.8914 136.5869 130.2751 123.6777 119.6256 122.9734 126.8986 134.2191 144.0972 152.7161 (72)
Total internal gains
610.7421 608.5956 590.7266 557.3213 524.1652 494.1729 476.4438 479.4976 496.5901 527.0115 563.7339 595.7477 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.8800	12.7500	0.6800	0.7000	0.7700	41.5534	(74)

Solar gains 41.5534 71.2837 120.7621 197.2865 255.7658 293.2158 268.8419 217.8807 153.7606 89.9647 50.6410 34.7464 (83)
Total gains 652.2955 679.8793 711.4887 754.6078 779.9310 787.3886 745.2857 697.3783 650.3507 616.9761 614.3749 630.4941 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9781	0.9690	0.9388	0.8618	0.7038	0.4813	0.3441	0.3862	0.6455	0.8756	0.9607	0.9818	(86)
MIT	20.2829	20.3807	20.5879	20.8051	20.9504	20.9952	20.9994	20.9989	20.9759	20.8187	20.5152	20.2413	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9729	0.9617	0.9245	0.8323	0.6536	0.4193	0.2767	0.3145	0.5790	0.8420	0.9501	0.9774	(89)
MIT 2	19.4110	19.5333	19.7883	20.0418	20.1931	20.2305	20.2330	20.2328	20.2173	20.0626	19.7026	19.3590	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.6570	19.7724	20.0139	20.2572	20.4068	20.4463	20.4493	20.4490	20.4314	20.2759	19.9319	19.6080	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6570	19.7724	20.0139	20.2572	20.4068	20.4463	20.4493	20.4490	20.4314	20.2759	19.9319	19.6080	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9681	0.9564	0.9198	0.8333	0.6654	0.4367	0.2958	0.3347	0.5967	0.8441	0.9451	0.9729	(94)
Useful gains	631.4884	650.2651	654.4144	628.8465	518.9539	343.8489	220.4209	233.4321	388.0396	520.7764	580.6620	613.4003	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	991.5228	959.6115	856.9815	721.5462	540.4288	345.4750	220.5527	233.7037	397.1749	604.2457	818.6569	994.8762	(97)
Space heating kWh	267.8656	207.8808	150.7099	66.7437	15.9773	0.0000	0.0000	0.0000	0.0000	62.1011	171.3563	283.8180	(98a)
Space heating requirement - total per year (kWh/year)												1226.4528	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	267.8656	207.8808	150.7099	66.7437	15.9773	0.0000	0.0000	0.0000	0.0000	62.1011	171.3563	283.8180	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1226.4528	
Space heating per m2											(98c) / (4) =	15.3345	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement
267.8656 207.8808 150.7099 66.7437 15.9773 0.0000 0.0000 0.0000 0.0000 62.1011 171.3563 283.8180 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50
307a 401.7983 311.8212 226.0649 100.1156 23.9660 0.0000 0.0000 0.0000 0.0000 93.1516 257.0345 425.7270
Space heating requirement
401.7983 311.8212 226.0649 100.1156 23.9660 0.0000 0.0000 0.0000 0.0000 93.1516 257.0345 425.7270 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)

Water heating
Annual water heating requirement
266.9446 236.1786 250.9634 220.5542 213.7828 192.6005 189.9534 197.4446 199.5749 222.6078 236.8171 263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50
310a 400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948
Water heating fuel
400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948 (310)
Cooling System Energy Efficiency Ratio 0.0000 (314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (315)
Pumps and Fa 1.8679 1.6872 1.8679 1.8077 1.8679 1.8077 1.8679 1.8679 1.8077 1.8679 1.8077 1.8679 (331)
Lighting 24.2988 19.4934 17.5516 12.8591 9.9327 8.1151 9.0610 11.7778 15.2982 20.0720 22.6713 24.9741 (332)
Electricity generated by PVs (Appendix M) (negative quantity)
(333a)m -17.9780 -26.9243 -45.2366 -58.5173 -66.4974 -66.2241 -64.3099 -58.6197 -48.0109 -34.7929 -20.6435 -14.9664 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(334a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (334a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)

Electricity generated by PVs (Appendix M) (negative quantity)

(333b)m	-6.0204	-13.0409	-32.0085	-59.0559	-82.7431	-94.8946	-90.1802	-72.6219	-46.3379	-22.2034	-8.3869	-4.5323	(333b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1839.6791	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	18.3968	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5040.1582	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1839.6791	6.5500	120.4990	(340a)
Space heating total			120.4990	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	196.1051	28.4300	55.7527	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	28.4300	-148.6096	
PV Unit electricity exported	-532.0259	5.8100	-30.9107	
Total			-179.5203	(352)
Total energy cost			371.4160	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1567.1484	0.1567	76.8872	(367)
Electrical energy for heat distribution (space & water)	18.3968	0.0000	8.5710	(372)
Overall CO2 factor for heat network			0.0404	(386)
Total CO2 associated with community systems			237.1305	(373)
Space and water heating			237.1305	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	0.1322	-69.1017	
PV Unit electricity exported	-532.0259	0.1213	-64.5494	
Total			-133.6511	(380)
Total CO2, kg/year			134.8342	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1567.1484	1.5802	775.2325	(467)
Electrical energy for heat distribution (space & water)	18.3968	0.0000	90.4736	(472)
Overall CO2 factor for heat network			0.4259	(486)
Total CO2 associated with community systems			2503.1019	(473)
Space and water heating			2503.1019	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	1.4884	-778.0360	
PV Unit electricity exported	-532.0259	0.4451	-236.7863	
Total			-1014.8223	(480)
Total Primary energy kWh/year			1822.3441	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - North

Current energy efficiency rating:	B 86
Current environmental impact rating:	A 98

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 86
Potential environmental impact rating: A 98

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£62	£62	£0
Community scheme	£489	£489	£0
Space heating	£231	£231	£0
Water heating	£264	£264	£0
Lighting	£56	£56	£0
Generated (PV)	-£180	-£180	£0
Total cost of fuels	£371	£371	£0
Total cost of uses	£371	£371	£0
Delivered energy	63 kWh/m²	63 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	2 kg/m²	2 kg/m²	0 kg/m²
Primary energy	23 kWh/m²	23 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17097.8798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6723 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
									Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)

Water heating gains (Table 5)

154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)

Total internal gains

610.7421	608.5956	590.7266	557.3213	524.1652	494.1729	476.4438	479.4976	496.5901	527.0115	563.7339	595.7477	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.8800	10.6334	0.6800	0.7000	0.7700	34.6552	(74)

Solar gains	34.6552	66.2279	112.5375	180.7640	243.5057	260.6801	243.3782	193.0895	135.3065	78.8357	42.7517	28.8903	(83)
Total gains	645.3973	674.8236	703.2641	738.0853	767.6709	754.8529	719.8220	672.5871	631.8966	605.8472	606.4856	624.6380	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9808	0.9724	0.9490	0.8837	0.7425	0.5498	0.4013	0.4480	0.6858	0.9000	0.9671	0.9839	(86)
MIT	20.2427	20.3444	20.5336	20.7654	20.9311	20.9896	20.9986	20.9974	20.9659	20.7735	20.4665	20.2021	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9762	0.9659	0.9370	0.8578	0.6956	0.4874	0.3320	0.3745	0.6212	0.8720	0.9582	0.9801	(89)
MIT 2	19.3604	19.4879	19.7222	19.9975	20.1750	20.2268	20.2326	20.2320	20.2095	20.0123	19.6425	19.3094	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.6094	19.7296	19.9512	20.2142	20.3884	20.4420	20.4487	20.4480	20.4229	20.2271	19.8750	19.5614	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6094	19.7296	19.9512	20.2142	20.3884	20.4420	20.4487	20.4480	20.4229	20.2271	19.8750	19.5614	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9717	0.9607	0.9319	0.8571	0.7055	0.5046	0.3516	0.3952	0.6378	0.8717	0.9532	0.9758	(94)
Useful gains	627.1055	648.3112	655.3716	632.6103	541.5865	380.9034	253.0620	265.8198	402.9993	528.1430	578.1272	609.5425	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1008.1381	976.5448	885.7771	745.0528	572.1383	384.7036	253.4445	266.5660	416.3724	633.9553	841.2478	1011.5623	(97)
Space heating kWh	283.4882	220.5730	171.4217	80.9586	22.7305	0.0000	0.0000	0.0000	0.0000	78.7243	189.4469	299.1027	(98a)
Space heating requirement - total per year (kWh/year)												1346.4459	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	283.4882	220.5730	171.4217	80.9586	22.7305	0.0000	0.0000	0.0000	0.0000	78.7243	189.4469	299.1027	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1346.4459	
Space heating per m2										(98c) / (4) =		16.8348	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	283.4882	220.5730	171.4217	80.9586	22.7305	0.0000	0.0000	0.0000	0.0000	78.7243	189.4469	299.1027	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	425.2323	330.8596	257.1325	121.4379	34.0957	0.0000	0.0000	0.0000	0.0000	118.0865	284.1703	448.6541	
Space heating requirement													
	425.2323	330.8596	257.1325	121.4379	34.0957	0.0000	0.0000	0.0000	0.0000	118.0865	284.1703	448.6541	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												2019.6689	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												20.1967	(313)
Space cooling fuel												0.0000	(321)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)

mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5316.6741	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2019.6689	4.4400	89.6733	(340a)
Space heating total			89.6733	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	196.1051	16.4900	32.3377	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	16.4900	-80.4802	
PV Unit electricity exported	-470.1661	5.5900	-26.2823	
Total			-106.7625	(352)
Total energy cost			290.1237	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8357	(357)
SAP value		86.4535	
SAP rating (Section 12)		86	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1615.1457	0.1562	84.1488	(367)
Electrical energy for heat distribution (space & water)	20.1967	0.0000	8.8433	(372)
Overall CO2 factor for heat network			0.0404	(386)
Total CO2 associated with community systems			244.6644	(373)
Space and water heating			244.6644	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			154.6226	(383)
CO2 emissions per m2			1.9300	(384)
EI value			98.3422	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)

Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17097.8798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.6723 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)
Total storage loss	

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)

											Total per year (kWh/year) = Sum(64)m =	2691.4183	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000		(64a)
Heat gains from water heating, kWh/month													
114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207		(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains													
	610.7421	608.5956	590.7266	557.3213	524.1652	494.1729	476.4438	479.4976	496.5901	527.0115	563.7339	595.7477	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.8800	12.7500	0.6800	0.7000	0.7700	41.5534	(74)

Solar gains	41.5534	71.2837	120.7621	197.2865	255.7658	293.2158	268.8419	217.8807	153.7606	89.9647	50.6410	34.7464	(83)
Total gains	652.2955	679.8793	711.4887	754.6078	779.9310	787.3886	745.2857	697.3783	650.3507	616.9761	614.3749	630.4941	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area													
	0.9781	0.9690	0.9388	0.8618	0.7038	0.4813	0.3441	0.3862	0.6455	0.8756	0.9607	0.9818	(86)
MIT	20.2829	20.3807	20.5879	20.8051	20.9504	20.9952	20.9994	20.9989	20.9759	20.8187	20.5152	20.2413	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house													
	0.9729	0.9617	0.9245	0.8323	0.6536	0.4193	0.2767	0.3145	0.5790	0.8420	0.9501	0.9774	(89)
MIT 2	19.4110	19.5333	19.7883	20.0418	20.1931	20.2305	20.2330	20.2328	20.2173	20.0626	19.7026	19.3590	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.6570	19.7724	20.0139	20.2572	20.4068	20.4463	20.4493	20.4490	20.4314	20.2759	19.9319	19.6080	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6570	19.7724	20.0139	20.2572	20.4068	20.4463	20.4493	20.4490	20.4314	20.2759	19.9319	19.6080	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9681	0.9564	0.9198	0.8333	0.6654	0.4367	0.2958	0.3347	0.5967	0.8441	0.9451	0.9729	(94)
Useful gains	631.4884	650.2651	654.4144	628.8465	518.9539	343.8489	220.4209	233.4321	388.0396	520.7764	580.6620	613.4003	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	991.5228	959.6115	856.9815	721.5462	540.4288	345.4750	220.5527	233.7037	397.1749	604.2457	818.6569	994.8762	(97)
Space heating kWh													
	267.8656	207.8808	150.7099	66.7437	15.9773	0.0000	0.0000	0.0000	0.0000	62.1011	171.3563	283.8180	(98a)
Space heating requirement - total per year (kWh/year)												1226.4528	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	267.8656	207.8808	150.7099	66.7437	15.9773	0.0000	0.0000	0.0000	0.0000	62.1011	171.3563	283.8180	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1226.4528	
Space heating per m2											(98c) / (4) =	15.3345	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement													
	267.8656	207.8808	150.7099	66.7437	15.9773	0.0000	0.0000	0.0000	0.0000	62.1011	171.3563	283.8180	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	401.7983	311.8212	226.0649	100.1156	23.9660	0.0000	0.0000	0.0000	0.0000	93.1516	257.0345	425.7270	
Space heating requirement													
	401.7983	311.8212	226.0649	100.1156	23.9660	0.0000	0.0000	0.0000	0.0000	93.1516	257.0345	425.7270	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.9780	-26.9243	-45.2366	-58.5173	-66.4974	-66.2241	-64.3099	-58.6197	-48.0109	-34.7929	-20.6435	-14.9664	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.0204	-13.0409	-32.0085	-59.0559	-82.7431	-94.8946	-90.1802	-72.6219	-46.3379	-22.2034	-8.3869	-4.5323	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1839.6791	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	18.3968	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5040.1582	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1839.6791	6.5500	120.4990	(340a)
Space heating total			120.4990	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	196.1051	28.4300	55.7527	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	28.4300	-148.6096	
PV Unit electricity exported	-532.0259	5.8100	-30.9107	
Total			-179.5203	(352)
Total energy cost			371.4160	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1567.1484	0.1567	76.8872	(367)
Electrical energy for heat distribution (space & water)	18.3968	0.0000	8.5710	(372)
Overall CO2 factor for heat network			0.0404	(386)
Total CO2 associated with community systems			237.1305	(373)
Space and water heating			237.1305	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	0.1322	-69.1017	
PV Unit electricity exported	-532.0259	0.1213	-64.5494	
Total			-133.6511	(380)
Total CO2, kg/year			134.8342	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1567.1484	1.5802	775.2325	(467)
Electrical energy for heat distribution (space & water)	18.3968	0.0000	90.4736	(472)
Overall CO2 factor for heat network			0.4259	(486)
Total CO2 associated with community systems			2503.1019	(473)
Space and water heating			2503.1019	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)

Energy saving/generation technologies			
PV Unit electricity used in dwelling	-522.7211	1.4884	-778.0360
PV Unit electricity exported	-532.0259	0.4451	-236.7863
Total			-1014.8223 (480)
Total Primary energy kWh/year			1822.3441 (483)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	2.01	**TER**	12.23
Environmental	98 A	**% DER < TER**			83.57
CO_2 Emissions (t/year)	0.13	**DFEE**	25.97	**TFEE**	32.84
Compliance Check	See BREL	**% DFEE < TFEE**			20.92
% DPER < TPER	60.65	**DPER**	25.50	**TPER**	64.80

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				4	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6723	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	33.5192	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.6786	139.1442	125.6786	129.8679	125.6786	129.8679	125.6786	125.6786	129.8679	125.6786	129.8679	125.6786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	559.0481	572.3498	548.4455	530.1166	504.1979	487.2994	469.3775	470.4487	484.3003	499.6452	529.1302	548.0502	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.8800	11.2829	0.6800	0.7000	0.7700	36.7722	(75)
Solar gains	36.7722	74.8509	134.8574	221.4746	297.7054	317.3854	296.9076	236.6981	164.3259	91.4737	46.2689	30.0300	(83)
Total gains	595.8203	647.2006	683.3029	751.5912	801.9033	804.6849	766.2851	707.1469	648.6262	591.1189	575.3991	578.0802	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9868	0.9770	0.9546	0.8768	0.7188	0.5178	0.3773	0.4266	0.6714	0.9080	0.9738	0.9889	(86)
MIT	20.1695	20.3057	20.5091	20.7764	20.9416	20.9923	20.9990	20.9980	20.9693	20.7597	20.4240	20.1324	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9835	0.9715	0.9436	0.8501	0.6716	0.4582	0.3120	0.3564	0.6070	0.8815	0.9665	0.9861	(89)
MIT 2	19.2686	19.4399	19.6927	20.0096	20.1844	20.2285	20.2327	20.2323	20.2121	19.9972	19.5904	19.2217	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.5228	19.6842	19.9231	20.2260	20.3981	20.4440	20.4490	20.4484	20.4258	20.2124	19.8256	19.4787	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5228	19.6842	19.9231	20.2260	20.3981	20.4440	20.4490	20.4484	20.4258	20.2124	19.8256	19.4787	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9797	0.9666	0.9384	0.8498	0.6821	0.4748	0.3304	0.3762	0.6238	0.8807	0.9617	0.9826	(94)
Useful gains	583.6955	625.6104	641.2437	638.7134	546.9888	382.0502	253.1845	266.0134	404.5880	520.5690	553.3876	568.0083	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1002.4406	973.5590	883.9250	745.8272	572.7807	384.8360	253.4592	266.5890	416.5584	632.9860	837.9953	1006.1178	(97)
Space heating kWh	311.5464	233.8215	180.5549	77.1220	19.1892	0.0000	0.0000	0.0000	0.0000	83.6383	204.9175	325.9534	(98a)
Space heating requirement - total per year (kWh/year)												1436.7431	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	311.5464	233.8215	180.5549	77.1220	19.1892	0.0000	0.0000	0.0000	0.0000	83.6383	204.9175	325.9534	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1436.7431	
Space heating per m2											(98c) / (4) =	17.9638	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	311.5464	233.8215	180.5549	77.1220	19.1892	0.0000	0.0000	0.0000	0.0000	83.6383	204.9175	325.9534	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	467.3196	350.7322	270.8323	115.6829	28.7837	0.0000	0.0000	0.0000	0.0000	125.4574	307.3763	488.9301	
Space heating requirement													
	467.3196	350.7322	270.8323	115.6829	28.7837	0.0000	0.0000	0.0000	0.0000	125.4574	307.3763	488.9301	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2155.1147	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	21.5511	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5452.1198	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1651.2645	0.1565	89.9310	(367)
Electrical energy for heat distribution (space & water)	21.5511	0.0000	9.0601	(372)
Overall CO2 factor for heat network			0.0405	(386)
Total CO2 associated with community systems			250.6635	(373)
Space and water heating			250.6635	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			160.6216	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.0100	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1651.2645	1.5793	907.6395	(467)
Electrical energy for heat distribution (space & water)	21.5511	0.0000	95.4388	(472)
Overall CO2 factor for heat network			0.4264	(486)
Total CO2 associated with community systems			2640.4741	(473)
Space and water heating			2640.4741	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	1.4873	-725.8942	
PV Unit electricity exported	-470.1661	0.4450	-209.2081	
Total			-935.1023	(480)
Total Primary energy kWh/year			2039.4363	(483)
Dwelling Primary energy Rate (DPER)			25.5000	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Semi-glazed door			3.5800	1.0000	3.5800			(26a)
TER Opening Type			9.8800	1.1450	11.3130			(27)
Heatloss Floor			39.9900	0.1300	5.1987			(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.1800	7.0326			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.5045			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			213.7769 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.4500	0.0500	0.4225
E3 Sill	6.7500	0.0500	0.3375
E4 Jamb	22.0000	0.0500	1.1000
E6 Intermediate floor within a dwelling	19.5200	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	6.0900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E5 Ground floor (normal)	19.5200	0.1600	3.1232
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
P1 Party wall - Ground floor	6.0900	0.0800	0.4872
E7 Party floor between dwellings (in blocks of flats)	14.1200	0.0700	0.9884
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.7208 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	41.2253 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	77.7420	77.5795	77.4202	76.6720	76.5321	75.8805	75.8805	75.7598	76.1315	76.5321	76.8152	77.1113	(39)
Average = Sum(39)m / 12 =												76.6714	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9700	0.9680	0.9586	0.9569	0.9487	0.9487	0.9472	0.9519	0.9569	0.9604	0.9641	(40)
HLP (average)												0.9586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers													
	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths													
	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses													
	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m													
	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
										Total per year (kWh/year) = Sum(64)m =		2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	122.0433	135.1194	122.0433	126.1114	122.0433	126.1114	122.0433	122.0433	126.1114	122.0433	126.1114	122.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													
	549.0775	561.9896	538.4748	520.0247	494.2273	474.2076	456.4069	457.4780	471.2084	489.6746	519.0383	538.0795	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.8800	11.2829	0.6300	0.7000	0.7700	34.0683	(75)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	34.0683	69.3471	124.9414	205.1897	275.8153	294.0483	275.0761	219.2939	152.2431	84.7477	42.8668	27.8219	(83)
Total gains	583.1458	631.3367	663.4163	725.2145	770.0425	768.2558	731.4830	676.7719	623.4515	574.4222	561.9051	565.9014	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
tau	61.0920	61.2199	61.3459	61.9445	62.0578	62.5907	62.5907	62.6904	62.3843	62.0578	61.8290	61.5917	
alpha	5.0728	5.0813	5.0897	5.1296	5.1372	5.1727	5.1727	5.1794	5.1590	5.1372	5.1219	5.1061	
util living area	0.9904	0.9843	0.9707	0.9208	0.8024	0.6091	0.4521	0.5068	0.7585	0.9398	0.9820	0.9917	(86)
MIT	19.8676	20.0135	20.2473	20.5904	20.8521	20.9720	20.9950	20.9913	20.9173	20.5963	20.1873	19.8444	(87)
Th 2	20.1067	20.1084	20.1101	20.1179	20.1194	20.1263	20.1263	20.1275	20.1236	20.1194	20.1164	20.1133	(88)
util rest of house	0.9879	0.9802	0.9626	0.8992	0.7546	0.5347	0.3645	0.4146	0.6886	0.9187	0.9764	0.9896	(89)
MIT 2	18.7907	18.9768	19.2725	19.6974	19.9913	20.1090	20.1244	20.1239	20.0643	19.7132	19.2045	18.7661	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.0946	19.2693	19.5476	19.9494	20.2342	20.3526	20.3701	20.3687	20.3050	19.9624	19.4818	19.0704	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0946	19.2693	19.5476	19.9494	20.2342	20.3526	20.3701	20.3687	20.3050	19.9624	19.4818	19.0704	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9840	0.9751	0.9562	0.8944	0.7613	0.5546	0.3892	0.4405	0.7041	0.9142	0.9712	0.9861	(94)
Useful gains	573.8280	615.6107	634.3798	648.6521	586.2259	426.0651	284.7145	298.1494	438.9957	525.1329	545.7404	558.0105	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1150.1584	1114.7659	1010.1473	847.1793	653.1427	436.5069	286.0738	300.6663	472.3973	716.5255	951.1136	1146.6739	(97)
Space heating kWh	428.7898	335.4323	279.5710	142.9396	49.7861	0.0000	0.0000	0.0000	0.0000	142.3961	291.8687	437.9656	(98a)
Space heating requirement - total per year (kWh/year)												2108.7491	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	428.7898	335.4323	279.5710	142.9396	49.7861	0.0000	0.0000	0.0000	0.0000	142.3961	291.8687	437.9656	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2108.7491	
Space heating per m2											(98c) / (4) =	26.3660	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	428.7898	335.4323	279.5710	142.9396	49.7861	0.0000	0.0000	0.0000	0.0000	142.3961	291.8687	437.9656	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	464.5610	363.4153	302.8938	154.8641	53.9395	0.0000	0.0000	0.0000	0.0000	154.2752	316.2174	474.5022	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4514	85.1904	84.6545	83.4396	81.5627	79.8000	79.8000	79.8000	79.8000	83.4040	84.8722	85.5178	(217)
Fuel for water heating, kWh/month	267.1873	236.9413	253.4388	226.7357	225.2236	207.8751	205.6450	213.6686	215.8200	229.7100	239.3109	264.1811	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.3582	20.3433	18.3169	13.4197	10.3658	8.4689	9.4560	12.2913	15.9652	20.9471	23.6598	26.0630	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3424	-31.5676	-47.5704	-56.1485	-62.8691	-59.5233	-58.7993	-54.3654	-46.9365	-37.2699	-23.9846	-18.2835	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9342	-17.0411	-34.5369	-52.8648	-70.8844	-71.5905	-70.7461	-59.4418	-42.9727	-24.6882	-10.6939	-6.2480	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2284.6686	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2785.7376	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	204.6551	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4372.7582	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2284.6686	0.2100	479.7804	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2785.7376	0.2100	585.0049	(264)
Space and water heating			1064.7853	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	204.6551	0.1443	29.5381	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	0.1336	-69.2911	
PV Unit electricity exported	-469.6425	0.1253	-58.8667	
Total			-128.1578	(269)
Total CO2, kg/year			978.0948	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.2300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2284.6686	1.1300	2581.6755	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2785.7376	1.1300	3147.8835	(278)
Space and water heating			5729.5590	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	204.6551	1.5338	313.9068	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	1.4937	-774.7198	
PV Unit electricity exported	-469.6425	0.4601	-216.0686	
Total			-990.7884	(283)
Total Primary energy kWh/year			5182.7782	(286)
Target Primary Energy Rate (TPER)			64.8000	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	2.01	**TER**	12.23
Environmental	98 A	**% DER < TER**			83.57
CO_2 Emissions (t/year)	0.13	**DFEE**	25.97	**TFEE**	32.84
Compliance Check	See BREL	**% DFEE < TFEE**			20.92
% DPER < TPER	60.65	**DPER**	25.50	**TPER**	64.80

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		3 * 10 =	30.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1531	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.3031	(18)
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2122	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2705	0.2652	0.2599	0.2334	0.2281	0.2016	0.2016	0.1963	0.2122	0.2281	0.2387	0.2493	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5366	0.5352	0.5338	0.5272	0.5260	0.5203	0.5203	0.5193	0.5225	0.5260	0.5285	0.5311	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							3.6723	(36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.6979	34.6061	34.5160	34.0930	34.0139	33.6455	33.6455	33.5772	33.7874	34.0139	34.1740	34.3414	(38)
Heat transfer coeff	68.2172	68.1253	68.0352	67.6122	67.5331	67.1647	67.1647	67.0965	67.3066	67.5331	67.6932	67.8606	(39)
Average = Sum(39)m / 12 =												67.6118	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8529	0.8518	0.8507	0.8454	0.8444	0.8398	0.8398	0.8389	0.8415	0.8444	0.8464	0.8485	(40)
HLP (average)												0.8454	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)

Total per year (kWh/year) = Sum(64)m = 881.7040 (64)
12Total per year (kWh/year) 882 (64)

Electric shower(s)

52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 596.7355 (64a)

Heat gains from water heating, kWh/month

36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.6786	139.1442	125.6786	129.8679	125.6786	129.8679	125.6786	125.6786	129.8679	125.6786	129.8679	125.6786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains	453.4664	467.9883	446.9019	435.3676	413.4459	400.7688	385.7326	384.8800	396.4077	407.0433	430.0429	443.3929	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.8800	11.2829	0.6800	0.7000	0.7700	36.7722	(75)

Solar gains	36.7722	74.8509	134.8574	221.4746	297.7054	317.3854	296.9076	236.6981	164.3259	91.4737	46.2689	30.0300	(83)
Total gains	490.2385	542.8392	581.7593	656.8422	711.1513	718.1543	682.6402	621.5782	560.7336	498.5170	476.3118	473.4229	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.6219	69.7158	69.8081	70.2449	70.3272	70.7129	70.7129	70.7848	70.5638	70.3272	70.1608	69.9878	
alpha	5.6415	5.6477	5.6539	5.6830	5.6885	5.7142	5.7142	5.7190	5.7043	5.6885	5.6774	5.6659	
util living area	0.9951	0.9904	0.9786	0.9264	0.7930	0.5853	0.4309	0.4919	0.7605	0.9541	0.9895	0.9960	(86)
MIT	19.9498	20.0982	20.3271	20.6615	20.8964	20.9847	20.9977	20.9954	20.9387	20.6338	20.2418	19.9211	(87)

Th 2	20.2077	20.2087	20.2096	20.2142	20.2150	20.2190	20.2190	20.2197	20.2175	20.2150	20.2133	20.2115	(88)
util rest of house	0.9938	0.9878	0.9727	0.9069	0.7477	0.5191	0.3554	0.4108	0.6960	0.9377	0.9863	0.9949	(89)
MIT 2	19.2436	19.3916	19.6179	19.9409	20.1450	20.2116	20.2183	20.2182	20.1827	19.9213	19.5386	19.2182	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.4429	19.5910	19.8181	20.1442	20.3571	20.4297	20.4383	20.4375	20.3960	20.1224	19.7370	19.4165	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4429	19.5910	19.8181	20.1442	20.3571	20.4297	20.4383	20.4375	20.3960	20.1224	19.7370	19.4165	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9921	0.9853	0.9692	0.9050	0.7564	0.5373	0.3767	0.4337	0.7116	0.9354	0.9837	0.9934	(94)
Useful gains	486.3669	534.8568	563.8131	594.4227	537.9031	385.8926	257.1795	269.5748	399.0329	466.3259	468.5578	470.3159	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1033.0056	1000.8305	906.0969	760.2473	584.6392	391.5520	257.7951	270.9026	423.7652	643.0741	855.4414	1032.6026	(97)
Space heating kWh	406.6992	313.1343	254.6592	119.3937	34.7717	0.0000	0.0000	0.0000	0.0000	131.5007	278.5562	418.3413	(98a)
Space heating requirement - total per year (kWh/year)												1957.0563	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	406.6992	313.1343	254.6592	119.3937	34.7717	0.0000	0.0000	0.0000	0.0000	131.5007	278.5562	418.3413	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1957.0563	
Space heating per m2											(98c) / (4) =	24.4693	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	631.3480	497.0186	509.9330	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9249	0.9640	0.9412	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	583.9460	479.1241	479.9481	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	780.0283	741.3638	672.5779	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	141.1792	195.1063	143.3166	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	35.2948	48.7766	35.8291	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												119.9005	(107)
Energy for space heating												24.4693	(99)
Energy for space cooling												1.4991	(108)
Total												25.9685	(109)
Fabric Energy Efficiency (DFEE)												26.0	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		3 * 10 =	30.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1531 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.4031 (18)
Number of sides sheltered			4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Semi-glazed door			3.5800	1.0000	3.5800			(26a)
TER Opening Type			9.8800	1.1450	11.3130			(27)
Heatloss Floor			39.9900	0.1300	5.1987			(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.1800	7.0326			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.5045			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 213.7769 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.4500	0.0500	0.4225
E3 Sill	6.7500	0.0500	0.3375
E4 Jamb	22.0000	0.0500	1.1000
E6 Intermediate floor within a dwelling	19.5200	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	6.0900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E5 Ground floor (normal)	19.5200	0.1600	3.1232
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
P1 Party wall - Ground floor	6.0900	0.0800	0.4872
E7 Party floor between dwellings (in blocks of flats)	14.1200	0.0700	0.9884

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.7208 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.2253 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	77.7420	77.5795	77.4202	76.6720	76.5321	75.8805	75.8805	75.7598	76.1315	76.5321	76.8152	77.1113	(39)

Average = Sum(39)m / 12 = 76.6714

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9700	0.9680	0.9586	0.9569	0.9487	0.9487	0.9472	0.9519	0.9569	0.9604	0.9641	(40)
HLP (average)												0.9586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	122.0433	135.1194	122.0433	126.1114	122.0433	126.1114	122.0433	122.0433	126.1114	122.0433	126.1114	122.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains													
	449.8311	463.9635	443.2666	431.6111	409.8106	397.0124	382.0973	381.2447	392.6512	403.4080	426.2864	439.7576	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.8800	11.2829	0.6300	0.7000	0.7700	34.0683	(75)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	34.0683	69.3471	124.9414	205.1897	275.8153	294.0483	275.0761	219.2939	152.2431	84.7477	42.8668	27.8219	(83)
Total gains	483.8994	533.3107	568.2080	636.8008	685.6259	691.0606	657.1735	600.5386	544.8943	488.1557	469.1532	467.5795	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.0920	61.2199	61.3459	61.9445	62.0578	62.5907	62.5907	62.6904	62.3843	62.0578	61.8290	61.5917	
alpha	5.0728	5.0813	5.0897	5.1296	5.1372	5.1727	5.1727	5.1794	5.1590	5.1372	5.1219	5.1061	
util living area													
	0.9958	0.9924	0.9843	0.9495	0.8523	0.6647	0.5004	0.5652	0.8219	0.9670	0.9916	0.9965	(86)
MIT	19.7172	19.8686	20.1142	20.4909	20.7992	20.9585	20.9921	20.9857	20.8778	20.4894	20.0510	19.6944	(87)
Th 2	20.1067	20.1084	20.1101	20.1179	20.1194	20.1263	20.1263	20.1275	20.1236	20.1194	20.1164	20.1133	(88)
util rest of house													
	0.9946	0.9902	0.9796	0.9340	0.8100	0.5879	0.4048	0.4652	0.7579	0.9539	0.9889	0.9955	(89)
MIT 2	18.9322	19.0839	19.3284	19.6999	19.9791	20.1057	20.1239	20.1227	20.0517	19.7050	19.2723	18.9146	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.1537	19.3053	19.5502	19.9231	20.2106	20.3464	20.3689	20.3663	20.2848	19.9264	19.4921	19.1347	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1537	19.3053	19.5502	19.9231	20.2106	20.3464	20.3689	20.3663	20.2848	19.9264	19.4921	19.1347	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9929	0.9877	0.9759	0.9299	0.8148	0.6081	0.4318	0.4933	0.7709	0.9503	0.9863	0.9940	(94)
Useful gains	480.4723	526.7404	554.5118	592.1803	558.6808	420.2541	283.7866	296.2669	420.0845	463.8831	462.7212	464.7833	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1154.7562	1117.5594	1010.3475	845.1615	651.3302	436.0358	285.9830	300.4840	470.8568	713.7660	951.8983	1151.6338	(97)
Space heating kWh													
	501.6673	397.0304	339.1418	182.1465	68.9312	0.0000	0.0000	0.0000	0.0000	185.9128	352.2075	511.0168	(98a)
Space heating requirement - total per year (kWh/year)												2538.0543	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	501.6673	397.0304	339.1418	182.1465	68.9312	0.0000	0.0000	0.0000	0.0000	185.9128	352.2075	511.0168	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2538.0543	
Space heating per m2										(98c) / (4) =		31.7336	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	713.2763	561.5154	575.7744	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8595	0.9208	0.8854	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	613.0835	517.0554	509.7738	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	752.4330	715.5028	651.7885	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	100.3316	147.6449	105.6589	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	25.0829	36.9112	26.4147	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												88.4089	(107)
Energy for space heating												31.7336	(99)
Energy for space cooling												1.1054	(108)
Total												32.8390	(109)
Fabric Energy Efficiency (TFEE)												32.8	(109)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	2.01	**TER**	12.23
Environmental	98 A	**% DER < TER**			83.57
CO_2 Emissions (t/year)	0.13	**DFEE**	25.97	**TFEE**	32.84
Compliance Check	See BREL	**% DFEE < TFEE**			20.92
% DPER < TPER	60.65	**DPER**	25.50	**TPER**	64.80

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				4	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6723	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	33.5192	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.6786	139.1442	125.6786	129.8679	125.6786	129.8679	125.6786	125.6786	129.8679	125.6786	129.8679	125.6786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	559.0481	572.3498	548.4455	530.1166	504.1979	487.2994	469.3775	470.4487	484.3003	499.6452	529.1302	548.0502	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.8800	11.2829	0.6800	0.7000	0.7700	36.7722	(75)
Solar gains	36.7722	74.8509	134.8574	221.4746	297.7054	317.3854	296.9076	236.6981	164.3259	91.4737	46.2689	30.0300	(83)
Total gains	595.8203	647.2006	683.3029	751.5912	801.9033	804.6849	766.2851	707.1469	648.6262	591.1189	575.3991	578.0802	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9868	0.9770	0.9546	0.8768	0.7188	0.5178	0.3773	0.4266	0.6714	0.9080	0.9738	0.9889	(86)
MIT	20.1695	20.3057	20.5091	20.7764	20.9416	20.9923	20.9990	20.9980	20.9693	20.7597	20.4240	20.1324	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9835	0.9715	0.9436	0.8501	0.6716	0.4582	0.3120	0.3564	0.6070	0.8815	0.9665	0.9861	(89)
MIT 2	19.2686	19.4399	19.6927	20.0096	20.1844	20.2285	20.2327	20.2323	20.2121	19.9972	19.5904	19.2217	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.5228	19.6842	19.9231	20.2260	20.3981	20.4440	20.4490	20.4484	20.4258	20.2124	19.8256	19.4787	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5228	19.6842	19.9231	20.2260	20.3981	20.4440	20.4490	20.4484	20.4258	20.2124	19.8256	19.4787	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9797	0.9666	0.9384	0.8498	0.6821	0.4748	0.3304	0.3762	0.6238	0.8807	0.9617	0.9826	(94)
Useful gains	583.6955	625.6104	641.2437	638.7134	546.9888	382.0502	253.1845	266.0134	404.5880	520.5690	553.3876	568.0083	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1002.4406	973.5590	883.9250	745.8272	572.7807	384.8360	253.4592	266.5890	416.5584	632.9860	837.9953	1006.1178	(97)
Space heating kWh	311.5464	233.8215	180.5549	77.1220	19.1892	0.0000	0.0000	0.0000	0.0000	83.6383	204.9175	325.9534	(98a)
Space heating requirement - total per year (kWh/year)												1436.7431	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	311.5464	233.8215	180.5549	77.1220	19.1892	0.0000	0.0000	0.0000	0.0000	83.6383	204.9175	325.9534	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1436.7431	
Space heating per m2											(98c) / (4) =	17.9638	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	311.5464	233.8215	180.5549	77.1220	19.1892	0.0000	0.0000	0.0000	0.0000	83.6383	204.9175	325.9534	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	467.3196	350.7322	270.8323	115.6829	28.7837	0.0000	0.0000	0.0000	0.0000	125.4574	307.3763	488.9301	
Space heating requirement													
	467.3196	350.7322	270.8323	115.6829	28.7837	0.0000	0.0000	0.0000	0.0000	125.4574	307.3763	488.9301	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2155.1147	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	21.5511	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5452.1198	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1651.2645	0.1565	89.9310	(367)
Electrical energy for heat distribution (space & water)	21.5511	0.0000	9.0601	(372)
Overall CO2 factor for heat network			0.0405	(386)
Total CO2 associated with community systems			250.6635	(373)
Space and water heating			250.6635	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			160.6216	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.0100	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1651.2645	1.5793	907.6395	(467)
Electrical energy for heat distribution (space & water)	21.5511	0.0000	95.4388	(472)
Overall CO2 factor for heat network			0.4264	(486)
Total CO2 associated with community systems			2640.4741	(473)
Space and water heating			2640.4741	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	1.4873	-725.8942	
PV Unit electricity exported	-470.1661	0.4450	-209.2081	
Total			-935.1023	(480)
Total Primary energy kWh/year			2039.4363	(483)
Dwelling Primary energy Rate (DPER)			25.5000	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Semi-glazed door			3.5800	1.0000	3.5800			(26a)
TER Opening Type			9.8800	1.1450	11.3130			(27)
Heatloss Floor			39.9900	0.1300	5.1987			(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.1800	7.0326			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.5045			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			213.7769 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.4500	0.0500	0.4225
E3 Sill	6.7500	0.0500	0.3375
E4 Jamb	22.0000	0.0500	1.1000
E6 Intermediate floor within a dwelling	19.5200	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	6.0900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E5 Ground floor (normal)	19.5200	0.1600	3.1232
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
P1 Party wall - Ground floor	6.0900	0.0800	0.4872
E7 Party floor between dwellings (in blocks of flats)	14.1200	0.0700	0.9884
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.7208 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	41.2253 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	77.7420	77.5795	77.4202	76.6720	76.5321	75.8805	75.8805	75.7598	76.1315	76.5321	76.8152	77.1113	(39)
Average = Sum(39)m / 12 =												76.6714	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9700	0.9680	0.9586	0.9569	0.9487	0.9487	0.9472	0.9519	0.9569	0.9604	0.9641	(40)
HLP (average)												0.9586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers													
	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths													
	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses													
	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m													
	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
										Total per year (kWh/year) = Sum(64)m =		2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	122.0433	135.1194	122.0433	126.1114	122.0433	126.1114	122.0433	122.0433	126.1114	122.0433	126.1114	122.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													
	549.0775	561.9896	538.4748	520.0247	494.2273	474.2076	456.4069	457.4780	471.2084	489.6746	519.0383	538.0795	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.8800	11.2829	0.6300	0.7000	0.7700	34.0683	(75)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	34.0683	69.3471	124.9414	205.1897	275.8153	294.0483	275.0761	219.2939	152.2431	84.7477	42.8668	27.8219	(83)
Total gains	583.1458	631.3367	663.4163	725.2145	770.0425	768.2558	731.4830	676.7719	623.4515	574.4222	561.9051	565.9014	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
tau	61.0920	61.2199	61.3459	61.9445	62.0578	62.5907	62.5907	62.6904	62.3843	62.0578	61.8290	61.5917	
alpha	5.0728	5.0813	5.0897	5.1296	5.1372	5.1727	5.1727	5.1794	5.1590	5.1372	5.1219	5.1061	
util living area	0.9904	0.9843	0.9707	0.9208	0.8024	0.6091	0.4521	0.5068	0.7585	0.9398	0.9820	0.9917	(86)
MIT	19.8676	20.0135	20.2473	20.5904	20.8521	20.9720	20.9950	20.9913	20.9173	20.5963	20.1873	19.8444	(87)
Th 2	20.1067	20.1084	20.1101	20.1179	20.1194	20.1263	20.1263	20.1275	20.1236	20.1194	20.1164	20.1133	(88)
util rest of house	0.9879	0.9802	0.9626	0.8992	0.7546	0.5347	0.3645	0.4146	0.6886	0.9187	0.9764	0.9896	(89)
MIT 2	18.7907	18.9768	19.2725	19.6974	19.9913	20.1090	20.1244	20.1239	20.0643	19.7132	19.2045	18.7661	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.0946	19.2693	19.5476	19.9494	20.2342	20.3526	20.3701	20.3687	20.3050	19.9624	19.4818	19.0704	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0946	19.2693	19.5476	19.9494	20.2342	20.3526	20.3701	20.3687	20.3050	19.9624	19.4818	19.0704	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9840	0.9751	0.9562	0.8944	0.7613	0.5546	0.3892	0.4405	0.7041	0.9142	0.9712	0.9861	(94)
Useful gains	573.8280	615.6107	634.3798	648.6521	586.2259	426.0651	284.7145	298.1494	438.9957	525.1329	545.7404	558.0105	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1150.1584	1114.7659	1010.1473	847.1793	653.1427	436.5069	286.0738	300.6663	472.3973	716.5255	951.1136	1146.6739	(97)
Space heating kWh	428.7898	335.4323	279.5710	142.9396	49.7861	0.0000	0.0000	0.0000	0.0000	142.3961	291.8687	437.9656	(98a)
Space heating requirement - total per year (kWh/year)												2108.7491	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	428.7898	335.4323	279.5710	142.9396	49.7861	0.0000	0.0000	0.0000	0.0000	142.3961	291.8687	437.9656	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2108.7491	
Space heating per m2											(98c) / (4) =	26.3660	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	428.7898	335.4323	279.5710	142.9396	49.7861	0.0000	0.0000	0.0000	0.0000	142.3961	291.8687	437.9656	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	464.5610	363.4153	302.8938	154.8641	53.9395	0.0000	0.0000	0.0000	0.0000	154.2752	316.2174	474.5022	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4514	85.1904	84.6545	83.4396	81.5627	79.8000	79.8000	79.8000	79.8000	83.4040	84.8722	85.5178	(217)
Fuel for water heating, kWh/month	267.1873	236.9413	253.4388	226.7357	225.2236	207.8751	205.6450	213.6686	215.8200	229.7100	239.3109	264.1811	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.3582	20.3433	18.3169	13.4197	10.3658	8.4689	9.4560	12.2913	15.9652	20.9471	23.6598	26.0630	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3424	-31.5676	-47.5704	-56.1485	-62.8691	-59.5233	-58.7993	-54.3654	-46.9365	-37.2699	-23.9846	-18.2835	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9342	-17.0411	-34.5369	-52.8648	-70.8844	-71.5905	-70.7461	-59.4418	-42.9727	-24.6882	-10.6939	-6.2480	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2284.6686	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2785.7376	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	204.6551	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4372.7582	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2284.6686	0.2100	479.7804	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2785.7376	0.2100	585.0049	(264)
Space and water heating			1064.7853	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	204.6551	0.1443	29.5381	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	0.1336	-69.2911	
PV Unit electricity exported	-469.6425	0.1253	-58.8667	
Total			-128.1578	(269)
Total CO2, kg/year			978.0948	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.2300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2284.6686	1.1300	2581.6755	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2785.7376	1.1300	3147.8835	(278)
Space and water heating			5729.5590	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	204.6551	1.5338	313.9068	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	1.4937	-774.7198	
PV Unit electricity exported	-469.6425	0.4601	-216.0686	
Total			-990.7884	(283)
Total Primary energy kWh/year			5182.7782	(286)
Target Primary Energy Rate (TPER)			64.8000	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	2.01	**TER**	12.23
Environmental	98 A	**% DER < TER**			83.57
CO_2 Emissions (t/year)	0.13	**DFEE**	25.97	**TFEE**	32.84
Compliance Check	See BREL	**% DFEE < TFEE**			20.92
% DPER < TPER	60.65	**DPER**	25.50	**TPER**	64.80

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				4	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6723	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	33.5192	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	610.7421	608.5956	590.7266	557.3213	524.1652	494.1729	476.4438	479.4976	496.5901	527.0115	563.7339	595.7477	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.8800	11.2829	0.6800	0.7000	0.7700	36.7722	(75)

Solar gains	36.7722	74.8509	134.8574	221.4746	297.7054	317.3854	296.9076	236.6981	164.3259	91.4737	46.2689	30.0300	(83)
Total gains	647.5143	683.4465	725.5841	778.7959	821.8706	811.5583	773.3514	716.1957	660.9160	618.4851	610.0028	625.7777	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)		

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9805	0.9708	0.9424	0.8627	0.7054	0.5137	0.3739	0.4213	0.6611	0.8929	0.9663	0.9838	(86)
MIT	20.2457	20.3562	20.5601	20.7973	20.9470	20.9926	20.9990	20.9981	20.9716	20.7848	20.4712	20.2038	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9759	0.9640	0.9292	0.8343	0.6580	0.4544	0.3091	0.3519	0.5970	0.8637	0.9572	0.9799	(89)
MIT 2	19.3642	19.5025	19.7539	20.0322	20.1892	20.2287	20.2328	20.2323	20.2138	20.0246	19.6482	19.3116	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.6130	19.7434	19.9814	20.2481	20.4030	20.4443	20.4490	20.4484	20.4276	20.2391	19.8804	19.5633	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6130	19.7434	19.9814	20.2481	20.4030	20.4443	20.4490	20.4484	20.4276	20.2391	19.8804	19.5633	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9713	0.9587	0.9242	0.8349	0.6689	0.4709	0.3274	0.3715	0.6138	0.8640	0.9522	0.9757	(94)
Useful gains	628.9173	655.2510	670.5868	650.2418	549.7246	382.1792	253.1994	266.0553	405.6396	534.3434	580.8561	610.5401	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1008.3761	977.4578	887.7682	747.2830	573.1042	384.8509	253.4610	266.5940	416.6813	634.7459	841.6065	1011.6933	(97)
Space heating kWh	282.3174	216.5230	161.5830	69.8696	17.3945	0.0000	0.0000	0.0000	0.0000	74.6994	187.7403	298.4580	(98a)
Space heating requirement - total per year (kWh/year)												1308.5852	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	282.3174	216.5230	161.5830	69.8696	17.3945	0.0000	0.0000	0.0000	0.0000	74.6994	187.7403	298.4580	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1308.5852	
Space heating per m2											(98c) / (4) =	16.3614	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	282.3174	216.5230	161.5830	69.8696	17.3945	0.0000	0.0000	0.0000	0.0000	74.6994	187.7403	298.4580	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	423.4761	324.7845	242.3744	104.8045	26.0917	0.0000	0.0000	0.0000	0.0000	112.0491	281.6104	447.6870	
Space heating requirement													
	423.4761	324.7845	242.3744	104.8045	26.0917	0.0000	0.0000	0.0000	0.0000	112.0491	281.6104	447.6870	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1962.8778	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												19.6288	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)
Total electricity for the above, kWh/year												21.9935	(331)
Electricity for lighting (calculated in Appendix L)												196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5259.8829	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1962.8778	4.4400	87.1518	(340a)
Space heating total			87.1518	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	196.1051	16.4900	32.3377	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	16.4900	-80.4802	
PV Unit electricity exported	-470.1661	5.5900	-26.2823	
Total			-106.7625	(352)
Total energy cost			287.6022	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8284 (357)
SAP value		86.5712
SAP rating (Section 12)		87 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1600.0014	0.1565	81.9310	(367)
Electrical energy for heat distribution (space & water)	19.6288	0.0000	8.7601	(372)
Overall CO2 factor for heat network			0.0404	(386)
Total CO2 associated with community systems			242.3635	(373)
Space and water heating			242.3635	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			152.3216	(383)
CO2 emissions per m2			1.9000	(384)
EI value			98.3669	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 79.9800						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate													
	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17097.8798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.6723	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 33.5192	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff													
	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m													
	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
327.4608 330.8588 322.2959 304.0665 281.0552 259.4278 244.9794 241.5813 250.1442 268.3736 291.3850 313.0124 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 (71)
Water heating gains (Table 5)
154.0336 151.5930 146.8914 136.5869 130.2751 123.6777 119.6256 122.9734 126.8986 134.2191 144.0972 152.7161 (72)
Total internal gains
610.7421 608.5956 590.7266 557.3213 524.1652 494.1729 476.4438 479.4976 496.5901 527.0115 563.7339 595.7477 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.8800	13.7758	0.6800	0.7000	0.7700	44.8965	(75)

Solar gains 44.8965 81.7088 145.7004 241.8651 312.1113 356.1490 327.2508 266.8970 187.4724 105.5879 55.7545 36.8040 (83)
Total gains 655.6386 690.3044 736.4270 799.1864 836.2765 850.3219 803.6947 746.3945 684.0626 632.5994 619.4884 632.5517 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9776	0.9669	0.9303	0.8371	0.6654	0.4468	0.3193	0.3611	0.6179	0.8656	0.9593	0.9815	(86)
MIT	20.2876	20.3948	20.6158	20.8353	20.9626	20.9967	20.9996	20.9992	20.9807	20.8307	20.5218	20.2443	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9723	0.9592	0.9146	0.8051	0.6155	0.3888	0.2566	0.2939	0.5527	0.8307	0.9484	0.9770	(89)
MIT 2	19.4169	19.5506	19.8210	20.0738	20.2035	20.2314	20.2330	20.2329	20.2206	20.0751	19.7106	19.3627	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.6626	19.7888	20.0453	20.2887	20.4177	20.4474	20.4494	20.4491	20.4351	20.2883	19.9395	19.6115	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6626	19.7888	20.0453	20.2887	20.4177	20.4474	20.4494	20.4491	20.4351	20.2883	19.9395	19.6115	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9674	0.9539	0.9102	0.8076	0.6279	0.4051	0.2743	0.3129	0.5703	0.8335	0.9435	0.9725	(94)
Useful gains	634.2946	658.4572	670.2727	645.4329	525.0763	344.4437	220.4714	233.5261	390.1314	527.2563	584.4580	615.1728	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	991.8918	960.6890	859.0480	723.6198	541.1477	345.5440	220.5590	233.7152	397.4182	605.0608	819.1553	995.1090	(97)
Space heating kWh	266.0523	203.0998	140.4488	56.2946	11.9571	0.0000	0.0000	0.0000	0.0000	57.8865	168.9820	282.6725	(98a)
Space heating requirement - total per year (kWh/year)												1187.3936	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	266.0523	203.0998	140.4488	56.2946	11.9571	0.0000	0.0000	0.0000	0.0000	57.8865	168.9820	282.6725	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1187.3936	
Space heating per m2										(98c) / (4) =		14.8461	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement
266.0523 203.0998 140.4488 56.2946 11.9571 0.0000 0.0000 0.0000 0.0000 57.8865 168.9820 282.6725 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50
307a 399.0784 304.6497 210.6732 84.4419 17.9356 0.0000 0.0000 0.0000 0.0000 86.8298 253.4730 424.0088
Space heating requirement
399.0784 304.6497 210.6732 84.4419 17.9356 0.0000 0.0000 0.0000 0.0000 86.8298 253.4730 424.0088 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)

Water heating
Annual water heating requirement
266.9446 236.1786 250.9634 220.5542 213.7828 192.6005 189.9534 197.4446 199.5749 222.6078 236.8171 263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50
310a 400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948
Water heating fuel
400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948 (310)
Cooling System Energy Efficiency Ratio 0.0000 (314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (315)
Pumps and Fa 1.8679 1.6872 1.8679 1.8077 1.8679 1.8077 1.8679 1.8679 1.8077 1.8679 1.8077 1.8679 (331)
Lighting 24.2988 19.4934 17.5516 12.8591 9.9327 8.1151 9.0610 11.7778 15.2982 20.0720 22.6713 24.9741 (332)
Electricity generated by PVs (Appendix M) (negative quantity)
(333a)m -17.9780 -26.9243 -45.2366 -58.5173 -66.4974 -66.2241 -64.3099 -58.6197 -48.0109 -34.7929 -20.6435 -14.9664 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(334a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (334a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.0204	-13.0409	-32.0085	-59.0559	-82.7431	-94.8946	-90.1802	-72.6219	-46.3379	-22.2034	-8.3869	-4.5323	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1781.0904	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	17.8109	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4981.5695	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1781.0904	6.5500	116.6614	(340a)
Space heating total			116.6614	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	196.1051	28.4300	55.7527	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	28.4300	-148.6096	
PV Unit electricity exported	-532.0259	5.8100	-30.9107	
Total			-179.5203	(352)
Total energy cost			367.5784	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1551.5248	0.1570	74.5776	(367)
Electrical energy for heat distribution (space & water)	17.8109	0.0000	8.4844	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			234.7343	(373)
Space and water heating			234.7343	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	0.1322	-69.1017	
PV Unit electricity exported	-532.0259	0.1213	-64.5494	
Total			-133.6511	(380)
Total CO2, kg/year			132.4380	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1551.5248	1.5813	751.0522	(467)
Electrical energy for heat distribution (space & water)	17.8109	0.0000	89.5668	(472)
Overall CO2 factor for heat network			0.4259	(486)
Total CO2 associated with community systems			2478.0148	(473)
Space and water heating			2478.0148	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	1.4884	-778.0360	
PV Unit electricity exported	-532.0259	0.4451	-236.7863	
Total			-1014.8223	(480)
Total Primary energy kWh/year			1797.2570	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Northeast

Current energy efficiency rating:	B 87
Current environmental impact rating:	A 98

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 87
Potential environmental impact rating: A 98

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£62	£62	£0
Community scheme	£485	£485	£0
Space heating	£227	£227	£0
Water heating	£264	£264	£0
Lighting	£56	£56	£0
Generated (PV)	-£180	-£180	£0
Total cost of fuels	£367	£367	£0
Total cost of uses	£367	£367	£0
Delivered energy	62 kWh/m²	62 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	2 kg/m²	2 kg/m²	0 kg/m²
Primary energy	22 kWh/m²	22 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17097.8798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6723 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
									Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)

Water heating gains (Table 5)

154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)

Total internal gains

610.7421	608.5956	590.7266	557.3213	524.1652	494.1729	476.4438	479.4976	496.5901	527.0115	563.7339	595.7477	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.8800	11.2829	0.6800	0.7000	0.7700	36.7722	(75)

Solar gains	36.7722	74.8509	134.8574	221.4746	297.7054	317.3854	296.9076	236.6981	164.3259	91.4737	46.2689	30.0300	(83)
Total gains	647.5143	683.4465	725.5841	778.7959	821.8706	811.5583	773.3514	716.1957	660.9160	618.4851	610.0028	625.7777	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9805	0.9708	0.9424	0.8627	0.7054	0.5137	0.3739	0.4213	0.6611	0.8929	0.9663	0.9838	(86)
MIT	20.2457	20.3562	20.5601	20.7973	20.9470	20.9926	20.9990	20.9981	20.9716	20.7848	20.4712	20.2038	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9759	0.9640	0.9292	0.8343	0.6580	0.4544	0.3091	0.3519	0.5970	0.8637	0.9572	0.9799	(89)
MIT 2	19.3642	19.5025	19.7539	20.0322	20.1892	20.2287	20.2328	20.2323	20.2138	20.0246	19.6482	19.3116	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.6130	19.7434	19.9814	20.2481	20.4030	20.4443	20.4490	20.4484	20.4276	20.2391	19.8804	19.5633	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6130	19.7434	19.9814	20.2481	20.4030	20.4443	20.4490	20.4484	20.4276	20.2391	19.8804	19.5633	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9713	0.9587	0.9242	0.8349	0.6689	0.4709	0.3274	0.3715	0.6138	0.8640	0.9522	0.9757	(94)
Useful gains	628.9173	655.2510	670.5868	650.2418	549.7246	382.1792	253.1994	266.0553	405.6396	534.3434	580.8561	610.5401	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1008.3761	977.4578	887.7682	747.2830	573.1042	384.8509	253.4610	266.5940	416.6813	634.7459	841.6065	1011.6933	(97)
Space heating kWh	282.3174	216.5230	161.5830	69.8696	17.3945	0.0000	0.0000	0.0000	0.0000	74.6994	187.7403	298.4580	(98a)
Space heating requirement - total per year (kWh/year)												1308.5852	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	282.3174	216.5230	161.5830	69.8696	17.3945	0.0000	0.0000	0.0000	0.0000	74.6994	187.7403	298.4580	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1308.5852	
Space heating per m2											(98c) / (4) =	16.3614	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	282.3174	216.5230	161.5830	69.8696	17.3945	0.0000	0.0000	0.0000	0.0000	74.6994	187.7403	298.4580	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	423.4761	324.7845	242.3744	104.8045	26.0917	0.0000	0.0000	0.0000	0.0000	112.0491	281.6104	447.6870	
Space heating requirement													
	423.4761	324.7845	242.3744	104.8045	26.0917	0.0000	0.0000	0.0000	0.0000	112.0491	281.6104	447.6870	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1962.8778	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												19.6288	(313)
Space cooling fuel												0.0000	(321)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)

mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5259.8829	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1962.8778	4.4400	87.1518	(340a)
Space heating total			87.1518	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	196.1051	16.4900	32.3377	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	16.4900	-80.4802	
PV Unit electricity exported	-470.1661	5.5900	-26.2823	
Total			-106.7625	(352)
Total energy cost			287.6022	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.8284	(357)
SAP value	86.5712	
SAP rating (Section 12)	87	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1600.0014	0.1565	81.9310	(367)
Electrical energy for heat distribution (space & water)	19.6288	0.0000	8.7601	(372)
Overall CO2 factor for heat network			0.0404	(386)
Total CO2 associated with community systems			242.3635	(373)
Space and water heating			242.3635	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			152.3216	(383)
CO2 emissions per m2			1.9000	(384)
EI value			98.3669	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 79.9800						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)

Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17097.8798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.6723 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)
Total storage loss	

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)

											Total per year (kWh/year) = Sum(64)m =	2691.4183	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000		(64a)
Heat gains from water heating, kWh/month													
114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207		(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains													
	610.7421	608.5956	590.7266	557.3213	524.1652	494.1729	476.4438	479.4976	496.5901	527.0115	563.7339	595.7477	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	9.8800	13.7758	0.6800	0.7000	0.7700	44.8965	(75)

Solar gains	44.8965	81.7088	145.7004	241.8651	312.1113	356.1490	327.2508	266.8970	187.4724	105.5879	55.7545	36.8040	(83)
Total gains	655.6386	690.3044	736.4270	799.1864	836.2765	850.3219	803.6947	746.3945	684.0626	632.5994	619.4884	632.5517	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area													
	0.9776	0.9669	0.9303	0.8371	0.6654	0.4468	0.3193	0.3611	0.6179	0.8656	0.9593	0.9815	(86)
MIT	20.2876	20.3948	20.6158	20.8353	20.9626	20.9967	20.9996	20.9992	20.9807	20.8307	20.5218	20.2443	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house													
	0.9723	0.9592	0.9146	0.8051	0.6155	0.3888	0.2566	0.2939	0.5527	0.8307	0.9484	0.9770	(89)
MIT 2	19.4169	19.5506	19.8210	20.0738	20.2035	20.2314	20.2330	20.2329	20.2206	20.0751	19.7106	19.3627	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.6626	19.7888	20.0453	20.2887	20.4177	20.4474	20.4494	20.4491	20.4351	20.2883	19.9395	19.6115	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6626	19.7888	20.0453	20.2887	20.4177	20.4474	20.4494	20.4491	20.4351	20.2883	19.9395	19.6115	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9674	0.9539	0.9102	0.8076	0.6279	0.4051	0.2743	0.3129	0.5703	0.8335	0.9435	0.9725	(94)
Useful gains	634.2946	658.4572	670.2727	645.4329	525.0763	344.4437	220.4714	233.5261	390.1314	527.2563	584.4580	615.1728	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	991.8918	960.6890	859.0480	723.6198	541.1477	345.5440	220.5590	233.7152	397.4182	605.0608	819.1553	995.1090	(97)
Space heating kWh													
	266.0523	203.0998	140.4488	56.2946	11.9571	0.0000	0.0000	0.0000	0.0000	57.8865	168.9820	282.6725	(98a)
Space heating requirement - total per year (kWh/year)												1187.3936	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	266.0523	203.0998	140.4488	56.2946	11.9571	0.0000	0.0000	0.0000	0.0000	57.8865	168.9820	282.6725	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1187.3936	
Space heating per m2											(98c) / (4) =	14.8461	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	266.0523	203.0998	140.4488	56.2946	11.9571	0.0000	0.0000	0.0000	0.0000	57.8865	168.9820	282.6725	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	399.0784	304.6497	210.6732	84.4419	17.9356	0.0000	0.0000	0.0000	0.0000	86.8298	253.4730	424.0088	
Space heating requirement													
	399.0784	304.6497	210.6732	84.4419	17.9356	0.0000	0.0000	0.0000	0.0000	86.8298	253.4730	424.0088	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.9780	-26.9243	-45.2366	-58.5173	-66.4974	-66.2241	-64.3099	-58.6197	-48.0109	-34.7929	-20.6435	-14.9664	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.0204	-13.0409	-32.0085	-59.0559	-82.7431	-94.8946	-90.1802	-72.6219	-46.3379	-22.2034	-8.3869	-4.5323	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1781.0904	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	17.8109	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4981.5695	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1781.0904	6.5500	116.6614	(340a)
Space heating total			116.6614	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	196.1051	28.4300	55.7527	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	28.4300	-148.6096	
PV Unit electricity exported	-532.0259	5.8100	-30.9107	
Total			-179.5203	(352)
Total energy cost			367.5784	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1551.5248	0.1570	74.5776	(367)
Electrical energy for heat distribution (space & water)	17.8109	0.0000	8.4844	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			234.7343	(373)
Space and water heating			234.7343	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	0.1322	-69.1017	
PV Unit electricity exported	-532.0259	0.1213	-64.5494	
Total			-133.6511	(380)
Total CO2, kg/year			132.4380	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1551.5248	1.5813	751.0522	(467)
Electrical energy for heat distribution (space & water)	17.8109	0.0000	89.5668	(472)
Overall CO2 factor for heat network			0.4259	(486)
Total CO2 associated with community systems			2478.0148	(473)
Space and water heating			2478.0148	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)

Energy saving/generation technologies				
PV Unit electricity used in dwelling		-522.7211	1.4884	-778.0360
PV Unit electricity exported		-532.0259	0.4451	-236.7863
Total				-1014.8223 (480)
Total Primary energy kWh/year				1797.2570 (483)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	2.01	**TER**	12.23
Environmental	98 A	**% DER < TER**			83.57
CO_2 Emissions (t/year)	0.13	**DFEE**	25.97	**TFEE**	32.84
Compliance Check	See BREL	**% DFEE < TFEE**			20.92
% DPER < TPER	60.65	**DPER**	25.50	**TPER**	64.80

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				4	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6723	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	33.5192	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.6786	139.1442	125.6786	129.8679	125.6786	129.8679	125.6786	125.6786	129.8679	125.6786	129.8679	125.6786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	559.0481	572.3498	548.4455	530.1166	504.1979	487.2994	469.3775	470.4487	484.3003	499.6452	529.1302	548.0502	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	9.8800	11.2829	0.6800	0.7000	0.7700	36.7722	(81)

Solar gains	36.7722	74.8509	134.8574	221.4746	297.7054	317.3854	296.9076	236.6981	164.3259	91.4737	46.2689	30.0300	(83)
Total gains	595.8203	647.2006	683.3029	751.5912	801.9033	804.6849	766.2851	707.1469	648.6262	591.1189	575.3991	578.0802	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9868	0.9770	0.9546	0.8768	0.7188	0.5178	0.3773	0.4266	0.6714	0.9080	0.9738	0.9889	(86)
MIT	20.1695	20.3057	20.5091	20.7764	20.9416	20.9923	20.9990	20.9980	20.9693	20.7597	20.4240	20.1324	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9835	0.9715	0.9436	0.8501	0.6716	0.4582	0.3120	0.3564	0.6070	0.8815	0.9665	0.9861	(89)
MIT 2	19.2686	19.4399	19.6927	20.0096	20.1844	20.2285	20.2327	20.2323	20.2121	19.9972	19.5904	19.2217	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.5228	19.6842	19.9231	20.2260	20.3981	20.4440	20.4490	20.4484	20.4258	20.2124	19.8256	19.4787	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5228	19.6842	19.9231	20.2260	20.3981	20.4440	20.4490	20.4484	20.4258	20.2124	19.8256	19.4787	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9797	0.9666	0.9384	0.8498	0.6821	0.4748	0.3304	0.3762	0.6238	0.8807	0.9617	0.9826	(94)
Useful gains	583.6955	625.6104	641.2437	638.7134	546.9888	382.0502	253.1845	266.0134	404.5880	520.5690	553.3876	568.0083	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1002.4406	973.5590	883.9250	745.8272	572.7807	384.8360	253.4592	266.5890	416.5584	632.9860	837.9953	1006.1178	(97)
Space heating kWh	311.5464	233.8215	180.5549	77.1220	19.1892	0.0000	0.0000	0.0000	0.0000	83.6383	204.9175	325.9534	(98a)
Space heating requirement - total per year (kWh/year)												1436.7431	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	311.5464	233.8215	180.5549	77.1220	19.1892	0.0000	0.0000	0.0000	0.0000	83.6383	204.9175	325.9534	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1436.7431	
Space heating per m2											(98c) / (4) =	17.9638	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	311.5464	233.8215	180.5549	77.1220	19.1892	0.0000	0.0000	0.0000	0.0000	83.6383	204.9175	325.9534	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	467.3196	350.7322	270.8323	115.6829	28.7837	0.0000	0.0000	0.0000	0.0000	125.4574	307.3763	488.9301	
Space heating requirement													
	467.3196	350.7322	270.8323	115.6829	28.7837	0.0000	0.0000	0.0000	0.0000	125.4574	307.3763	488.9301	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2155.1147	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	21.5511	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5452.1198	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1651.2645	0.1565	89.9310	(367)
Electrical energy for heat distribution (space & water)	21.5511	0.0000	9.0601	(372)
Overall CO2 factor for heat network			0.0405	(386)
Total CO2 associated with community systems			250.6635	(373)
Space and water heating			250.6635	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			160.6216	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.0100	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1651.2645	1.5793	907.6395	(467)
Electrical energy for heat distribution (space & water)	21.5511	0.0000	95.4388	(472)
Overall CO2 factor for heat network			0.4264	(486)
Total CO2 associated with community systems			2640.4741	(473)
Space and water heating			2640.4741	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	1.4873	-725.8942	
PV Unit electricity exported	-470.1661	0.4450	-209.2081	
Total			-935.1023	(480)
Total Primary energy kWh/year			2039.4363	(483)
Dwelling Primary energy Rate (DPER)			25.5000	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Semi-glazed door			3.5800	1.0000	3.5800			(26a)
TER Opening Type			9.8800	1.1450	11.3130			(27)
Heatloss Floor			39.9900	0.1300	5.1987			(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.1800	7.0326			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.5045			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			213.7769 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.4500	0.0500	0.4225
E3 Sill	6.7500	0.0500	0.3375
E4 Jamb	22.0000	0.0500	1.1000
E6 Intermediate floor within a dwelling	19.5200	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	6.0900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E5 Ground floor (normal)	19.5200	0.1600	3.1232
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
P1 Party wall - Ground floor	6.0900	0.0800	0.4872
E7 Party floor between dwellings (in blocks of flats)	14.1200	0.0700	0.9884
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.7208 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	41.2253 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	77.7420	77.5795	77.4202	76.6720	76.5321	75.8805	75.8805	75.7598	76.1315	76.5321	76.8152	77.1113	(39)
Average = Sum(39)m / 12 =												76.6714	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9700	0.9680	0.9586	0.9569	0.9487	0.9487	0.9472	0.9519	0.9569	0.9604	0.9641	(40)
HLP (average)												0.9586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers													
	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths													
	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses													
	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m													
	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
										Total per year (kWh/year) = Sum(64)m =		2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	122.0433	135.1194	122.0433	126.1114	122.0433	126.1114	122.0433	122.0433	126.1114	122.0433	126.1114	122.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													
	549.0775	561.9896	538.4748	520.0247	494.2273	474.2076	456.4069	457.4780	471.2084	489.6746	519.0383	538.0795	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	9.8800	11.2829	0.6300	0.7000	0.7700	34.0683	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	34.0683	69.3471	124.9414	205.1897	275.8153	294.0483	275.0761	219.2939	152.2431	84.7477	42.8668	27.8219	(83)
Total gains	583.1458	631.3367	663.4163	725.2145	770.0425	768.2558	731.4830	676.7719	623.4515	574.4222	561.9051	565.9014	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.0920	61.2199	61.3459	61.9445	62.0578	62.5907	62.5907	62.6904	62.3843	62.0578	61.8290	61.5917	
alpha	5.0728	5.0813	5.0897	5.1296	5.1372	5.1727	5.1727	5.1794	5.1590	5.1372	5.1219	5.1061	
util living area	0.9904	0.9843	0.9707	0.9208	0.8024	0.6091	0.4521	0.5068	0.7585	0.9398	0.9820	0.9917	(86)
MIT	19.8676	20.0135	20.2473	20.5904	20.8521	20.9720	20.9950	20.9913	20.9173	20.5963	20.1873	19.8444	(87)
Th 2	20.1067	20.1084	20.1101	20.1179	20.1194	20.1263	20.1263	20.1275	20.1236	20.1194	20.1164	20.1133	(88)
util rest of house	0.9879	0.9802	0.9626	0.8992	0.7546	0.5347	0.3645	0.4146	0.6886	0.9187	0.9764	0.9896	(89)
MIT 2	18.7907	18.9768	19.2725	19.6974	19.9913	20.1090	20.1244	20.1239	20.0643	19.7132	19.2045	18.7661	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.0946	19.2693	19.5476	19.9494	20.2342	20.3526	20.3701	20.3687	20.3050	19.9624	19.4818	19.0704	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0946	19.2693	19.5476	19.9494	20.2342	20.3526	20.3701	20.3687	20.3050	19.9624	19.4818	19.0704	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9840	0.9751	0.9562	0.8944	0.7613	0.5546	0.3892	0.4405	0.7041	0.9142	0.9712	0.9861	(94)
Useful gains	573.8280	615.6107	634.3798	648.6521	586.2259	426.0651	284.7145	298.1494	438.9957	525.1329	545.7404	558.0105	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1150.1584	1114.7659	1010.1473	847.1793	653.1427	436.5069	286.0738	300.6663	472.3973	716.5255	951.1136	1146.6739	(97)
Space heating kWh	428.7898	335.4323	279.5710	142.9396	49.7861	0.0000	0.0000	0.0000	0.0000	142.3961	291.8687	437.9656	(98a)
Space heating requirement - total per year (kWh/year)												2108.7491	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	428.7898	335.4323	279.5710	142.9396	49.7861	0.0000	0.0000	0.0000	0.0000	142.3961	291.8687	437.9656	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2108.7491	
Space heating per m2											(98c) / (4) =	26.3660	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	428.7898	335.4323	279.5710	142.9396	49.7861	0.0000	0.0000	0.0000	0.0000	142.3961	291.8687	437.9656	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	464.5610	363.4153	302.8938	154.8641	53.9395	0.0000	0.0000	0.0000	0.0000	154.2752	316.2174	474.5022	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4514	85.1904	84.6545	83.4396	81.5627	79.8000	79.8000	79.8000	79.8000	83.4040	84.8722	85.5178	(217)
Fuel for water heating, kWh/month	267.1873	236.9413	253.4388	226.7357	225.2236	207.8751	205.6450	213.6686	215.8200	229.7100	239.3109	264.1811	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.3582	20.3433	18.3169	13.4197	10.3658	8.4689	9.4560	12.2913	15.9652	20.9471	23.6598	26.0630	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3424	-31.5676	-47.5704	-56.1485	-62.8691	-59.5233	-58.7993	-54.3654	-46.9365	-37.2699	-23.9846	-18.2835	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9342	-17.0411	-34.5369	-52.8648	-70.8844	-71.5905	-70.7461	-59.4418	-42.9727	-24.6882	-10.6939	-6.2480	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2284.6686	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2785.7376	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	204.6551	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4372.7582	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2284.6686	0.2100	479.7804	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2785.7376	0.2100	585.0049	(264)
Space and water heating			1064.7853	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	204.6551	0.1443	29.5381	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	0.1336	-69.2911	
PV Unit electricity exported	-469.6425	0.1253	-58.8667	
Total			-128.1578	(269)
Total CO2, kg/year			978.0948	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.2300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2284.6686	1.1300	2581.6755	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2785.7376	1.1300	3147.8835	(278)
Space and water heating			5729.5590	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	204.6551	1.5338	313.9068	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	1.4937	-774.7198	
PV Unit electricity exported	-469.6425	0.4601	-216.0686	
Total			-990.7884	(283)
Total Primary energy kWh/year			5182.7782	(286)
Target Primary Energy Rate (TPER)			64.8000	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	2.01	**TER**	12.23
Environmental	98 A	**% DER < TER**			83.57
CO_2 Emissions (t/year)	0.13	**DFEE**	25.97	**TFEE**	32.84
Compliance Check	See BREL	**% DFEE < TFEE**			20.92
% DPER < TPER	60.65	**DPER**	25.50	**TPER**	64.80

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2122	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2705	0.2652	0.2599	0.2334	0.2281	0.2016	0.2016	0.1963	0.2122	0.2281	0.2387	0.2493	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5366	0.5352	0.5338	0.5272	0.5260	0.5203	0.5203	0.5193	0.5225	0.5260	0.5285	0.5311	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17097.8798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.6723 (36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.6979	34.6061	34.5160	34.0930	34.0139	33.6455	33.6455	33.5772	33.7874	34.0139	34.1740	34.3414	(38)
Heat transfer coeff	68.2172	68.1253	68.0352	67.6122	67.5331	67.1647	67.1647	67.0965	67.3066	67.5331	67.6932	67.8606	(39)
Average = Sum(39)m / 12 =												67.6118	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8529	0.8518	0.8507	0.8454	0.8444	0.8398	0.8398	0.8389	0.8415	0.8444	0.8464	0.8485	(40)
HLP (average)												0.8454	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.6786	139.1442	125.6786	129.8679	125.6786	129.8679	125.6786	125.6786	129.8679	125.6786	129.8679	125.6786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains	453.4664	467.9883	446.9019	435.3676	413.4459	400.7688	385.7326	384.8800	396.4077	407.0433	430.0429	443.3929	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	9.8800	11.2829	0.6800	0.7000	0.7700	36.7722	(81)

Solar gains	36.7722	74.8509	134.8574	221.4746	297.7054	317.3854	296.9076	236.6981	164.3259	91.4737	46.2689	30.0300	(83)
Total gains	490.2385	542.8392	581.7593	656.8422	711.1513	718.1543	682.6402	621.5782	560.7336	498.5170	476.3118	473.4229	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.6219	69.7158	69.8081	70.2449	70.3272	70.7129	70.7129	70.7848	70.5638	70.3272	70.1608	69.9878	
alpha	5.6415	5.6477	5.6539	5.6830	5.6885	5.7142	5.7142	5.7190	5.7043	5.6885	5.6774	5.6659	
util living area	0.9951	0.9904	0.9786	0.9264	0.7930	0.5853	0.4309	0.4919	0.7605	0.9541	0.9895	0.9960	(86)
MIT	19.9498	20.0982	20.3271	20.6615	20.8964	20.9847	20.9977	20.9954	20.9387	20.6338	20.2418	19.9211	(87)

Th 2	20.2077	20.2087	20.2096	20.2142	20.2150	20.2190	20.2190	20.2197	20.2175	20.2150	20.2133	20.2115	(88)
util rest of house	0.9938	0.9878	0.9727	0.9069	0.7477	0.5191	0.3554	0.4108	0.6960	0.9377	0.9863	0.9949	(89)
MIT 2	19.2436	19.3916	19.6179	19.9409	20.1450	20.2116	20.2183	20.2182	20.1827	19.9213	19.5386	19.2182	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.4429	19.5910	19.8181	20.1442	20.3571	20.4297	20.4383	20.4375	20.3960	20.1224	19.7370	19.4165	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4429	19.5910	19.8181	20.1442	20.3571	20.4297	20.4383	20.4375	20.3960	20.1224	19.7370	19.4165	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9921	0.9853	0.9692	0.9050	0.7564	0.5373	0.3767	0.4337	0.7116	0.9354	0.9837	0.9934	(94)
Useful gains	486.3669	534.8568	563.8131	594.4227	537.9031	385.8926	257.1795	269.5748	399.0329	466.3259	468.5578	470.3159	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1033.0056	1000.8305	906.0969	760.2473	584.6392	391.5520	257.7951	270.9026	423.7652	643.0741	855.4414	1032.6026	(97)
Space heating kWh	406.6992	313.1343	254.6592	119.3937	34.7717	0.0000	0.0000	0.0000	0.0000	131.5007	278.5562	418.3413	(98a)
Space heating requirement - total per year (kWh/year)												1957.0563	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	406.6992	313.1343	254.6592	119.3937	34.7717	0.0000	0.0000	0.0000	0.0000	131.5007	278.5562	418.3413	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1957.0563	
Space heating per m2											(98c) / (4) =	24.4693	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	631.3480	497.0186	509.9330	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9249	0.9640	0.9412	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	583.9460	479.1241	479.9481	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	780.0283	741.3638	672.5779	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	141.1792	195.1063	143.3166	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	35.2948	48.7766	35.8291	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												119.9005	(107)
Energy for space heating												24.4693	(99)
Energy for space cooling												1.4991	(108)
Total												25.9685	(109)
Fabric Energy Efficiency (DFEE)												26.0	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		3 * 10 =	30.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1531 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.4031 (18)
Number of sides sheltered			4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Semi-glazed door			3.5800	1.0000	3.5800			(26a)
TER Opening Type			9.8800	1.1450	11.3130			(27)
Heatloss Floor			39.9900	0.1300	5.1987			(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.1800	7.0326			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.5045			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 213.7769 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.4500	0.0500	0.4225
E3 Sill	6.7500	0.0500	0.3375
E4 Jamb	22.0000	0.0500	1.1000
E6 Intermediate floor within a dwelling	19.5200	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	6.0900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E5 Ground floor (normal)	19.5200	0.1600	3.1232
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
P1 Party wall - Ground floor	6.0900	0.0800	0.4872
E7 Party floor between dwellings (in blocks of flats)	14.1200	0.0700	0.9884

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.7208 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.2253 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	77.7420	77.5795	77.4202	76.6720	76.5321	75.8805	75.8805	75.7598	76.1315	76.5321	76.8152	77.1113	(39)

Average = Sum(39)m / 12 = 76.6714

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9700	0.9680	0.9586	0.9569	0.9487	0.9487	0.9472	0.9519	0.9569	0.9604	0.9641	(40)
HLP (average)												0.9586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	122.0433	135.1194	122.0433	126.1114	122.0433	126.1114	122.0433	122.0433	126.1114	122.0433	126.1114	122.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains													
	449.8311	463.9635	443.2666	431.6111	409.8106	397.0124	382.0973	381.2447	392.6512	403.4080	426.2864	439.7576	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	9.8800	11.2829	0.6300	0.7000	0.7700	34.0683	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	34.0683	69.3471	124.9414	205.1897	275.8153	294.0483	275.0761	219.2939	152.2431	84.7477	42.8668	27.8219	(83)
Total gains	483.8994	533.3107	568.2080	636.8008	685.6259	691.0606	657.1735	600.5386	544.8943	488.1557	469.1532	467.5795	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.0920	61.2199	61.3459	61.9445	62.0578	62.5907	62.5907	62.6904	62.3843	62.0578	61.8290	61.5917	
alpha	5.0728	5.0813	5.0897	5.1296	5.1372	5.1727	5.1727	5.1794	5.1590	5.1372	5.1219	5.1061	
util living area													
	0.9958	0.9924	0.9843	0.9495	0.8523	0.6647	0.5004	0.5652	0.8219	0.9670	0.9916	0.9965	(86)
MIT	19.7172	19.8686	20.1142	20.4909	20.7992	20.9585	20.9921	20.9857	20.8778	20.4894	20.0510	19.6944	(87)
Th 2	20.1067	20.1084	20.1101	20.1179	20.1194	20.1263	20.1263	20.1275	20.1236	20.1194	20.1164	20.1133	(88)
util rest of house													
	0.9946	0.9902	0.9796	0.9340	0.8100	0.5879	0.4048	0.4652	0.7579	0.9539	0.9889	0.9955	(89)
MIT 2	18.9322	19.0839	19.3284	19.6999	19.9791	20.1057	20.1239	20.1227	20.0517	19.7050	19.2723	18.9146	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.1537	19.3053	19.5502	19.9231	20.2106	20.3464	20.3689	20.3663	20.2848	19.9264	19.4921	19.1347	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1537	19.3053	19.5502	19.9231	20.2106	20.3464	20.3689	20.3663	20.2848	19.9264	19.4921	19.1347	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9929	0.9877	0.9759	0.9299	0.8148	0.6081	0.4318	0.4933	0.7709	0.9503	0.9863	0.9940	(94)
Useful gains	480.4723	526.7404	554.5118	592.1803	558.6808	420.2541	283.7866	296.2669	420.0845	463.8831	462.7212	464.7833	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1154.7562	1117.5594	1010.3475	845.1615	651.3302	436.0358	285.9830	300.4840	470.8568	713.7660	951.8983	1151.6338	(97)
Space heating kWh													
	501.6673	397.0304	339.1418	182.1465	68.9312	0.0000	0.0000	0.0000	0.0000	185.9128	352.2075	511.0168	(98a)
Space heating requirement - total per year (kWh/year)												2538.0543	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	501.6673	397.0304	339.1418	182.1465	68.9312	0.0000	0.0000	0.0000	0.0000	185.9128	352.2075	511.0168	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2538.0543	
Space heating per m2										(98c) / (4) =		31.7336	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	713.2763	561.5154	575.7744	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8595	0.9208	0.8854	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	613.0835	517.0554	509.7738	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	752.4330	715.5028	651.7885	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	100.3316	147.6449	105.6589	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	25.0829	36.9112	26.4147	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												88.4089	(107)
Energy for space heating												31.7336	(99)
Energy for space cooling												1.1054	(108)
Total												32.8390	(109)
Fabric Energy Efficiency (TFEE)												32.8	(109)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	2.01	**TER**	12.23
Environmental	98 A	**% DER < TER**			83.57
CO_2 Emissions (t/year)	0.13	**DFEE**	25.97	**TFEE**	32.84
Compliance Check	See BREL	**% DFEE < TFEE**			20.92
% DPER < TPER	60.65	**DPER**	25.50	**TPER**	64.80

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				4	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6723	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	33.5192	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.6786	139.1442	125.6786	129.8679	125.6786	129.8679	125.6786	125.6786	129.8679	125.6786	129.8679	125.6786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	559.0481	572.3498	548.4455	530.1166	504.1979	487.2994	469.3775	470.4487	484.3003	499.6452	529.1302	548.0502	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	9.8800	11.2829	0.6800	0.7000	0.7700	36.7722	(81)

Solar gains	36.7722	74.8509	134.8574	221.4746	297.7054	317.3854	296.9076	236.6981	164.3259	91.4737	46.2689	30.0300	(83)
Total gains	595.8203	647.2006	683.3029	751.5912	801.9033	804.6849	766.2851	707.1469	648.6262	591.1189	575.3991	578.0802	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9868	0.9770	0.9546	0.8768	0.7188	0.5178	0.3773	0.4266	0.6714	0.9080	0.9738	0.9889	(86)
MIT	20.1695	20.3057	20.5091	20.7764	20.9416	20.9923	20.9990	20.9980	20.9693	20.7597	20.4240	20.1324	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9835	0.9715	0.9436	0.8501	0.6716	0.4582	0.3120	0.3564	0.6070	0.8815	0.9665	0.9861	(89)
MIT 2	19.2686	19.4399	19.6927	20.0096	20.1844	20.2285	20.2327	20.2323	20.2121	19.9972	19.5904	19.2217	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.5228	19.6842	19.9231	20.2260	20.3981	20.4440	20.4490	20.4484	20.4258	20.2124	19.8256	19.4787	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5228	19.6842	19.9231	20.2260	20.3981	20.4440	20.4490	20.4484	20.4258	20.2124	19.8256	19.4787	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9797	0.9666	0.9384	0.8498	0.6821	0.4748	0.3304	0.3762	0.6238	0.8807	0.9617	0.9826	(94)
Useful gains	583.6955	625.6104	641.2437	638.7134	546.9888	382.0502	253.1845	266.0134	404.5880	520.5690	553.3876	568.0083	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1002.4406	973.5590	883.9250	745.8272	572.7807	384.8360	253.4592	266.5890	416.5584	632.9860	837.9953	1006.1178	(97)
Space heating kWh	311.5464	233.8215	180.5549	77.1220	19.1892	0.0000	0.0000	0.0000	0.0000	83.6383	204.9175	325.9534	(98a)
Space heating requirement - total per year (kWh/year)												1436.7431	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	311.5464	233.8215	180.5549	77.1220	19.1892	0.0000	0.0000	0.0000	0.0000	83.6383	204.9175	325.9534	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1436.7431	
Space heating per m2											(98c) / (4) =	17.9638	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	311.5464	233.8215	180.5549	77.1220	19.1892	0.0000	0.0000	0.0000	0.0000	83.6383	204.9175	325.9534	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	467.3196	350.7322	270.8323	115.6829	28.7837	0.0000	0.0000	0.0000	0.0000	125.4574	307.3763	488.9301	
Space heating requirement													
	467.3196	350.7322	270.8323	115.6829	28.7837	0.0000	0.0000	0.0000	0.0000	125.4574	307.3763	488.9301	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	2155.1147	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	21.5511	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5452.1198	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1651.2645	0.1565	89.9310	(367)
Electrical energy for heat distribution (space & water)	21.5511	0.0000	9.0601	(372)
Overall CO2 factor for heat network			0.0405	(386)
Total CO2 associated with community systems			250.6635	(373)
Space and water heating			250.6635	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			160.6216	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.0100	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1651.2645	1.5793	907.6395	(467)
Electrical energy for heat distribution (space & water)	21.5511	0.0000	95.4388	(472)
Overall CO2 factor for heat network			0.4264	(486)
Total CO2 associated with community systems			2640.4741	(473)
Space and water heating			2640.4741	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	1.4873	-725.8942	
PV Unit electricity exported	-470.1661	0.4450	-209.2081	
Total			-935.1023	(480)
Total Primary energy kWh/year			2039.4363	(483)
Dwelling Primary energy Rate (DPER)			25.5000	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Semi-glazed door			3.5800	1.0000	3.5800			(26a)
TER Opening Type			9.8800	1.1450	11.3130			(27)
Heatloss Floor			39.9900	0.1300	5.1987			(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.1800	7.0326			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.5045			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			213.7769 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.4500	0.0500	0.4225
E3 Sill	6.7500	0.0500	0.3375
E4 Jamb	22.0000	0.0500	1.1000
E6 Intermediate floor within a dwelling	19.5200	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	6.0900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E5 Ground floor (normal)	19.5200	0.1600	3.1232
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
P1 Party wall - Ground floor	6.0900	0.0800	0.4872
E7 Party floor between dwellings (in blocks of flats)	14.1200	0.0700	0.9884
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.7208 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	41.2253 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	77.7420	77.5795	77.4202	76.6720	76.5321	75.8805	75.8805	75.7598	76.1315	76.5321	76.8152	77.1113	(39)
Average = Sum(39)m / 12 =												76.6714	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9700	0.9680	0.9586	0.9569	0.9487	0.9487	0.9472	0.9519	0.9569	0.9604	0.9641	(40)
HLP (average)												0.9586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers													
	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths													
	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses													
	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m													
	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
										Total per year (kWh/year) = Sum(64)m =		2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	122.0433	135.1194	122.0433	126.1114	122.0433	126.1114	122.0433	122.0433	126.1114	122.0433	126.1114	122.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													
	549.0775	561.9896	538.4748	520.0247	494.2273	474.2076	456.4069	457.4780	471.2084	489.6746	519.0383	538.0795	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	9.8800	11.2829	0.6300	0.7000	0.7700	34.0683	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	34.0683	69.3471	124.9414	205.1897	275.8153	294.0483	275.0761	219.2939	152.2431	84.7477	42.8668	27.8219	(83)
Total gains	583.1458	631.3367	663.4163	725.2145	770.0425	768.2558	731.4830	676.7719	623.4515	574.4222	561.9051	565.9014	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.0920	61.2199	61.3459	61.9445	62.0578	62.5907	62.5907	62.6904	62.3843	62.0578	61.8290	61.5917	
alpha	5.0728	5.0813	5.0897	5.1296	5.1372	5.1727	5.1727	5.1794	5.1590	5.1372	5.1219	5.1061	
util living area	0.9904	0.9843	0.9707	0.9208	0.8024	0.6091	0.4521	0.5068	0.7585	0.9398	0.9820	0.9917	(86)
MIT	19.8676	20.0135	20.2473	20.5904	20.8521	20.9720	20.9950	20.9913	20.9173	20.5963	20.1873	19.8444	(87)
Th 2	20.1067	20.1084	20.1101	20.1179	20.1194	20.1263	20.1263	20.1275	20.1236	20.1194	20.1164	20.1133	(88)
util rest of house	0.9879	0.9802	0.9626	0.8992	0.7546	0.5347	0.3645	0.4146	0.6886	0.9187	0.9764	0.9896	(89)
MIT 2	18.7907	18.9768	19.2725	19.6974	19.9913	20.1090	20.1244	20.1239	20.0643	19.7132	19.2045	18.7661	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.0946	19.2693	19.5476	19.9494	20.2342	20.3526	20.3701	20.3687	20.3050	19.9624	19.4818	19.0704	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0946	19.2693	19.5476	19.9494	20.2342	20.3526	20.3701	20.3687	20.3050	19.9624	19.4818	19.0704	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9840	0.9751	0.9562	0.8944	0.7613	0.5546	0.3892	0.4405	0.7041	0.9142	0.9712	0.9861	(94)
Useful gains	573.8280	615.6107	634.3798	648.6521	586.2259	426.0651	284.7145	298.1494	438.9957	525.1329	545.7404	558.0105	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1150.1584	1114.7659	1010.1473	847.1793	653.1427	436.5069	286.0738	300.6663	472.3973	716.5255	951.1136	1146.6739	(97)
Space heating kWh	428.7898	335.4323	279.5710	142.9396	49.7861	0.0000	0.0000	0.0000	0.0000	142.3961	291.8687	437.9656	(98a)
Space heating requirement - total per year (kWh/year)												2108.7491	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	428.7898	335.4323	279.5710	142.9396	49.7861	0.0000	0.0000	0.0000	0.0000	142.3961	291.8687	437.9656	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2108.7491	
Space heating per m2											(98c) / (4) =	26.3660	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	428.7898	335.4323	279.5710	142.9396	49.7861	0.0000	0.0000	0.0000	0.0000	142.3961	291.8687	437.9656	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	464.5610	363.4153	302.8938	154.8641	53.9395	0.0000	0.0000	0.0000	0.0000	154.2752	316.2174	474.5022	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4514	85.1904	84.6545	83.4396	81.5627	79.8000	79.8000	79.8000	79.8000	83.4040	84.8722	85.5178	(217)
Fuel for water heating, kWh/month	267.1873	236.9413	253.4388	226.7357	225.2236	207.8751	205.6450	213.6686	215.8200	229.7100	239.3109	264.1811	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.3582	20.3433	18.3169	13.4197	10.3658	8.4689	9.4560	12.2913	15.9652	20.9471	23.6598	26.0630	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3424	-31.5676	-47.5704	-56.1485	-62.8691	-59.5233	-58.7993	-54.3654	-46.9365	-37.2699	-23.9846	-18.2835	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9342	-17.0411	-34.5369	-52.8648	-70.8844	-71.5905	-70.7461	-59.4418	-42.9727	-24.6882	-10.6939	-6.2480	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2284.6686	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2785.7376	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	204.6551	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4372.7582	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2284.6686	0.2100	479.7804	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2785.7376	0.2100	585.0049	(264)
Space and water heating			1064.7853	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	204.6551	0.1443	29.5381	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	0.1336	-69.2911	
PV Unit electricity exported	-469.6425	0.1253	-58.8667	
Total			-128.1578	(269)
Total CO2, kg/year			978.0948	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.2300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2284.6686	1.1300	2581.6755	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2785.7376	1.1300	3147.8835	(278)
Space and water heating			5729.5590	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	204.6551	1.5338	313.9068	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	1.4937	-774.7198	
PV Unit electricity exported	-469.6425	0.4601	-216.0686	
Total			-990.7884	(283)
Total Primary energy kWh/year			5182.7782	(286)
Target Primary Energy Rate (TPER)			64.8000	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	2.01	**TER**	12.23
Environmental	98 A	**% DER < TER**			83.57
CO_2 Emissions (t/year)	0.13	**DFEE**	25.97	**TFEE**	32.84
Compliance Check	See BREL	**% DFEE < TFEE**			20.92
% DPER < TPER	60.65	**DPER**	25.50	**TPER**	64.80

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 3.6723 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	610.7421	608.5956	590.7266	557.3213	524.1652	494.1729	476.4438	479.4976	496.5901	527.0115	563.7339	595.7477	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	9.8800	11.2829	0.6800	0.7000	0.7700	36.7722	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	36.7722	74.8509	134.8574	221.4746	297.7054	317.3854	296.9076	236.6981	164.3259	91.4737	46.2689	30.0300	(83)
Total gains	647.5143	683.4465	725.5841	778.7959	821.8706	811.5583	773.3514	716.1957	660.9160	618.4851	610.0028	625.7777	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9805	0.9708	0.9424	0.8627	0.7054	0.5137	0.3739	0.4213	0.6611	0.8929	0.9663	0.9838	(86)
MIT	20.2457	20.3562	20.5601	20.7973	20.9470	20.9926	20.9990	20.9981	20.9716	20.7848	20.4712	20.2038	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9759	0.9640	0.9292	0.8343	0.6580	0.4544	0.3091	0.3519	0.5970	0.8637	0.9572	0.9799	(89)
MIT 2	19.3642	19.5025	19.7539	20.0322	20.1892	20.2287	20.2328	20.2323	20.2138	20.0246	19.6482	19.3116	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.6130	19.7434	19.9814	20.2481	20.4030	20.4443	20.4490	20.4484	20.4276	20.2391	19.8804	19.5633	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6130	19.7434	19.9814	20.2481	20.4030	20.4443	20.4490	20.4484	20.4276	20.2391	19.8804	19.5633	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9713	0.9587	0.9242	0.8349	0.6689	0.4709	0.3274	0.3715	0.6138	0.8640	0.9522	0.9757	(94)
Useful gains	628.9173	655.2510	670.5868	650.2418	549.7246	382.1792	253.1994	266.0553	405.6396	534.3434	580.8561	610.5401	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1008.3761	977.4578	887.7682	747.2830	573.1042	384.8509	253.4610	266.5940	416.6813	634.7459	841.6065	1011.6933	(97)
Space heating kWh	282.3174	216.5230	161.5830	69.8696	17.3945	0.0000	0.0000	0.0000	0.0000	74.6994	187.7403	298.4580	(98a)
Space heating requirement - total per year (kWh/year)												1308.5852	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	282.3174	216.5230	161.5830	69.8696	17.3945	0.0000	0.0000	0.0000	0.0000	74.6994	187.7403	298.4580	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1308.5852	
Space heating per m2											(98c) / (4) =	16.3614	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	282.3174	216.5230	161.5830	69.8696	17.3945	0.0000	0.0000	0.0000	0.0000	74.6994	187.7403	298.4580	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	423.4761	324.7845	242.3744	104.8045	26.0917	0.0000	0.0000	0.0000	0.0000	112.0491	281.6104	447.6870	
Space heating requirement													
	423.4761	324.7845	242.3744	104.8045	26.0917	0.0000	0.0000	0.0000	0.0000	112.0491	281.6104	447.6870	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1962.8778	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												19.6288	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)
Total electricity for the above, kWh/year												21.9935	(331)
Electricity for lighting (calculated in Appendix L)												196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5259.8829	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1962.8778	4.4400	87.1518	(340a)
Space heating total			87.1518	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	196.1051	16.4900	32.3377	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	16.4900	-80.4802	
PV Unit electricity exported	-470.1661	5.5900	-26.2823	
Total			-106.7625	(352)
Total energy cost			287.6022	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8284 (357)
SAP value		86.5712
SAP rating (Section 12)		87 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1600.0014	0.1565	81.9310	(367)
Electrical energy for heat distribution (space & water)	19.6288	0.0000	8.7601	(372)
Overall CO2 factor for heat network			0.0404	(386)
Total CO2 associated with community systems			242.3635	(373)
Space and water heating			242.3635	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			152.3216	(383)
CO2 emissions per m2			1.9000	(384)
EI value			98.3669	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 79.9800						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate													
	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17097.8798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.6723	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 33.5192	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff													
	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m													
	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
327.4608 330.8588 322.2959 304.0665 281.0552 259.4278 244.9794 241.5813 250.1442 268.3736 291.3850 313.0124 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 (71)
Water heating gains (Table 5)
154.0336 151.5930 146.8914 136.5869 130.2751 123.6777 119.6256 122.9734 126.8986 134.2191 144.0972 152.7161 (72)
Total internal gains
610.7421 608.5956 590.7266 557.3213 524.1652 494.1729 476.4438 479.4976 496.5901 527.0115 563.7339 595.7477 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	9.8800	13.7758	0.6800	0.7000	0.7700	44.8965	(81)

Solar gains 44.8965 81.7088 145.7004 241.8651 312.1113 356.1490 327.2508 266.8970 187.4724 105.5879 55.7545 36.8040 (83)
Total gains 655.6386 690.3044 736.4270 799.1864 836.2765 850.3219 803.6947 746.3945 684.0626 632.5994 619.4884 632.5517 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9776	0.9669	0.9303	0.8371	0.6654	0.4468	0.3193	0.3611	0.6179	0.8656	0.9593	0.9815	(86)
MIT	20.2876	20.3948	20.6158	20.8353	20.9626	20.9967	20.9996	20.9992	20.9807	20.8307	20.5218	20.2443	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9723	0.9592	0.9146	0.8051	0.6155	0.3888	0.2566	0.2939	0.5527	0.8307	0.9484	0.9770	(89)
MIT 2	19.4169	19.5506	19.8210	20.0738	20.2035	20.2314	20.2330	20.2329	20.2206	20.0751	19.7106	19.3627	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.6626	19.7888	20.0453	20.2887	20.4177	20.4474	20.4494	20.4491	20.4351	20.2883	19.9395	19.6115	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6626	19.7888	20.0453	20.2887	20.4177	20.4474	20.4494	20.4491	20.4351	20.2883	19.9395	19.6115	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9674	0.9539	0.9102	0.8076	0.6279	0.4051	0.2743	0.3129	0.5703	0.8335	0.9435	0.9725	(94)
Useful gains	634.2946	658.4572	670.2727	645.4329	525.0763	344.4437	220.4714	233.5261	390.1314	527.2563	584.4580	615.1728	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	991.8918	960.6890	859.0480	723.6198	541.1477	345.5440	220.5590	233.7152	397.4182	605.0608	819.1553	995.1090	(97)
Space heating kWh	266.0523	203.0998	140.4488	56.2946	11.9571	0.0000	0.0000	0.0000	0.0000	57.8865	168.9820	282.6725	(98a)
Space heating requirement - total per year (kWh/year)												1187.3936	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	266.0523	203.0998	140.4488	56.2946	11.9571	0.0000	0.0000	0.0000	0.0000	57.8865	168.9820	282.6725	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1187.3936	
Space heating per m2										(98c) / (4) =		14.8461	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement
266.0523 203.0998 140.4488 56.2946 11.9571 0.0000 0.0000 0.0000 0.0000 57.8865 168.9820 282.6725 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50
307a 399.0784 304.6497 210.6732 84.4419 17.9356 0.0000 0.0000 0.0000 0.0000 86.8298 253.4730 424.0088
Space heating requirement
399.0784 304.6497 210.6732 84.4419 17.9356 0.0000 0.0000 0.0000 0.0000 86.8298 253.4730 424.0088 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)

Water heating
Annual water heating requirement
266.9446 236.1786 250.9634 220.5542 213.7828 192.6005 189.9534 197.4446 199.5749 222.6078 236.8171 263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50
310a 400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948
Water heating fuel
400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948 (310)
Cooling System Energy Efficiency Ratio 0.0000 (314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (315)
Pumps and Fa 1.8679 1.6872 1.8679 1.8077 1.8679 1.8077 1.8679 1.8679 1.8077 1.8679 1.8077 1.8679 (331)
Lighting 24.2988 19.4934 17.5516 12.8591 9.9327 8.1151 9.0610 11.7778 15.2982 20.0720 22.6713 24.9741 (332)
Electricity generated by PVs (Appendix M) (negative quantity)
(333a)m -17.9780 -26.9243 -45.2366 -58.5173 -66.4974 -66.2241 -64.3099 -58.6197 -48.0109 -34.7929 -20.6435 -14.9664 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(334a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (334a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)

Electricity generated by PVs (Appendix M) (negative quantity)

(333b)m	-6.0204	-13.0409	-32.0085	-59.0559	-82.7431	-94.8946	-90.1802	-72.6219	-46.3379	-22.2034	-8.3869	-4.5323	(333b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1781.0904	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	17.8109	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4981.5695	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1781.0904	6.5500	116.6614	(340a)
Space heating total			116.6614	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	196.1051	28.4300	55.7527	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	28.4300	-148.6096	
PV Unit electricity exported	-532.0259	5.8100	-30.9107	
Total			-179.5203	(352)
Total energy cost			367.5784	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1551.5248	0.1570	74.5776	(367)
Electrical energy for heat distribution (space & water)	17.8109	0.0000	8.4844	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			234.7343	(373)
Space and water heating			234.7343	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	0.1322	-69.1017	
PV Unit electricity exported	-532.0259	0.1213	-64.5494	
Total			-133.6511	(380)
Total CO2, kg/year			132.4380	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1551.5248	1.5813	751.0522	(467)
Electrical energy for heat distribution (space & water)	17.8109	0.0000	89.5668	(472)
Overall CO2 factor for heat network			0.4259	(486)
Total CO2 associated with community systems			2478.0148	(473)
Space and water heating			2478.0148	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	1.4884	-778.0360	
PV Unit electricity exported	-532.0259	0.4451	-236.7863	
Total			-1014.8223	(480)
Total Primary energy kWh/year			1797.2570	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Northwest

Current energy efficiency rating:	B 87
Current environmental impact rating:	A 98

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 87
Potential environmental impact rating: A 98

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£62	£62	£0
Community scheme	£485	£485	£0
Space heating	£227	£227	£0
Water heating	£264	£264	£0
Lighting	£56	£56	£0
Generated (PV)	-£180	-£180	£0
Total cost of fuels	£367	£367	£0
Total cost of uses	£367	£367	£0
Delivered energy	62 kWh/m²	62 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	2 kg/m²	2 kg/m²	0 kg/m²
Primary energy	22 kWh/m²	22 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17097.8798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6723 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
									Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)

Water heating gains (Table 5)

154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)

Total internal gains

610.7421	608.5956	590.7266	557.3213	524.1652	494.1729	476.4438	479.4976	496.5901	527.0115	563.7339	595.7477	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	9.8800	11.2829	0.6800	0.7000	0.7700	36.7722	(81)

Solar gains	36.7722	74.8509	134.8574	221.4746	297.7054	317.3854	296.9076	236.6981	164.3259	91.4737	46.2689	30.0300	(83)
Total gains	647.5143	683.4465	725.5841	778.7959	821.8706	811.5583	773.3514	716.1957	660.9160	618.4851	610.0028	625.7777	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9805	0.9708	0.9424	0.8627	0.7054	0.5137	0.3739	0.4213	0.6611	0.8929	0.9663	0.9838	(86)
MIT	20.2457	20.3562	20.5601	20.7973	20.9470	20.9926	20.9990	20.9981	20.9716	20.7848	20.4712	20.2038	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9759	0.9640	0.9292	0.8343	0.6580	0.4544	0.3091	0.3519	0.5970	0.8637	0.9572	0.9799	(89)
MIT 2	19.3642	19.5025	19.7539	20.0322	20.1892	20.2287	20.2328	20.2323	20.2138	20.0246	19.6482	19.3116	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.6130	19.7434	19.9814	20.2481	20.4030	20.4443	20.4490	20.4484	20.4276	20.2391	19.8804	19.5633	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6130	19.7434	19.9814	20.2481	20.4030	20.4443	20.4490	20.4484	20.4276	20.2391	19.8804	19.5633	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9713	0.9587	0.9242	0.8349	0.6689	0.4709	0.3274	0.3715	0.6138	0.8640	0.9522	0.9757	(94)
Useful gains	628.9173	655.2510	670.5868	650.2418	549.7246	382.1792	253.1994	266.0553	405.6396	534.3434	580.8561	610.5401	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1008.3761	977.4578	887.7682	747.2830	573.1042	384.8509	253.4610	266.5940	416.6813	634.7459	841.6065	1011.6933	(97)
Space heating kWh	282.3174	216.5230	161.5830	69.8696	17.3945	0.0000	0.0000	0.0000	0.0000	74.6994	187.7403	298.4580	(98a)
Space heating requirement - total per year (kWh/year)												1308.5852	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	282.3174	216.5230	161.5830	69.8696	17.3945	0.0000	0.0000	0.0000	0.0000	74.6994	187.7403	298.4580	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1308.5852	
Space heating per m2											(98c) / (4) =	16.3614	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	282.3174	216.5230	161.5830	69.8696	17.3945	0.0000	0.0000	0.0000	0.0000	74.6994	187.7403	298.4580	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	423.4761	324.7845	242.3744	104.8045	26.0917	0.0000	0.0000	0.0000	0.0000	112.0491	281.6104	447.6870	
Space heating requirement													
	423.4761	324.7845	242.3744	104.8045	26.0917	0.0000	0.0000	0.0000	0.0000	112.0491	281.6104	447.6870	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1962.8778	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												19.6288	(313)
Space cooling fuel												0.0000	(321)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)

mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5259.8829	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1962.8778	4.4400	87.1518	(340a)
Space heating total			87.1518	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	196.1051	16.4900	32.3377	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	16.4900	-80.4802	
PV Unit electricity exported	-470.1661	5.5900	-26.2823	
Total			-106.7625	(352)
Total energy cost			287.6022	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.8284	(357)
SAP value	86.5712	
SAP rating (Section 12)	87	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1600.0014	0.1565	81.9310	(367)
Electrical energy for heat distribution (space & water)	19.6288	0.0000	8.7601	(372)
Overall CO2 factor for heat network			0.0404	(386)
Total CO2 associated with community systems			242.3635	(373)
Space and water heating			242.3635	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			152.3216	(383)
CO2 emissions per m2			1.9000	(384)
EI value			98.3669	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 79.9800						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)

Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17097.8798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.6723 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)
Total storage loss	

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)

											Total per year (kWh/year) = Sum(64)m =	2691.4183	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000		(64a)
Heat gains from water heating, kWh/month													
114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207		(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains													
	610.7421	608.5956	590.7266	557.3213	524.1652	494.1729	476.4438	479.4976	496.5901	527.0115	563.7339	595.7477	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	9.8800	13.7758	0.6800	0.7000	0.7700	44.8965	(81)

Solar gains	44.8965	81.7088	145.7004	241.8651	312.1113	356.1490	327.2508	266.8970	187.4724	105.5879	55.7545	36.8040	(83)
Total gains	655.6386	690.3044	736.4270	799.1864	836.2765	850.3219	803.6947	746.3945	684.0626	632.5994	619.4884	632.5517	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area													
	0.9776	0.9669	0.9303	0.8371	0.6654	0.4468	0.3193	0.3611	0.6179	0.8656	0.9593	0.9815	(86)
MIT	20.2876	20.3948	20.6158	20.8353	20.9626	20.9967	20.9996	20.9992	20.9807	20.8307	20.5218	20.2443	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house													
	0.9723	0.9592	0.9146	0.8051	0.6155	0.3888	0.2566	0.2939	0.5527	0.8307	0.9484	0.9770	(89)
MIT 2	19.4169	19.5506	19.8210	20.0738	20.2035	20.2314	20.2330	20.2329	20.2206	20.0751	19.7106	19.3627	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.6626	19.7888	20.0453	20.2887	20.4177	20.4474	20.4494	20.4491	20.4351	20.2883	19.9395	19.6115	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6626	19.7888	20.0453	20.2887	20.4177	20.4474	20.4494	20.4491	20.4351	20.2883	19.9395	19.6115	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9674	0.9539	0.9102	0.8076	0.6279	0.4051	0.2743	0.3129	0.5703	0.8335	0.9435	0.9725	(94)
Useful gains	634.2946	658.4572	670.2727	645.4329	525.0763	344.4437	220.4714	233.5261	390.1314	527.2563	584.4580	615.1728	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	991.8918	960.6890	859.0480	723.6198	541.1477	345.5440	220.5590	233.7152	397.4182	605.0608	819.1553	995.1090	(97)
Space heating kWh													
	266.0523	203.0998	140.4488	56.2946	11.9571	0.0000	0.0000	0.0000	0.0000	57.8865	168.9820	282.6725	(98a)
Space heating requirement - total per year (kWh/year)												1187.3936	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	266.0523	203.0998	140.4488	56.2946	11.9571	0.0000	0.0000	0.0000	0.0000	57.8865	168.9820	282.6725	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1187.3936	
Space heating per m2											(98c) / (4) =	14.8461	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	266.0523	203.0998	140.4488	56.2946	11.9571	0.0000	0.0000	0.0000	0.0000	57.8865	168.9820	282.6725	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	399.0784	304.6497	210.6732	84.4419	17.9356	0.0000	0.0000	0.0000	0.0000	86.8298	253.4730	424.0088	
Space heating requirement													
	399.0784	304.6497	210.6732	84.4419	17.9356	0.0000	0.0000	0.0000	0.0000	86.8298	253.4730	424.0088	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.9780	-26.9243	-45.2366	-58.5173	-66.4974	-66.2241	-64.3099	-58.6197	-48.0109	-34.7929	-20.6435	-14.9664	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.0204	-13.0409	-32.0085	-59.0559	-82.7431	-94.8946	-90.1802	-72.6219	-46.3379	-22.2034	-8.3869	-4.5323	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1781.0904	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	17.8109	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4981.5695	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1781.0904	6.5500	116.6614	(340a)
Space heating total			116.6614	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	196.1051	28.4300	55.7527	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	28.4300	-148.6096	
PV Unit electricity exported	-532.0259	5.8100	-30.9107	
Total			-179.5203	(352)
Total energy cost			367.5784	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1551.5248	0.1570	74.5776	(367)
Electrical energy for heat distribution (space & water)	17.8109	0.0000	8.4844	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			234.7343	(373)
Space and water heating			234.7343	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	0.1322	-69.1017	
PV Unit electricity exported	-532.0259	0.1213	-64.5494	
Total			-133.6511	(380)
Total CO2, kg/year			132.4380	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1551.5248	1.5813	751.0522	(467)
Electrical energy for heat distribution (space & water)	17.8109	0.0000	89.5668	(472)
Overall CO2 factor for heat network			0.4259	(486)
Total CO2 associated with community systems			2478.0148	(473)
Space and water heating			2478.0148	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)

Energy saving/generation technologies				
PV Unit electricity used in dwelling		-522.7211	1.4884	-778.0360
PV Unit electricity exported		-532.0259	0.4451	-236.7863
Total				-1014.8223 (480)
Total Primary energy kWh/year				1797.2570 (483)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.68	**TER**	11.01
Environmental	99 A	**% DER < TER**			84.74
CO_2 Emissions (t/year)	0.11	**DFEE**	20.09	**TFEE**	26.86
Compliance Check	See BREL	**% DFEE < TFEE**			25.22
% DPER < TPER	61.97	**DPER**	22.15	**TPER**	58.23

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				4	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6723	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	33.5192	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.6786	139.1442	125.6786	129.8679	125.6786	129.8679	125.6786	125.6786	129.8679	125.6786	129.8679	125.6786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	559.0481	572.3498	548.4455	530.1166	504.1979	487.2994	469.3775	470.4487	484.3003	499.6452	529.1302	548.0502	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	9.8800	46.7521	0.6800	0.7000	0.7700	152.3695	(78)

Solar gains	152.3695	249.5419	317.8721	359.2645	374.3758	360.2858	352.0212	341.8613	332.0550	269.1544	180.6098	131.6612	(83)
Total gains	711.4176	821.8917	866.3177	889.3811	878.5738	847.5853	821.3987	812.3100	816.3553	768.7996	709.7400	679.7114	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9703	0.9378	0.8912	0.8024	0.6687	0.4929	0.3522	0.3721	0.5482	0.7996	0.9377	0.9764	(86)
MIT	20.3357	20.5303	20.7034	20.8651	20.9595	20.9940	20.9993	20.9990	20.9889	20.8862	20.5947	20.2817	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9637	0.9253	0.8708	0.7692	0.6215	0.4356	0.2911	0.3105	0.4905	0.7604	0.9231	0.9710	(89)
MIT 2	19.4760	19.7143	19.9209	20.1037	20.2001	20.2296	20.2329	20.2327	20.2260	20.1295	19.7965	19.4089	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.7186	19.9445	20.1417	20.3185	20.4144	20.4453	20.4492	20.4490	20.4413	20.3431	20.0217	19.6552	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7186	19.9445	20.1417	20.3185	20.4144	20.4453	20.4492	20.4490	20.4413	20.3431	20.0217	19.6552	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9584	0.9200	0.8681	0.7731	0.6330	0.4516	0.3084	0.3279	0.5064	0.7663	0.9184	0.9660	(94)
Useful gains	681.8129	756.1376	752.0805	687.5792	556.1076	382.7640	253.2813	266.3520	413.3804	589.1611	651.8506	656.5843	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1015.3328	990.7006	898.3233	751.9229	573.8545	384.9184	253.4709	266.6295	417.5792	641.5911	850.9114	1017.7439	(97)
Space heating kWh	248.1388	157.6263	108.8047	46.3275	13.2037	0.0000	0.0000	0.0000	0.0000	39.0080	143.3238	268.7027	(98a)
Space heating requirement - total per year (kWh/year)												1025.1355	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	248.1388	157.6263	108.8047	46.3275	13.2037	0.0000	0.0000	0.0000	0.0000	39.0080	143.3238	268.7027	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1025.1355	
Space heating per m2										(98c) / (4) =		12.8174	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	248.1388	157.6263	108.8047	46.3275	13.2037	0.0000	0.0000	0.0000	0.0000	39.0080	143.3238	268.7027	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	372.2082	236.4395	163.2071	69.4912	19.8055	0.0000	0.0000	0.0000	0.0000	58.5119	214.9857	403.0541	
Space heating requirement	372.2082	236.4395	163.2071	69.4912	19.8055	0.0000	0.0000	0.0000	0.0000	58.5119	214.9857	403.0541	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1537.7032	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												15.3770	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)
Total electricity for the above, kWh/year												21.9935	(331)
Electricity for lighting (calculated in Appendix L)												196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4834.7083	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1486.6215	0.1575	64.5709	(367)
Electrical energy for heat distribution (space & water)	15.3770	0.0000	8.1091	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			224.3523	(373)
Space and water heating			224.3523	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			134.3105	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6800	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1486.6215	1.5829	649.0814	(467)
Electrical energy for heat distribution (space & water)	15.3770	0.0000	85.7429	(472)
Overall CO2 factor for heat network			0.4255	(486)
Total CO2 associated with community systems			2372.2201	(473)
Space and water heating			2372.2201	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	1.4873	-725.8942	
PV Unit electricity exported	-470.1661	0.4450	-209.2081	
Total			-935.1023	(480)
Total Primary energy kWh/year			1771.1822	(483)
Dwelling Primary energy Rate (DPER)			22.1500	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 79.9800						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Semi-glazed door			3.5800	1.0000	3.5800			(26a)
TER Opening Type			9.8800	1.1450	11.3130			(27)
Heatloss Floor			39.9900	0.1300	5.1987			(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.1800	7.0326			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.5045			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			213.7769 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.4500	0.0500	0.4225
E3 Sill	6.7500	0.0500	0.3375
E4 Jamb	22.0000	0.0500	1.1000
E6 Intermediate floor within a dwelling	19.5200	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	6.0900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E5 Ground floor (normal)	19.5200	0.1600	3.1232
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
P1 Party wall - Ground floor	6.0900	0.0800	0.4872
E7 Party floor between dwellings (in blocks of flats)	14.1200	0.0700	0.9884
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.7208 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	41.2253 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	77.7420	77.5795	77.4202	76.6720	76.5321	75.8805	75.8805	75.7598	76.1315	76.5321	76.8152	77.1113	(39)
Average = Sum(39)m / 12 =												76.6714	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9700	0.9680	0.9586	0.9569	0.9487	0.9487	0.9472	0.9519	0.9569	0.9604	0.9641	(40)
HLP (average)												0.9586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers													
	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths													
	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses													
	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m													
	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
										Total per year (kWh/year) = Sum(64)m =		2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	122.0433	135.1194	122.0433	126.1114	122.0433	126.1114	122.0433	122.0433	126.1114	122.0433	126.1114	122.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													
	549.0775	561.9896	538.4748	520.0247	494.2273	474.2076	456.4069	457.4780	471.2084	489.6746	519.0383	538.0795	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	9.8800	46.7521	0.6300	0.7000	0.7700	141.1658	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	141.1658	231.1932	294.4992	332.8480	346.8482	333.7942	326.1373	316.7245	307.6392	249.3636	167.3296	121.9803	(83)
Total gains	690.2433	793.1828	832.9740	852.8727	841.0755	808.0018	782.5441	774.2025	778.8476	739.0382	686.3680	660.0597	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.0920	61.2199	61.3459	61.9445	62.0578	62.5907	62.5907	62.6904	62.3843	62.0578	61.8290	61.5917	
alpha	5.0728	5.0813	5.0897	5.1296	5.1372	5.1727	5.1727	5.1794	5.1590	5.1372	5.1219	5.1061	
util living area	0.9806	0.9612	0.9325	0.8699	0.7601	0.5830	0.4237	0.4461	0.6429	0.8664	0.9602	0.9841	(86)
MIT	20.0236	20.2351	20.4562	20.7072	20.8859	20.9770	20.9963	20.9951	20.9612	20.7547	20.3563	19.9834	(87)
Th 2	20.1067	20.1084	20.1101	20.1179	20.1194	20.1263	20.1263	20.1275	20.1236	20.1194	20.1164	20.1133	(88)
util rest of house	0.9758	0.9522	0.9168	0.8404	0.7095	0.5104	0.3411	0.3635	0.5724	0.8310	0.9493	0.9801	(89)
MIT 2	18.9871	19.2519	19.5248	19.8281	20.0231	20.1123	20.1249	20.1256	20.0978	19.8880	19.4125	18.9416	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.2796	19.5294	19.7877	20.0762	20.2665	20.3563	20.3708	20.3710	20.3414	20.1326	19.6788	19.2356	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2796	19.5294	19.7877	20.0762	20.2665	20.3563	20.3708	20.3710	20.3414	20.1326	19.6788	19.2356	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9701	0.9450	0.9102	0.8388	0.7185	0.5300	0.3644	0.3868	0.5906	0.8316	0.9427	0.9749	(94)
Useful gains	669.5841	749.5687	758.1486	715.4086	604.2802	428.2702	285.1301	299.4593	459.9683	614.5867	647.0320	643.5145	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1164.5426	1134.9397	1028.7339	856.8987	655.6157	436.7916	286.1291	300.8387	475.1701	729.5508	966.2436	1159.4135	(97)
Space heating kWh	368.2492	258.9693	201.3154	101.8729	38.1936	0.0000	0.0000	0.0000	0.0000	85.5333	229.8323	383.8289	(98a)
Space heating requirement - total per year (kWh/year)												1667.7949	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	368.2492	258.9693	201.3154	101.8729	38.1936	0.0000	0.0000	0.0000	0.0000	85.5333	229.8323	383.8289	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1667.7949	
Space heating per m2											(98c) / (4) =	20.8526	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	368.2492	258.9693	201.3154	101.8729	38.1936	0.0000	0.0000	0.0000	0.0000	85.5333	229.8323	383.8289	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	398.9698	280.5735	218.1099	110.3715	41.3799	0.0000	0.0000	0.0000	0.0000	92.6688	249.0058	415.8492	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.1257	84.6197	83.9173	82.7349	81.2169	79.8000	79.8000	79.8000	79.8000	82.3769	84.3377	85.2381	(217)
Fuel for water heating, kWh/month	268.2098	238.5394	255.6652	228.6669	226.1826	207.8751	205.6450	213.6686	215.8200	232.5742	240.8277	265.0480	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.3582	20.3433	18.3169	13.4197	10.3658	8.4689	9.4560	12.2913	15.9652	20.9471	23.6598	26.0630	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3424	-31.5676	-47.5704	-56.1485	-62.8691	-59.5233	-58.7993	-54.3654	-46.9365	-37.2699	-23.9846	-18.2835	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9342	-17.0411	-34.5369	-52.8648	-70.8844	-71.5905	-70.7461	-59.4418	-42.9727	-24.6882	-10.6939	-6.2480	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1806.9284	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2798.7225	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	204.6551	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3908.0030	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1806.9284	0.2100	379.4550	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2798.7225	0.2100	587.7317	(264)
Space and water heating			967.1867	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	204.6551	0.1443	29.5381	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	0.1336	-69.2911	
PV Unit electricity exported	-469.6425	0.1253	-58.8667	
Total			-128.1578	(269)
Total CO2, kg/year			880.4962	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.0100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1806.9284	1.1300	2041.8291	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2798.7225	1.1300	3162.5565	(278)
Space and water heating			5204.3856	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	204.6551	1.5338	313.9068	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	1.4937	-774.7198	
PV Unit electricity exported	-469.6425	0.4601	-216.0686	
Total			-990.7884	(283)
Total Primary energy kWh/year			4657.6048	(286)
Target Primary Energy Rate (TPER)			58.2300	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.68	**TER**	11.01
Environmental	99 A	**% DER < TER**			84.74
CO_2 Emissions (t/year)	0.11	**DFEE**	20.09	**TFEE**	26.86
Compliance Check	See BREL	**% DFEE < TFEE**			25.22
% DPER < TPER	61.97	**DPER**	22.15	**TPER**	58.23

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.3031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2122 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2705	0.2652	0.2599	0.2334	0.2281	0.2016	0.2016	0.1963	0.2122	0.2281	0.2387	0.2493	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5366	0.5352	0.5338	0.5272	0.5260	0.5203	0.5203	0.5193	0.5225	0.5260	0.5285	0.5311	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							3.6723	(36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.6979	34.6061	34.5160	34.0930	34.0139	33.6455	33.6455	33.5772	33.7874	34.0139	34.1740	34.3414	(38)
Heat transfer coeff	68.2172	68.1253	68.0352	67.6122	67.5331	67.1647	67.1647	67.0965	67.3066	67.5331	67.6932	67.8606	(39)
Average = Sum(39)m / 12 =												67.6118	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8529	0.8518	0.8507	0.8454	0.8444	0.8398	0.8398	0.8389	0.8415	0.8444	0.8464	0.8485	(40)
HLP (average)												0.8454	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)

Total per year (kWh/year) = Sum(64)m = 881.7040 (64)
12Total per year (kWh/year) 882 (64)

Electric shower(s)

52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 596.7355 (64a)

Heat gains from water heating, kWh/month

36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.6786	139.1442	125.6786	129.8679	125.6786	129.8679	125.6786	125.6786	129.8679	125.6786	129.8679	125.6786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains	453.4664	467.9883	446.9019	435.3676	413.4459	400.7688	385.7326	384.8800	396.4077	407.0433	430.0429	443.3929	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	9.8800	46.7521	0.6800	0.7000	0.7700	152.3695	(78)

Solar gains	152.3695	249.5419	317.8721	359.2645	374.3758	360.2858	352.0212	341.8613	332.0550	269.1544	180.6098	131.6612	(83)
Total gains	605.8358	717.5303	764.7740	794.6321	787.8218	761.0547	737.7538	726.7414	728.4627	676.1977	610.6526	575.0541	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.6219	69.7158	69.8081	70.2449	70.3272	70.7129	70.7129	70.7848	70.5638	70.3272	70.1608	69.9878	
alpha	5.6415	5.6477	5.6539	5.6830	5.6885	5.7142	5.7142	5.7190	5.7043	5.6885	5.6774	5.6659	
util living area	0.9865	0.9665	0.9347	0.8625	0.7401	0.5552	0.3993	0.4229	0.6189	0.8661	0.9681	0.9896	(86)
MIT	20.1269	20.3496	20.5618	20.7856	20.9274	20.9882	20.9985	20.9978	20.9781	20.8116	20.4353	20.0786	(87)

Th 2	20.2077	20.2087	20.2096	20.2142	20.2150	20.2190	20.2190	20.2197	20.2175	20.2150	20.2133	20.2115	(88)
util rest of house	0.9832	0.9588	0.9201	0.8337	0.6925	0.4913	0.3291	0.3521	0.5555	0.8327	0.9593	0.9870	(89)
MIT 2	19.4185	19.6363	19.8401	20.0487	20.1674	20.2134	20.2185	20.2190	20.2061	20.0757	19.7260	19.3740	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.6184	19.8376	20.0438	20.2567	20.3819	20.4320	20.4386	20.4388	20.4239	20.2834	19.9261	19.5729	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6184	19.8376	20.0438	20.2567	20.3819	20.4320	20.4386	20.4388	20.4239	20.2834	19.9261	19.5729	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9801	0.9546	0.9166	0.8354	0.7031	0.5090	0.3489	0.3721	0.5727	0.8359	0.9555	0.9843	(94)
Useful gains	593.7574	684.9264	700.9780	663.8411	553.8797	387.3826	257.4072	270.3867	417.1558	565.2320	583.4983	566.0497	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1044.9761	1017.6295	921.4535	767.8488	586.3125	391.7051	257.8201	270.9903	425.6409	653.9481	868.2414	1043.2107	(97)
Space heating kWh	335.7067	223.5764	164.0338	74.8856	24.1300	0.0000	0.0000	0.0000	0.0000	66.0048	205.0150	355.0078	(98a)
Space heating requirement - total per year (kWh/year)												1448.3601	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	335.7067	223.5764	164.0338	74.8856	24.1300	0.0000	0.0000	0.0000	0.0000	66.0048	205.0150	355.0078	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1448.3601	
Space heating per m2											(98c) / (4) =	18.1090	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	631.3480	497.0186	509.9330	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9404	0.9748	0.9703	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	593.7283	484.4883	494.7780	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	830.1716	805.7823	795.4959	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	170.2392	239.0427	223.7341	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	42.5598	59.7607	55.9335	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												158.2540	(107)
Energy for space heating												18.1090	(99)
Energy for space cooling												1.9787	(108)
Total												20.0877	(109)
Fabric Energy Efficiency (DFEE)												20.1	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Semi-glazed door			3.5800	1.0000	3.5800			(26a)
TER Opening Type			9.8800	1.1450	11.3130			(27)
Heatloss Floor			39.9900	0.1300	5.1987			(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.1800	7.0326			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.5045			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 213.7769 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.4500	0.0500	0.4225
E3 Sill	6.7500	0.0500	0.3375
E4 Jamb	22.0000	0.0500	1.1000
E6 Intermediate floor within a dwelling	19.5200	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	6.0900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E5 Ground floor (normal)	19.5200	0.1600	3.1232
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
P1 Party wall - Ground floor	6.0900	0.0800	0.4872
E7 Party floor between dwellings (in blocks of flats)	14.1200	0.0700	0.9884

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.7208 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.2253 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	77.7420	77.5795	77.4202	76.6720	76.5321	75.8805	75.8805	75.7598	76.1315	76.5321	76.8152	77.1113	(39)

Average = Sum(39)m / 12 = 76.6714

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9700	0.9680	0.9586	0.9569	0.9487	0.9487	0.9472	0.9519	0.9569	0.9604	0.9641	(40)
HLP (average)												0.9586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	122.0433	135.1194	122.0433	126.1114	122.0433	126.1114	122.0433	122.0433	126.1114	122.0433	126.1114	122.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains													
	449.8311	463.9635	443.2666	431.6111	409.8106	397.0124	382.0973	381.2447	392.6512	403.4080	426.2864	439.7576	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	9.8800	46.7521	0.6300	0.7000	0.7700	141.1658	(78)

Solar gains	141.1658	231.1932	294.4992	332.8480	346.8482	333.7942	326.1373	316.7245	307.6392	249.3636	167.3296	121.9803	(83)
Total gains	590.9969	695.1568	737.7657	764.4591	756.6589	730.8066	708.2346	697.9692	700.2904	652.7716	593.6160	561.7378	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.0920	61.2199	61.3459	61.9445	62.0578	62.5907	62.5907	62.6904	62.3843	62.0578	61.8290	61.5917	
alpha	5.0728	5.0813	5.0897	5.1296	5.1372	5.1727	5.1727	5.1794	5.1590	5.1372	5.1219	5.1061	
util living area													
	0.9899	0.9768	0.9561	0.9061	0.8104	0.6353	0.4663	0.4924	0.6989	0.9077	0.9774	0.9920	(86)
MIT	19.8793	20.1040	20.3439	20.6297	20.8447	20.9662	20.9942	20.9923	20.9434	20.6794	20.2321	19.8381	(87)
Th 2	20.1067	20.1084	20.1101	20.1179	20.1194	20.1263	20.1263	20.1275	20.1236	20.1194	20.1164	20.1133	(88)
util rest of house													
	0.9872	0.9709	0.9448	0.8819	0.7633	0.5595	0.3763	0.4024	0.6274	0.8793	0.9707	0.9899	(89)
MIT 2	19.0926	19.3147	19.5493	19.8250	20.0141	20.1098	20.1246	20.1251	20.0933	19.8758	19.4491	19.0572	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.3146	19.5374	19.7735	20.0521	20.2485	20.3515	20.3700	20.3698	20.3332	20.1026	19.6701	19.2776	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3146	19.5374	19.7735	20.0521	20.2485	20.3515	20.3700	20.3698	20.3332	20.1026	19.6701	19.2776	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9841	0.9663	0.9398	0.8799	0.7707	0.5797	0.4017	0.4277	0.6454	0.8787	0.9664	0.9873	(94)
Useful gains	581.6079	671.6992	693.3336	672.6468	583.1814	423.6807	284.4941	298.5543	451.9362	573.6042	573.6758	554.5774	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1167.2661	1135.5652	1027.6389	855.0540	654.2317	436.4241	286.0675	300.7526	474.5395	727.2528	965.5745	1162.6518	(97)
Space heating kWh													
	435.7297	311.7179	248.7231	131.3332	52.8615	0.0000	0.0000	0.0000	0.0000	114.3145	282.1671	452.4073	(98a)
Space heating requirement - total per year (kWh/year)												2029.2544	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	435.7297	311.7179	248.7231	131.3332	52.8615	0.0000	0.0000	0.0000	0.0000	114.3145	282.1671	452.4073	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2029.2544	
Space heating per m2										(98c) / (4) =		25.3720	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	713.2763	561.5154	575.7744	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8815	0.9398	0.9316	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	628.7742	527.7013	536.3784	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	798.8893	775.1847	765.6684	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	122.4829	184.1276	170.5917	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	30.6207	46.0319	42.6479	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												119.3006	(107)
Energy for space heating												25.3720	(99)
Energy for space cooling												1.4916	(108)
Total												26.8637	(109)
Fabric Energy Efficiency (TFEE)												26.9	(109)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.68	**TER**	11.01
Environmental	99 A	**% DER < TER**			84.74
CO_2 Emissions (t/year)	0.11	**DFEE**	20.09	**TFEE**	26.86
Compliance Check	See BREL	**% DFEE < TFEE**			25.22
% DPER < TPER	61.97	**DPER**	22.15	**TPER**	58.23

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				4	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6723	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	33.5192	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.6786	139.1442	125.6786	129.8679	125.6786	129.8679	125.6786	125.6786	129.8679	125.6786	129.8679	125.6786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	559.0481	572.3498	548.4455	530.1166	504.1979	487.2994	469.3775	470.4487	484.3003	499.6452	529.1302	548.0502	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	9.8800	46.7521	0.6800	0.7000	0.7700	152.3695	(78)

Solar gains	152.3695	249.5419	317.8721	359.2645	374.3758	360.2858	352.0212	341.8613	332.0550	269.1544	180.6098	131.6612	(83)
Total gains	711.4176	821.8917	866.3177	889.3811	878.5738	847.5853	821.3987	812.3100	816.3553	768.7996	709.7400	679.7114	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9703	0.9378	0.8912	0.8024	0.6687	0.4929	0.3522	0.3721	0.5482	0.7996	0.9377	0.9764	(86)
MIT	20.3357	20.5303	20.7034	20.8651	20.9595	20.9940	20.9993	20.9990	20.9889	20.8862	20.5947	20.2817	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9637	0.9253	0.8708	0.7692	0.6215	0.4356	0.2911	0.3105	0.4905	0.7604	0.9231	0.9710	(89)
MIT 2	19.4760	19.7143	19.9209	20.1037	20.2001	20.2296	20.2329	20.2327	20.2260	20.1295	19.7965	19.4089	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.7186	19.9445	20.1417	20.3185	20.4144	20.4453	20.4492	20.4490	20.4413	20.3431	20.0217	19.6552	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7186	19.9445	20.1417	20.3185	20.4144	20.4453	20.4492	20.4490	20.4413	20.3431	20.0217	19.6552	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9584	0.9200	0.8681	0.7731	0.6330	0.4516	0.3084	0.3279	0.5064	0.7663	0.9184	0.9660	(94)
Useful gains	681.8129	756.1376	752.0805	687.5792	556.1076	382.7640	253.2813	266.3520	413.3804	589.1611	651.8506	656.5843	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1015.3328	990.7006	898.3233	751.9229	573.8545	384.9184	253.4709	266.6295	417.5792	641.5911	850.9114	1017.7439	(97)
Space heating kWh	248.1388	157.6263	108.8047	46.3275	13.2037	0.0000	0.0000	0.0000	0.0000	39.0080	143.3238	268.7027	(98a)
Space heating requirement - total per year (kWh/year)												1025.1355	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	248.1388	157.6263	108.8047	46.3275	13.2037	0.0000	0.0000	0.0000	0.0000	39.0080	143.3238	268.7027	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1025.1355	
Space heating per m2										(98c) / (4) =		12.8174	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	248.1388	157.6263	108.8047	46.3275	13.2037	0.0000	0.0000	0.0000	0.0000	39.0080	143.3238	268.7027	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	372.2082	236.4395	163.2071	69.4912	19.8055	0.0000	0.0000	0.0000	0.0000	58.5119	214.9857	403.0541	
Space heating requirement	372.2082	236.4395	163.2071	69.4912	19.8055	0.0000	0.0000	0.0000	0.0000	58.5119	214.9857	403.0541	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1537.7032	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												15.3770	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)
Total electricity for the above, kWh/year												21.9935	(331)
Electricity for lighting (calculated in Appendix L)												196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4834.7083	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1486.6215	0.1575	64.5709	(367)
Electrical energy for heat distribution (space & water)	15.3770	0.0000	8.1091	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			224.3523	(373)
Space and water heating			224.3523	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			134.3105	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6800	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1486.6215	1.5829	649.0814	(467)
Electrical energy for heat distribution (space & water)	15.3770	0.0000	85.7429	(472)
Overall CO2 factor for heat network			0.4255	(486)
Total CO2 associated with community systems			2372.2201	(473)
Space and water heating			2372.2201	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	1.4873	-725.8942	
PV Unit electricity exported	-470.1661	0.4450	-209.2081	
Total			-935.1023	(480)
Total Primary energy kWh/year			1771.1822	(483)
Dwelling Primary energy Rate (DPER)			22.1500	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 79.9800						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Semi-glazed door			3.5800	1.0000	3.5800			(26a)
TER Opening Type			9.8800	1.1450	11.3130			(27)
Heatloss Floor			39.9900	0.1300	5.1987			(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.1800	7.0326			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.5045			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			213.7769 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.4500	0.0500	0.4225
E3 Sill	6.7500	0.0500	0.3375
E4 Jamb	22.0000	0.0500	1.1000
E6 Intermediate floor within a dwelling	19.5200	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	6.0900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E5 Ground floor (normal)	19.5200	0.1600	3.1232
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
P1 Party wall - Ground floor	6.0900	0.0800	0.4872
E7 Party floor between dwellings (in blocks of flats)	14.1200	0.0700	0.9884
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.7208 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	41.2253 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	77.7420	77.5795	77.4202	76.6720	76.5321	75.8805	75.8805	75.7598	76.1315	76.5321	76.8152	77.1113	(39)
Average = Sum(39)m / 12 =												76.6714	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9700	0.9680	0.9586	0.9569	0.9487	0.9487	0.9472	0.9519	0.9569	0.9604	0.9641	(40)
HLP (average)												0.9586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers													
	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths													
	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses													
	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m													
	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
										Total per year (kWh/year) = Sum(64)m =		2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	122.0433	135.1194	122.0433	126.1114	122.0433	126.1114	122.0433	122.0433	126.1114	122.0433	126.1114	122.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													
	549.0775	561.9896	538.4748	520.0247	494.2273	474.2076	456.4069	457.4780	471.2084	489.6746	519.0383	538.0795	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	9.8800	46.7521	0.6300	0.7000	0.7700	141.1658	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	141.1658	231.1932	294.4992	332.8480	346.8482	333.7942	326.1373	316.7245	307.6392	249.3636	167.3296	121.9803	(83)
Total gains	690.2433	793.1828	832.9740	852.8727	841.0755	808.0018	782.5441	774.2025	778.8476	739.0382	686.3680	660.0597	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.0920	61.2199	61.3459	61.9445	62.0578	62.5907	62.5907	62.6904	62.3843	62.0578	61.8290	61.5917	
alpha	5.0728	5.0813	5.0897	5.1296	5.1372	5.1727	5.1727	5.1794	5.1590	5.1372	5.1219	5.1061	
util living area	0.9806	0.9612	0.9325	0.8699	0.7601	0.5830	0.4237	0.4461	0.6429	0.8664	0.9602	0.9841	(86)
MIT	20.0236	20.2351	20.4562	20.7072	20.8859	20.9770	20.9963	20.9951	20.9612	20.7547	20.3563	19.9834	(87)
Th 2	20.1067	20.1084	20.1101	20.1179	20.1194	20.1263	20.1263	20.1275	20.1236	20.1194	20.1164	20.1133	(88)
util rest of house	0.9758	0.9522	0.9168	0.8404	0.7095	0.5104	0.3411	0.3635	0.5724	0.8310	0.9493	0.9801	(89)
MIT 2	18.9871	19.2519	19.5248	19.8281	20.0231	20.1123	20.1249	20.1256	20.0978	19.8880	19.4125	18.9416	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.2796	19.5294	19.7877	20.0762	20.2665	20.3563	20.3708	20.3710	20.3414	20.1326	19.6788	19.2356	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2796	19.5294	19.7877	20.0762	20.2665	20.3563	20.3708	20.3710	20.3414	20.1326	19.6788	19.2356	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9701	0.9450	0.9102	0.8388	0.7185	0.5300	0.3644	0.3868	0.5906	0.8316	0.9427	0.9749	(94)
Useful gains	669.5841	749.5687	758.1486	715.4086	604.2802	428.2702	285.1301	299.4593	459.9683	614.5867	647.0320	643.5145	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1164.5426	1134.9397	1028.7339	856.8987	655.6157	436.7916	286.1291	300.8387	475.1701	729.5508	966.2436	1159.4135	(97)
Space heating kWh	368.2492	258.9693	201.3154	101.8729	38.1936	0.0000	0.0000	0.0000	0.0000	85.5333	229.8323	383.8289	(98a)
Space heating requirement - total per year (kWh/year)												1667.7949	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	368.2492	258.9693	201.3154	101.8729	38.1936	0.0000	0.0000	0.0000	0.0000	85.5333	229.8323	383.8289	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1667.7949	
Space heating per m2											(98c) / (4) =	20.8526	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	368.2492	258.9693	201.3154	101.8729	38.1936	0.0000	0.0000	0.0000	0.0000	85.5333	229.8323	383.8289	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	398.9698	280.5735	218.1099	110.3715	41.3799	0.0000	0.0000	0.0000	0.0000	92.6688	249.0058	415.8492	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.1257	84.6197	83.9173	82.7349	81.2169	79.8000	79.8000	79.8000	79.8000	82.3769	84.3377	85.2381	(217)
Fuel for water heating, kWh/month	268.2098	238.5394	255.6652	228.6669	226.1826	207.8751	205.6450	213.6686	215.8200	232.5742	240.8277	265.0480	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.3582	20.3433	18.3169	13.4197	10.3658	8.4689	9.4560	12.2913	15.9652	20.9471	23.6598	26.0630	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3424	-31.5676	-47.5704	-56.1485	-62.8691	-59.5233	-58.7993	-54.3654	-46.9365	-37.2699	-23.9846	-18.2835	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9342	-17.0411	-34.5369	-52.8648	-70.8844	-71.5905	-70.7461	-59.4418	-42.9727	-24.6882	-10.6939	-6.2480	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1806.9284	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2798.7225	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	204.6551	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3908.0030	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1806.9284	0.2100	379.4550	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2798.7225	0.2100	587.7317	(264)
Space and water heating			967.1867	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	204.6551	0.1443	29.5381	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	0.1336	-69.2911	
PV Unit electricity exported	-469.6425	0.1253	-58.8667	
Total			-128.1578	(269)
Total CO2, kg/year			880.4962	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.0100	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1806.9284	1.1300	2041.8291	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2798.7225	1.1300	3162.5565	(278)
Space and water heating			5204.3856	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	204.6551	1.5338	313.9068	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	1.4937	-774.7198	
PV Unit electricity exported	-469.6425	0.4601	-216.0686	
Total			-990.7884	(283)
Total Primary energy kWh/year			4657.6048	(286)
Target Primary Energy Rate (TPER)			58.2300	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.68	**TER**	11.01
Environmental	99 A	**% DER < TER**			84.74
CO_2 Emissions (t/year)	0.11	**DFEE**	20.09	**TFEE**	26.86
Compliance Check	See BREL	**% DFEE < TFEE**			25.22
% DPER < TPER	61.97	**DPER**	22.15	**TPER**	58.23

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6723	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	33.5192	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	610.7421	608.5956	590.7266	557.3213	524.1652	494.1729	476.4438	479.4976	496.5901	527.0115	563.7339	595.7477	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	9.8800	46.7521	0.6800	0.7000	0.7700	152.3695	(78)

Solar gains	152.3695	249.5419	317.8721	359.2645	374.3758	360.2858	352.0212	341.8613	332.0550	269.1544	180.6098	131.6612	(83)
Total gains	763.1116	858.1375	908.5988	916.5858	898.5411	854.4587	828.4650	821.3589	828.6451	796.1658	744.3437	727.4089	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9600	0.9269	0.8734	0.7874	0.6563	0.4891	0.3492	0.3681	0.5406	0.7820	0.9256	0.9682	(86)
MIT	20.4043	20.5702	20.7383	20.8781	20.9631	20.9942	20.9993	20.9991	20.9897	20.8990	20.6327	20.3476	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9515	0.9128	0.8511	0.7534	0.6094	0.4322	0.2886	0.3071	0.4835	0.7418	0.9089	0.9612	(89)
MIT 2	19.5604	19.7618	19.9603	20.1170	20.2032	20.2297	20.2329	20.2328	20.2265	20.1420	19.8411	19.4906	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.7986	19.9899	20.1799	20.3318	20.4177	20.4454	20.4492	20.4490	20.4418	20.3556	20.0645	19.7324	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7986	19.9899	20.1799	20.3318	20.4177	20.4454	20.4492	20.4490	20.4418	20.3556	20.0645	19.7324	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9459	0.9079	0.8494	0.7579	0.6209	0.4481	0.3057	0.3243	0.4993	0.7485	0.9048	0.9558	(94)
Useful gains	721.8381	779.0616	771.7942	694.7160	557.9425	382.8602	253.2910	266.3700	413.7095	595.9622	673.4674	695.2310	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1020.5974	993.6894	900.8351	752.7949	574.0690	384.9295	253.4721	266.6316	417.6171	642.4184	853.7249	1022.8283	(97)
Space heating kWh	222.2769	144.2299	96.0064	41.8168	11.9981	0.0000	0.0000	0.0000	0.0000	34.5634	129.7854	243.7324	(98a)
Space heating requirement - total per year (kWh/year)												924.4093	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	222.2769	144.2299	96.0064	41.8168	11.9981	0.0000	0.0000	0.0000	0.0000	34.5634	129.7854	243.7324	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												924.4093	
Space heating per m2											(98c) / (4) =	11.5580	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	222.2769	144.2299	96.0064	41.8168	11.9981	0.0000	0.0000	0.0000	0.0000	34.5634	129.7854	243.7324	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	333.4154	216.3448	144.0097	62.7253	17.9971	0.0000	0.0000	0.0000	0.0000	51.8450	194.6782	365.5986	
Space heating requirement													
	333.4154	216.3448	144.0097	62.7253	17.9971	0.0000	0.0000	0.0000	0.0000	51.8450	194.6782	365.5986	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1386.6140	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												13.8661	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)
Total electricity for the above, kWh/year												21.9935	(331)
Electricity for lighting (calculated in Appendix L)												196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4683.6191	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1386.6140	4.4400	61.5657	(340a)
Space heating total			61.5657	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	196.1051	16.4900	32.3377	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	16.4900	-80.4802	
PV Unit electricity exported	-470.1661	5.5900	-26.2823	
Total			-106.7625	(352)
Total energy cost			262.0161	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7547 (357)
SAP value		87.7659
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1446.3310	0.1575	58.2348	(367)
Electrical energy for heat distribution (space & water)	13.8661	0.0000	7.8715	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			217.7787	(373)
Space and water heating			217.7787	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			127.7368	(383)
CO2 emissions per m2			1.6000	(384)
EI value			98.6304	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 79.9800						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate													
	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17097.8798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.6723	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 33.5192	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff													
	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m													
	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
327.4608 330.8588 322.2959 304.0665 281.0552 259.4278 244.9794 241.5813 250.1442 268.3736 291.3850 313.0124 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 (71)
Water heating gains (Table 5)
154.0336 151.5930 146.8914 136.5869 130.2751 123.6777 119.6256 122.9734 126.8986 134.2191 144.0972 152.7161 (72)
Total internal gains
610.7421 608.5956 590.7266 557.3213 524.1652 494.1729 476.4438 479.4976 496.5901 527.0115 563.7339 595.7477 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	9.8800	54.0600	0.6800	0.7000	0.7700	176.1868	(78)

Solar gains 176.1868 255.7427 320.5796 368.2072 372.6925 386.6067 369.8493 363.3701 353.8632 290.7458 205.5388 153.2721 (83)
Total gains 786.9289 864.3383 911.3062 925.5285 896.8577 880.7796 846.2931 842.8677 850.4533 817.7572 769.2727 749.0198 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9512	0.9196	0.8580	0.7650	0.6271	0.4317	0.3033	0.3200	0.5059	0.7421	0.9072	0.9611	(86)
MIT	20.4622	20.6015	20.7728	20.8987	20.9723	20.9973	20.9997	20.9996	20.9929	20.9268	20.6899	20.4050	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9410	0.9043	0.8334	0.7288	0.5782	0.3755	0.2437	0.2603	0.4492	0.6982	0.8872	0.9527	(89)
MIT 2	19.6315	19.7994	20.0000	20.1386	20.2115	20.2317	20.2331	20.2330	20.2288	20.1697	19.9084	19.5617	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.8659	20.0257	20.2181	20.3531	20.4262	20.4477	20.4494	20.4493	20.4444	20.3834	20.1289	19.7997	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8659	20.0257	20.2181	20.3531	20.4262	20.4477	20.4494	20.4493	20.4444	20.3834	20.1289	19.7997	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9354	0.8997	0.8328	0.7348	0.5908	0.3913	0.2605	0.2772	0.4650	0.7072	0.8842	0.9471	(94)
Useful gains	736.1191	777.6559	758.9748	680.0358	529.8475	344.6499	220.4959	233.6297	395.4436	578.2832	680.1944	709.4132	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	1005.2792	976.2912	870.4257	727.8614	541.7034	345.5679	220.5621	233.7279	398.0326	611.3202	831.6281	1007.5028	(97)
Space heating kWh	200.2551	133.4829	82.9195	34.4344	8.8208	0.0000	0.0000	0.0000	0.0000	24.5795	109.0322	221.7786	(98a)
Space heating requirement - total per year (kWh/year)												815.3030	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	200.2551	133.4829	82.9195	34.4344	8.8208	0.0000	0.0000	0.0000	0.0000	24.5795	109.0322	221.7786	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												815.3030	
Space heating per m2											(98c) / (4) =	10.1938	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement
200.2551 133.4829 82.9195 34.4344 8.8208 0.0000 0.0000 0.0000 0.0000 24.5795 109.0322 221.7786 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50
307a 300.3827 200.2243 124.3792 51.6516 13.2312 0.0000 0.0000 0.0000 0.0000 36.8692 163.5484 332.6679
Space heating requirement
300.3827 200.2243 124.3792 51.6516 13.2312 0.0000 0.0000 0.0000 0.0000 36.8692 163.5484 332.6679 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)

Water heating
Annual water heating requirement
266.9446 236.1786 250.9634 220.5542 213.7828 192.6005 189.9534 197.4446 199.5749 222.6078 236.8171 263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50
310a 400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948
Water heating fuel
400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948 (310)
Cooling System Energy Efficiency Ratio 0.0000 (314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (315)
Pumps and Fa 1.8679 1.6872 1.8679 1.8077 1.8679 1.8077 1.8679 1.8679 1.8077 1.8679 1.8077 1.8679 (331)
Lighting 24.2988 19.4934 17.5516 12.8591 9.9327 8.1151 9.0610 11.7778 15.2982 20.0720 22.6713 24.9741 (332)
Electricity generated by PVs (Appendix M) (negative quantity)
(333a)m -17.9780 -26.9243 -45.2366 -58.5173 -66.4974 -66.2241 -64.3099 -58.6197 -48.0109 -34.7929 -20.6435 -14.9664 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(334a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (334a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)

Electricity generated by PVs (Appendix M) (negative quantity)

(333b)m	-6.0204	-13.0409	-32.0085	-59.0559	-82.7431	-94.8946	-90.1802	-72.6219	-46.3379	-22.2034	-8.3869	-4.5323	(333b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1222.9546	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	12.2295	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4423.4336	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1222.9546	6.5500	80.1035	(340a)
Space heating total			80.1035	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	196.1051	28.4300	55.7527	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	28.4300	-148.6096	
PV Unit electricity exported	-532.0259	5.8100	-30.9107	
Total			-179.5203	(352)
Total energy cost			331.0205	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1402.6885	0.1579	51.4922	(367)
Electrical energy for heat distribution (space & water)	12.2295	0.0000	7.6187	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			210.7832	(373)
Space and water heating			210.7832	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	0.1322	-69.1017	
PV Unit electricity exported	-532.0259	0.1213	-64.5494	
Total			-133.6511	(380)
Total CO2, kg/year			108.4869	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1402.6885	1.5845	516.7354	(467)
Electrical energy for heat distribution (space & water)	12.2295	0.0000	80.7799	(472)
Overall CO2 factor for heat network			0.4249	(486)
Total CO2 associated with community systems			2234.9112	(473)
Space and water heating			2234.9112	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	1.4884	-778.0360	
PV Unit electricity exported	-532.0259	0.4451	-236.7863	
Total			-1014.8223	(480)
Total Primary energy kWh/year			1554.1533	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - South

Current energy efficiency rating:	B 88
Current environmental impact rating:	A 99

N Solar water heating — Not applicable
U Solar photovoltaic panels — Not applicable
V2 Wind turbine — Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£62	£62	£0
Community scheme	£449	£449	£0
Space heating	£190	£190	£0
Water heating	£264	£264	£0
Lighting	£56	£56	£0
Generated (PV)	-£180	-£180	£0
Total cost of fuels	£331	£331	£0
Total cost of uses	£330	£330	£0
Delivered energy	55 kWh/m²	55 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	19 kWh/m²	19 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		4 (19)
Shelter factor (20) = 1 - [0.075 x (19)] =		0.7000 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =		0.1050 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation — 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) — 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17097.8798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6723 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
									Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)

Water heating gains (Table 5)

154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)

Total internal gains

610.7421	608.5956	590.7266	557.3213	524.1652	494.1729	476.4438	479.4976	496.5901	527.0115	563.7339	595.7477	(73)

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6. Solar gains

[Jan]													
				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
South				9.8800	46.7521	0.6800		0.7000		0.7700		152.3695	(78)
Solar gains	152.3695	249.5419	317.8721	359.2645	374.3758	360.2858	352.0212	341.8613	332.0550	269.1544	180.6098	131.6612	(83)
Total gains	763.1116	858.1375	908.5988	916.5858	898.5411	854.4587	828.4650	821.3589	828.6451	796.1658	744.3437	727.4089	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9600	0.9269	0.8734	0.7874	0.6563	0.4891	0.3492	0.3681	0.5406	0.7820	0.9256	0.9682	(86)
MIT	20.4043	20.5702	20.7383	20.8781	20.9631	20.9942	20.9993	20.9991	20.9897	20.8990	20.6327	20.3476	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9515	0.9128	0.8511	0.7534	0.6094	0.4322	0.2886	0.3071	0.4835	0.7418	0.9089	0.9612	(89)
MIT 2	19.5604	19.7618	19.9603	20.1170	20.2032	20.2297	20.2329	20.2328	20.2265	20.1420	19.8411	19.4906	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.7986	19.9899	20.1799	20.3318	20.4177	20.4454	20.4492	20.4490	20.4418	20.3556	20.0645	19.7324	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7986	19.9899	20.1799	20.3318	20.4177	20.4454	20.4492	20.4490	20.4418	20.3556	20.0645	19.7324	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9459	0.9079	0.8494	0.7579	0.6209	0.4481	0.3057	0.3243	0.4993	0.7485	0.9048	0.9558	(94)
Useful gains	721.8381	779.0616	771.7942	694.7160	557.9425	382.8602	253.2910	266.3700	413.7095	595.9622	673.4674	695.2310	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1020.5974	993.6894	900.8351	752.7949	574.0690	384.9295	253.4721	266.6316	417.6171	642.4184	853.7249	1022.8283	(97)
Space heating kWh	222.2769	144.2299	96.0064	41.8168	11.9981	0.0000	0.0000	0.0000	0.0000	34.5634	129.7854	243.7324	(98a)
Space heating requirement - total per year (kWh/year)												924.4093	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	222.2769	144.2299	96.0064	41.8168	11.9981	0.0000	0.0000	0.0000	0.0000	34.5634	129.7854	243.7324	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												924.4093	
Space heating per m2											(98c) / (4) =	11.5580	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	222.2769	144.2299	96.0064	41.8168	11.9981	0.0000	0.0000	0.0000	0.0000	34.5634	129.7854	243.7324	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	333.4154	216.3448	144.0097	62.7253	17.9971	0.0000	0.0000	0.0000	0.0000	51.8450	194.6782	365.5986	
Space heating requirement													
	333.4154	216.3448	144.0097	62.7253	17.9971	0.0000	0.0000	0.0000	0.0000	51.8450	194.6782	365.5986	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1386.6140	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												13.8661	(313)
Space cooling fuel												0.0000	(321)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)

mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4683.6191	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1386.6140	4.4400	61.5657	(340a)
Space heating total			61.5657	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	196.1051	16.4900	32.3377	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	16.4900	-80.4802	
PV Unit electricity exported	-470.1661	5.5900	-26.2823	
Total			-106.7625	(352)
Total energy cost			262.0161	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7547	(357)
SAP value		87.7659	
SAP rating (Section 12)		88	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1446.3310	0.1575	58.2348	(367)
Electrical energy for heat distribution (space & water)	13.8661	0.0000	7.8715	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			217.7787	(373)
Space and water heating			217.7787	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			127.7368	(383)
CO2 emissions per m2			1.6000	(384)
EI value			98.6304	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)

Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17097.8798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.6723 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)
Total storage loss	

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)

Total per year (kWh/year) = Sum(64)m = 2691.4183 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)

Water heating gains (Table 5)

154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)

Total internal gains

610.7421	608.5956	590.7266	557.3213	524.1652	494.1729	476.4438	479.4976	496.5901	527.0115	563.7339	595.7477	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	9.8800	54.0600	0.6800	0.7000	0.7700	176.1868	(78)

Solar gains	176.1868	255.7427	320.5796	368.2072	372.6925	386.6067	369.8493	363.3701	353.8632	290.7458	205.5388	153.2721	(83)
Total gains	786.9289	864.3383	911.3062	925.5285	896.8577	880.7796	846.2931	842.8677	850.4533	817.7572	769.2727	749.0198	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9512	0.9196	0.8580	0.7650	0.6271	0.4317	0.3033	0.3200	0.5059	0.7421	0.9072	0.9611	(86)
MIT	20.4622	20.6015	20.7728	20.8987	20.9723	20.9973	20.9997	20.9996	20.9929	20.9268	20.6899	20.4050	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9410	0.9043	0.8334	0.7288	0.5782	0.3755	0.2437	0.2603	0.4492	0.6982	0.8872	0.9527	(89)
MIT 2	19.6315	19.7994	20.0000	20.1386	20.2115	20.2317	20.2331	20.2330	20.2288	20.1697	19.9084	19.5617	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.8659	20.0257	20.2181	20.3531	20.4262	20.4477	20.4494	20.4493	20.4444	20.3834	20.1289	19.7997	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8659	20.0257	20.2181	20.3531	20.4262	20.4477	20.4494	20.4493	20.4444	20.3834	20.1289	19.7997	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9354	0.8997	0.8328	0.7348	0.5908	0.3913	0.2605	0.2772	0.4650	0.7072	0.8842	0.9471	(94)
Useful gains	736.1191	777.6559	758.9748	680.0358	529.8475	344.6499	220.4959	233.6297	395.4436	578.2832	680.1944	709.4132	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	1005.2792	976.2912	870.4257	727.8614	541.7034	345.5679	220.5621	233.7279	398.0326	611.3202	831.6281	1007.5028	(97)
Space heating kWh	200.2551	133.4829	82.9195	34.4344	8.8208	0.0000	0.0000	0.0000	0.0000	24.5795	109.0322	221.7786	(98a)

Space heating requirement - total per year (kWh/year) 815.3030

Solar heating kWh 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh 200.2551	133.4829	82.9195	34.4344	8.8208	0.0000	0.0000	0.0000	0.0000	24.5795	109.0322	221.7786	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 815.3030

Space heating per m2 (98c) / (4) = 10.1938 (99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump-Space and Water	1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.5000 (306)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

Space heating:

Space heating requirement

200.2551	133.4829	82.9195	34.4344	8.8208	0.0000	0.0000	0.0000	0.0000	24.5795	109.0322	221.7786	(98)

Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50

307a 300.3827	200.2243	124.3792	51.6516	13.2312	0.0000	0.0000	0.0000	0.0000	36.8692	163.5484	332.6679	
Space heating requirement 300.3827	200.2243	124.3792	51.6516	13.2312	0.0000	0.0000	0.0000	0.0000	36.8692	163.5484	332.6679	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)

Space heating fuel for secondary/supplementary system

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.9780	-26.9243	-45.2366	-58.5173	-66.4974	-66.2241	-64.3099	-58.6197	-48.0109	-34.7929	-20.6435	-14.9664	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.0204	-13.0409	-32.0085	-59.0559	-82.7431	-94.8946	-90.1802	-72.6219	-46.3379	-22.2034	-8.3869	-4.5323	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1222.9546	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	12.2295	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4423.4336	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1222.9546	6.5500	80.1035	(340a)
Space heating total			80.1035	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	196.1051	28.4300	55.7527	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	28.4300	-148.6096	
PV Unit electricity exported	-532.0259	5.8100	-30.9107	
Total			-179.5203	(352)
Total energy cost			331.0205	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1402.6885	0.1579	51.4922	(367)
Electrical energy for heat distribution (space & water)	12.2295	0.0000	7.6187	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			210.7832	(373)
Space and water heating			210.7832	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	0.1322	-69.1017	
PV Unit electricity exported	-532.0259	0.1213	-64.5494	
Total			-133.6511	(380)
Total CO2, kg/year			108.4869	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1402.6885	1.5845	516.7354	(467)
Electrical energy for heat distribution (space & water)	12.2295	0.0000	80.7799	(472)
Overall CO2 factor for heat network			0.4249	(486)
Total CO2 associated with community systems			2234.9112	(473)
Space and water heating			2234.9112	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)

Energy saving/generation technologies				
PV Unit electricity used in dwelling		-522.7211	1.4884	-778.0360
PV Unit electricity exported		-532.0259	0.4451	-236.7863
Total				-1014.8223 (480)
Total Primary energy kWh/year				1554.1533 (483)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.75	**TER**	11.27
Environmental	99 A	**% DER < TER**			84.47
CO_2 Emissions (t/year)	0.11	**DFEE**	21.56	**TFEE**	28.31
Compliance Check	See BREL	**% DFEE < TFEE**			23.84
% DPER < TPER	61.65	**DPER**	22.87	**TPER**	59.65

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6723	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	33.5192	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.6786	139.1442	125.6786	129.8679	125.6786	129.8679	125.6786	125.6786	129.8679	125.6786	129.8679	125.6786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	559.0481	572.3498	548.4455	530.1166	504.1979	487.2994	469.3775	470.4487	484.3003	499.6452	529.1302	548.0502	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.8800	36.7938	0.6800	0.7000	0.7700	119.9146	(77)

Solar gains	119.9146	204.2590	279.4760	346.2844	387.8673	385.0625	371.2413	340.2186	302.6134	225.7497	143.6301	102.6219	(83)
Total gains	678.9628	776.6087	827.9216	876.4009	892.0653	872.3619	840.6189	810.6673	786.9137	725.3949	672.7603	650.6721	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9759	0.9501	0.9066	0.8096	0.6603	0.4794	0.3442	0.3729	0.5671	0.8275	0.9495	0.9806	(86)
MIT	20.2906	20.4770	20.6685	20.8584	20.9620	20.9948	20.9994	20.9990	20.9869	20.8627	20.5512	20.2402	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9703	0.9396	0.8880	0.7768	0.6133	0.4235	0.2845	0.3111	0.5080	0.7904	0.9370	0.9760	(89)
MIT 2	19.4202	19.6502	19.8809	20.0968	20.2023	20.2300	20.2329	20.2327	20.2246	20.1061	19.7449	19.3571	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.6658	19.8835	20.1032	20.3117	20.4167	20.4459	20.4492	20.4490	20.4397	20.3196	19.9724	19.6063	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6658	19.8835	20.1032	20.3117	20.4167	20.4459	20.4492	20.4490	20.4397	20.3196	19.9724	19.6063	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9653	0.9341	0.8845	0.7804	0.6248	0.4391	0.3013	0.3286	0.5242	0.7949	0.9320	0.9714	(94)
Useful gains	655.3944	725.4170	732.3099	683.9141	557.3682	383.0911	253.3065	266.3486	412.4731	576.5838	627.0072	632.0830	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1011.8572	986.6792	895.7850	751.4731	574.0019	384.9561	253.4740	266.6291	417.4745	640.0470	847.6638	1014.5227	(97)
Space heating kWh	265.2084	175.5682	121.6255	48.6425	12.3755	0.0000	0.0000	0.0000	0.0000	47.2166	158.8727	284.5351	(98a)
Space heating requirement - total per year (kWh/year)												1114.0445	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	265.2084	175.5682	121.6255	48.6425	12.3755	0.0000	0.0000	0.0000	0.0000	47.2166	158.8727	284.5351	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1114.0445	
Space heating per m2										(98c) / (4) =		13.9290	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	265.2084	175.5682	121.6255	48.6425	12.3755	0.0000	0.0000	0.0000	0.0000	47.2166	158.8727	284.5351	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	397.8126	263.3523	182.4382	72.9638	18.5632	0.0000	0.0000	0.0000	0.0000	70.8250	238.3091	426.8027	
Space heating requirement													
	397.8126	263.3523	182.4382	72.9638	18.5632	0.0000	0.0000	0.0000	0.0000	70.8250	238.3091	426.8027	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1671.0668	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												16.7107	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)
Total electricity for the above, kWh/year												21.9935	(331)
Electricity for lighting (calculated in Appendix L)												196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4968.0720	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1522.1851	0.1574	70.1234	(367)
Electrical energy for heat distribution (space & water)	16.7107	0.0000	8.3173	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			230.1131	(373)
Space and water heating			230.1131	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			140.0712	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.7500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1522.1851	1.5825	705.2040	(467)
Electrical energy for heat distribution (space & water)	16.7107	0.0000	87.8475	(472)
Overall CO2 factor for heat network			0.4258	(486)
Total CO2 associated with community systems			2430.4473	(473)
Space and water heating			2430.4473	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	1.4873	-725.8942	
PV Unit electricity exported	-470.1661	0.4450	-209.2081	
Total			-935.1023	(480)
Total Primary energy kWh/year			1829.4095	(483)
Dwelling Primary energy Rate (DPER)			22.8700	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Semi-glazed door			3.5800	1.0000	3.5800			(26a)
TER Opening Type			9.8800	1.1450	11.3130			(27)
Heatloss Floor			39.9900	0.1300	5.1987			(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.1800	7.0326			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.5045			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			213.7769 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.4500	0.0500	0.4225
E3 Sill	6.7500	0.0500	0.3375
E4 Jamb	22.0000	0.0500	1.1000
E6 Intermediate floor within a dwelling	19.5200	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	6.0900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E5 Ground floor (normal)	19.5200	0.1600	3.1232
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
P1 Party wall - Ground floor	6.0900	0.0800	0.4872
E7 Party floor between dwellings (in blocks of flats)	14.1200	0.0700	0.9884
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.7208 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	41.2253 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	77.7420	77.5795	77.4202	76.6720	76.5321	75.8805	75.8805	75.7598	76.1315	76.5321	76.8152	77.1113	(39)
Average = Sum(39)m / 12 =												76.6714	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9700	0.9680	0.9586	0.9569	0.9487	0.9487	0.9472	0.9519	0.9569	0.9604	0.9641	(40)
HLP (average)												0.9586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers													
	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths													
	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses													
	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m													
	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
										Total per year (kWh/year) = Sum(64)m =		2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	122.0433	135.1194	122.0433	126.1114	122.0433	126.1114	122.0433	122.0433	126.1114	122.0433	126.1114	122.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													
	549.0775	561.9896	538.4748	520.0247	494.2273	474.2076	456.4069	457.4780	471.2084	489.6746	519.0383	538.0795	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.8800	36.7938	0.6300	0.7000	0.7700	111.0974	(77)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	111.0974	189.2399	258.9263	320.8223	359.3477	356.7491	343.9442	315.2025	280.3625	209.1504	133.0691	95.0762	(83)
Total gains	660.1748	751.2295	797.4012	840.8470	853.5749	830.9566	800.3510	772.6805	751.5709	698.8250	652.1074	633.1557	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.0920	61.2199	61.3459	61.9445	62.0578	62.5907	62.5907	62.6904	62.3843	62.0578	61.8290	61.5917	
alpha	5.0728	5.0813	5.0897	5.1296	5.1372	5.1727	5.1727	5.1794	5.1590	5.1372	5.1219	5.1061	
util living area	0.9838	0.9685	0.9420	0.8751	0.7528	0.5688	0.4145	0.4470	0.6617	0.8863	0.9673	0.9866	(86)
MIT	19.9806	20.1803	20.4159	20.6976	20.8910	20.9795	20.9966	20.9951	20.9558	20.7217	20.3117	19.9443	(87)
Th 2	20.1067	20.1084	20.1101	20.1179	20.1194	20.1263	20.1263	20.1275	20.1236	20.1194	20.1164	20.1133	(88)
util rest of house	0.9797	0.9608	0.9279	0.8462	0.7018	0.4973	0.3336	0.3642	0.5906	0.8540	0.9580	0.9832	(89)
MIT 2	18.9332	19.1845	19.4769	19.8175	20.0277	20.1138	20.1250	20.1256	20.0939	19.8529	19.3582	18.8924	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.2288	19.4655	19.7419	20.0659	20.2713	20.3581	20.3710	20.3709	20.3371	20.0981	19.6273	19.1892	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2288	19.4655	19.7419	20.0659	20.2713	20.3581	20.3710	20.3709	20.3371	20.0981	19.6273	19.1892	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9745	0.9541	0.9211	0.8443	0.7111	0.5167	0.3564	0.3875	0.6087	0.8531	0.9516	0.9785	(94)
Useful gains	643.3588	716.7140	734.4602	709.9191	606.9822	429.3322	285.2436	299.4450	457.4518	596.1606	620.5439	619.5621	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1160.5941	1129.9856	1025.1895	856.1088	655.9821	436.9284	286.1443	300.8368	474.8417	726.9071	962.2849	1155.8369	(97)
Space heating kWh	384.8230	277.7185	216.3026	105.2566	36.4559	0.0000	0.0000	0.0000	0.0000	97.2754	246.0535	398.9885	(98a)
Space heating requirement - total per year (kWh/year)												1762.8740	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	384.8230	277.7185	216.3026	105.2566	36.4559	0.0000	0.0000	0.0000	0.0000	97.2754	246.0535	398.9885	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1762.8740	
Space heating per m2											(98c) / (4) =	22.0414	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 92.3000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	384.8230	277.7185	216.3026	105.2566	36.4559	0.0000	0.0000	0.0000	0.0000	97.2754	246.0535	398.9885	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	416.9263	300.8868	234.3474	114.0375	39.4972	0.0000	0.0000	0.0000	0.0000	105.3905	266.5802	432.2735	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.2210	84.7757	84.0781	82.7999	81.1621	79.8000	79.8000	79.8000	79.8000	82.6198	84.4910	85.3211	(217)
Fuel for water heating, kWh/month	267.9098	238.1004	255.1762	228.4874	226.3350	207.8751	205.6450	213.6686	215.8200	231.8904	240.3906	264.7901	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.3582	20.3433	18.3169	13.4197	10.3658	8.4689	9.4560	12.2913	15.9652	20.9471	23.6598	26.0630	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3424	-31.5676	-47.5704	-56.1485	-62.8691	-59.5233	-58.7993	-54.3654	-46.9365	-37.2699	-23.9846	-18.2835	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9342	-17.0411	-34.5369	-52.8648	-70.8844	-71.5905	-70.7461	-59.4418	-42.9727	-24.6882	-10.6939	-6.2480	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1909.9393	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2796.0887	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	204.6551	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4008.3801	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1909.9393	0.2100	401.0873	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2796.0887	0.2100	587.1786	(264)
Space and water heating			988.2659	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	204.6551	0.1443	29.5381	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	0.1336	-69.2911	
PV Unit electricity exported	-469.6425	0.1253	-58.8667	
Total			-128.1578	(269)
Total CO2, kg/year			901.5754	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.2700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1909.9393	1.1300	2158.2314	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2796.0887	1.1300	3159.5802	(278)
Space and water heating			5317.8117	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	204.6551	1.5338	313.9068	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	1.4937	-774.7198	
PV Unit electricity exported	-469.6425	0.4601	-216.0686	
Total			-990.7884	(283)
Total Primary energy kWh/year			4771.0309	(286)
Target Primary Energy Rate (TPER)			59.6500	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.75	**TER**	11.27
Environmental	99 A	**% DER < TER**			84.47
CO_2 Emissions (t/year)	0.11	**DFEE**	21.56	**TFEE**	28.31
Compliance Check	See BREL	**% DFEE < TFEE**			23.84
% DPER < TPER	61.65	**DPER**	22.87	**TPER**	59.65

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		3 * 10 =	30.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2122	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2705	0.2652	0.2599	0.2334	0.2281	0.2016	0.2016	0.1963	0.2122	0.2281	0.2387	0.2493	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5366	0.5352	0.5338	0.5272	0.5260	0.5203	0.5203	0.5193	0.5225	0.5260	0.5285	0.5311	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							3.6723	(36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.6979	34.6061	34.5160	34.0930	34.0139	33.6455	33.6455	33.5772	33.7874	34.0139	34.1740	34.3414	(38)
Heat transfer coeff	68.2172	68.1253	68.0352	67.6122	67.5331	67.1647	67.1647	67.0965	67.3066	67.5331	67.6932	67.8606	(39)
Average = Sum(39)m / 12 =												67.6118	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8529	0.8518	0.8507	0.8454	0.8444	0.8398	0.8398	0.8389	0.8415	0.8444	0.8464	0.8485	(40)
HLP (average)												0.8454	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.6786	139.1442	125.6786	129.8679	125.6786	129.8679	125.6786	125.6786	129.8679	125.6786	129.8679	125.6786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains	453.4664	467.9883	446.9019	435.3676	413.4459	400.7688	385.7326	384.8800	396.4077	407.0433	430.0429	443.3929	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.8800	36.7938	0.6800	0.7000	0.7700	119.9146	(77)

Solar gains	119.9146	204.2590	279.4760	346.2844	387.8673	385.0625	371.2413	340.2186	302.6134	225.7497	143.6301	102.6219	(83)
Total gains	573.3810	672.2473	726.3779	781.6519	801.3133	785.8313	756.9740	725.0986	699.0212	632.7930	573.6729	546.0148	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.6219	69.7158	69.8081	70.2449	70.3272	70.7129	70.7129	70.7848	70.5638	70.3272	70.1608	69.9878	
alpha	5.6415	5.6477	5.6539	5.6830	5.6885	5.7142	5.7142	5.7190	5.7043	5.6885	5.6774	5.6659	
util living area	0.9896	0.9746	0.9463	0.8690	0.7311	0.5390	0.3893	0.4238	0.6412	0.8910	0.9756	0.9919	(86)
MIT	20.0781	20.2878	20.5175	20.7758	20.9318	20.9898	20.9986	20.9978	20.9739	20.7763	20.3844	20.0342	(87)

Th 2	20.2077	20.2087	20.2096	20.2142	20.2150	20.2190	20.2190	20.2197	20.2175	20.2150	20.2133	20.2115	(88)
util rest of house	0.9869	0.9685	0.9336	0.8410	0.6832	0.4764	0.3208	0.3529	0.5769	0.8612	0.9686	0.9898	(89)
MIT 2	19.3705	19.5769	19.7990	20.0405	20.1705	20.2142	20.2186	20.2190	20.2037	20.0465	19.6773	19.3302	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.5702	19.7775	20.0018	20.2480	20.3853	20.4330	20.4387	20.4388	20.4211	20.2524	19.8768	19.5289	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5702	19.7775	20.0018	20.2480	20.3853	20.4330	20.4387	20.4388	20.4211	20.2524	19.8768	19.5289	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9842	0.9646	0.9298	0.8424	0.6940	0.4938	0.3401	0.3729	0.5941	0.8628	0.9650	0.9875	(94)
Useful gains	564.3288	648.4197	675.3800	658.4269	556.1217	388.0595	257.4652	270.3789	415.2814	545.9831	553.6016	539.1924	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1041.6872	1013.5331	918.5946	767.2626	586.5454	391.7747	257.8265	270.9894	425.4483	651.8589	864.9054	1040.2278	(97)
Space heating kWh	355.1546	245.3562	180.9516	78.3617	22.6352	0.0000	0.0000	0.0000	0.0000	78.7716	224.1388	372.7703	(98a)
Space heating requirement - total per year (kWh/year)												1558.1401	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	355.1546	245.3562	180.9516	78.3617	22.6352	0.0000	0.0000	0.0000	0.0000	78.7716	224.1388	372.7703	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1558.1401	
Space heating per m2											(98c) / (4) =	19.4816	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	631.3480	497.0186	509.9330	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9478	0.9777	0.9700	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	598.3942	485.9187	494.6202	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	859.1313	828.2474	793.5758	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	187.7308	254.6926	222.4229	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	46.9327	63.6731	55.6057	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												166.2116	(107)
Energy for space heating												19.4816	(99)
Energy for space cooling												2.0782	(108)
Total												21.5598	(109)
Fabric Energy Efficiency (DFEE)												21.6	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Semi-glazed door			3.5800	1.0000	3.5800			(26a)
TER Opening Type			9.8800	1.1450	11.3130			(27)
Heatloss Floor			39.9900	0.1300	5.1987			(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.1800	7.0326			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.5045			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 213.7769 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.4500	0.0500	0.4225
E3 Sill	6.7500	0.0500	0.3375
E4 Jamb	22.0000	0.0500	1.1000
E6 Intermediate floor within a dwelling	19.5200	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	6.0900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E5 Ground floor (normal)	19.5200	0.1600	3.1232
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
P1 Party wall - Ground floor	6.0900	0.0800	0.4872
E7 Party floor between dwellings (in blocks of flats)	14.1200	0.0700	0.9884

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.7208 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.2253 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	77.7420	77.5795	77.4202	76.6720	76.5321	75.8805	75.8805	75.7598	76.1315	76.5321	76.8152	77.1113	(39)

Average = Sum(39)m / 12 = 76.6714

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9700	0.9680	0.9586	0.9569	0.9487	0.9487	0.9472	0.9519	0.9569	0.9604	0.9641	(40)
HLP (average)												0.9586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	122.0433	135.1194	122.0433	126.1114	122.0433	126.1114	122.0433	122.0433	126.1114	122.0433	126.1114	122.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains													
	449.8311	463.9635	443.2666	431.6111	409.8106	397.0124	382.0973	381.2447	392.6512	403.4080	426.2864	439.7576	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.8800	36.7938	0.6300	0.7000	0.7700	111.0974	(77)

Solar gains	111.0974	189.2399	258.9263	320.8223	359.3477	356.7491	343.9442	315.2025	280.3625	209.1504	133.0691	95.0762	(83)
Total gains	560.9284	653.2035	702.1929	752.4334	769.1583	753.7614	726.0415	696.4472	673.0137	612.5585	559.3554	534.8338	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.0920	61.2199	61.3459	61.9445	62.0578	62.5907	62.5907	62.6904	62.3843	62.0578	61.8290	61.5917	
alpha	5.0728	5.0813	5.0897	5.1296	5.1372	5.1727	5.1727	5.1794	5.1590	5.1372	5.1219	5.1061	
util living area													
	0.9919	0.9819	0.9635	0.9107	0.8029	0.6190	0.4554	0.4934	0.7196	0.9249	0.9823	0.9936	(86)
MIT	19.8343	20.0449	20.2986	20.6180	20.8516	20.9699	20.9948	20.9923	20.9353	20.6385	20.1837	19.7974	(87)
Th 2	20.1067	20.1084	20.1101	20.1179	20.1194	20.1263	20.1263	20.1275	20.1236	20.1194	20.1164	20.1133	(88)
util rest of house													
	0.9897	0.9772	0.9538	0.8873	0.7551	0.5441	0.3672	0.4032	0.6483	0.9003	0.9768	0.9918	(89)
MIT 2	19.0482	19.2572	19.5063	19.8147	20.0193	20.1117	20.1247	20.1251	20.0884	19.8403	19.4022	19.0169	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.2701	19.4795	19.7299	20.0414	20.2541	20.3539	20.3703	20.3698	20.3274	20.0655	19.6227	19.2372	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2701	19.4795	19.7299	20.0414	20.2541	20.3539	20.3703	20.3698	20.3274	20.0655	19.6227	19.2372	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9871	0.9731	0.9488	0.8850	0.7630	0.5643	0.3921	0.4286	0.6658	0.8985	0.9730	0.9895	(94)
Useful gains	553.6755	635.6260	666.2643	665.9184	586.8755	425.3205	284.6836	298.5301	448.1062	550.3884	544.2408	529.2428	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1163.8026	1131.0695	1024.2629	854.2319	654.6655	436.6095	286.0902	300.7497	474.1022	724.4171	961.9361	1159.5367	(97)
Space heating kWh													
	453.9346	332.9381	266.3509	135.5857	50.4357	0.0000	0.0000	0.0000	0.0000	129.4773	300.7407	468.9387	(98a)
Space heating requirement - total per year (kWh/year)												2138.4017	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	453.9346	332.9381	266.3509	135.5857	50.4357	0.0000	0.0000	0.0000	0.0000	129.4773	300.7407	468.9387	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2138.4017	
Space heating per m2										(98c) / (4) =		26.7367	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	713.2763	561.5154	575.7744	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8926	0.9452	0.9310	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	636.7049	530.7410	536.0632	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	825.7196	795.9980	763.8895	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	136.0906	197.3512	169.5027	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	34.0226	49.3378	42.3757	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												125.7361	(107)
Energy for space heating												26.7367	(99)
Energy for space cooling												1.5721	(108)
Total												28.3088	(109)
Fabric Energy Efficiency (TFEE)												28.3	(109)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.75	**TER**	11.27
Environmental	99 A	**% DER < TER**			84.47
CO_2 Emissions (t/year)	0.11	**DFEE**	21.56	**TFEE**	28.31
Compliance Check	See BREL	**% DFEE < TFEE**			23.84
% DPER < TPER	61.65	**DPER**	22.87	**TPER**	59.65

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6723	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	33.5192	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.6786	139.1442	125.6786	129.8679	125.6786	129.8679	125.6786	125.6786	129.8679	125.6786	129.8679	125.6786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	559.0481	572.3498	548.4455	530.1166	504.1979	487.2994	469.3775	470.4487	484.3003	499.6452	529.1302	548.0502	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.8800	36.7938	0.6800	0.7000	0.7700	119.9146	(77)

Solar gains	119.9146	204.2590	279.4760	346.2844	387.8673	385.0625	371.2413	340.2186	302.6134	225.7497	143.6301	102.6219	(83)
Total gains	678.9628	776.6087	827.9216	876.4009	892.0653	872.3619	840.6189	810.6673	786.9137	725.3949	672.7603	650.6721	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9759	0.9501	0.9066	0.8096	0.6603	0.4794	0.3442	0.3729	0.5671	0.8275	0.9495	0.9806	(86)
MIT	20.2906	20.4770	20.6685	20.8584	20.9620	20.9948	20.9994	20.9990	20.9869	20.8627	20.5512	20.2402	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9703	0.9396	0.8880	0.7768	0.6133	0.4235	0.2845	0.3111	0.5080	0.7904	0.9370	0.9760	(89)
MIT 2	19.4202	19.6502	19.8809	20.0968	20.2023	20.2300	20.2329	20.2327	20.2246	20.1061	19.7449	19.3571	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.6658	19.8835	20.1032	20.3117	20.4167	20.4459	20.4492	20.4490	20.4397	20.3196	19.9724	19.6063	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6658	19.8835	20.1032	20.3117	20.4167	20.4459	20.4492	20.4490	20.4397	20.3196	19.9724	19.6063	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9653	0.9341	0.8845	0.7804	0.6248	0.4391	0.3013	0.3286	0.5242	0.7949	0.9320	0.9714	(94)
Useful gains	655.3944	725.4170	732.3099	683.9141	557.3682	383.0911	253.3065	266.3486	412.4731	576.5838	627.0072	632.0830	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1011.8572	986.6792	895.7850	751.4731	574.0019	384.9561	253.4740	266.6291	417.4745	640.0470	847.6638	1014.5227	(97)
Space heating kWh	265.2084	175.5682	121.6255	48.6425	12.3755	0.0000	0.0000	0.0000	0.0000	47.2166	158.8727	284.5351	(98a)
Space heating requirement - total per year (kWh/year)												1114.0445	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	265.2084	175.5682	121.6255	48.6425	12.3755	0.0000	0.0000	0.0000	0.0000	47.2166	158.8727	284.5351	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1114.0445	
Space heating per m2										(98c) / (4) =		13.9290	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	265.2084	175.5682	121.6255	48.6425	12.3755	0.0000	0.0000	0.0000	0.0000	47.2166	158.8727	284.5351	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	397.8126	263.3523	182.4382	72.9638	18.5632	0.0000	0.0000	0.0000	0.0000	70.8250	238.3091	426.8027	
Space heating requirement													
	397.8126	263.3523	182.4382	72.9638	18.5632	0.0000	0.0000	0.0000	0.0000	70.8250	238.3091	426.8027	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1671.0668	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												16.7107	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)
Total electricity for the above, kWh/year												21.9935	(331)
Electricity for lighting (calculated in Appendix L)												196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4968.0720	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1522.1851	0.1574	70.1234	(367)
Electrical energy for heat distribution (space & water)	16.7107	0.0000	8.3173	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			230.1131	(373)
Space and water heating			230.1131	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			140.0712	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.7500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1522.1851	1.5825	705.2040	(467)
Electrical energy for heat distribution (space & water)	16.7107	0.0000	87.8475	(472)
Overall CO2 factor for heat network			0.4258	(486)
Total CO2 associated with community systems			2430.4473	(473)
Space and water heating			2430.4473	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	1.4873	-725.8942	
PV Unit electricity exported	-470.1661	0.4450	-209.2081	
Total			-935.1023	(480)
Total Primary energy kWh/year			1829.4095	(483)
Dwelling Primary energy Rate (DPER)			22.8700	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Semi-glazed door			3.5800	1.0000	3.5800			(26a)
TER Opening Type			9.8800	1.1450	11.3130			(27)
Heatloss Floor			39.9900	0.1300	5.1987			(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.1800	7.0326			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.5045			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			213.7769 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.4500	0.0500	0.4225
E3 Sill	6.7500	0.0500	0.3375
E4 Jamb	22.0000	0.0500	1.1000
E6 Intermediate floor within a dwelling	19.5200	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	6.0900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E5 Ground floor (normal)	19.5200	0.1600	3.1232
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
P1 Party wall - Ground floor	6.0900	0.0800	0.4872
E7 Party floor between dwellings (in blocks of flats)	14.1200	0.0700	0.9884
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.7208 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	41.2253 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	77.7420	77.5795	77.4202	76.6720	76.5321	75.8805	75.8805	75.7598	76.1315	76.5321	76.8152	77.1113	(39)
Average = Sum(39)m / 12 =												76.6714	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9700	0.9680	0.9586	0.9569	0.9487	0.9487	0.9472	0.9519	0.9569	0.9604	0.9641	(40)
HLP (average)												0.9586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers													
	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths													
	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses													
	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m													
	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
										Total per year (kWh/year) = Sum(64)m =		2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	122.0433	135.1194	122.0433	126.1114	122.0433	126.1114	122.0433	122.0433	126.1114	122.0433	126.1114	122.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													
	549.0775	561.9896	538.4748	520.0247	494.2273	474.2076	456.4069	457.4780	471.2084	489.6746	519.0383	538.0795	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.8800	36.7938	0.6300	0.7000	0.7700	111.0974	(77)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	111.0974	189.2399	258.9263	320.8223	359.3477	356.7491	343.9442	315.2025	280.3625	209.1504	133.0691	95.0762	(83)
Total gains	660.1748	751.2295	797.4012	840.8470	853.5749	830.9566	800.3510	772.6805	751.5709	698.8250	652.1074	633.1557	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.0920	61.2199	61.3459	61.9445	62.0578	62.5907	62.5907	62.6904	62.3843	62.0578	61.8290	61.5917	
alpha	5.0728	5.0813	5.0897	5.1296	5.1372	5.1727	5.1727	5.1794	5.1590	5.1372	5.1219	5.1061	
util living area	0.9838	0.9685	0.9420	0.8751	0.7528	0.5688	0.4145	0.4470	0.6617	0.8863	0.9673	0.9866	(86)
MIT	19.9806	20.1803	20.4159	20.6976	20.8910	20.9795	20.9966	20.9951	20.9558	20.7217	20.3117	19.9443	(87)
Th 2	20.1067	20.1084	20.1101	20.1179	20.1194	20.1263	20.1263	20.1275	20.1236	20.1194	20.1164	20.1133	(88)
util rest of house	0.9797	0.9608	0.9279	0.8462	0.7018	0.4973	0.3336	0.3642	0.5906	0.8540	0.9580	0.9832	(89)
MIT 2	18.9332	19.1845	19.4769	19.8175	20.0277	20.1138	20.1250	20.1256	20.0939	19.8529	19.3582	18.8924	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.2288	19.4655	19.7419	20.0659	20.2713	20.3581	20.3710	20.3709	20.3371	20.0981	19.6273	19.1892	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2288	19.4655	19.7419	20.0659	20.2713	20.3581	20.3710	20.3709	20.3371	20.0981	19.6273	19.1892	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9745	0.9541	0.9211	0.8443	0.7111	0.5167	0.3564	0.3875	0.6087	0.8531	0.9516	0.9785	(94)
Useful gains	643.3588	716.7140	734.4602	709.9191	606.9822	429.3322	285.2436	299.4450	457.4518	596.1606	620.5439	619.5621	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1160.5941	1129.9856	1025.1895	856.1088	655.9821	436.9284	286.1443	300.8368	474.8417	726.9071	962.2849	1155.8369	(97)
Space heating kWh	384.8230	277.7185	216.3026	105.2566	36.4559	0.0000	0.0000	0.0000	0.0000	97.2754	246.0535	398.9885	(98a)
Space heating requirement - total per year (kWh/year)												1762.8740	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	384.8230	277.7185	216.3026	105.2566	36.4559	0.0000	0.0000	0.0000	0.0000	97.2754	246.0535	398.9885	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1762.8740	
Space heating per m2											(98c) / (4) =	22.0414	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 92.3000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	384.8230	277.7185	216.3026	105.2566	36.4559	0.0000	0.0000	0.0000	0.0000	97.2754	246.0535	398.9885	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	416.9263	300.8868	234.3474	114.0375	39.4972	0.0000	0.0000	0.0000	0.0000	105.3905	266.5802	432.2735	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.2210	84.7757	84.0781	82.7999	81.1621	79.8000	79.8000	79.8000	79.8000	82.6198	84.4910	85.3211	(217)
Fuel for water heating, kWh/month	267.9098	238.1004	255.1762	228.4874	226.3350	207.8751	205.6450	213.6686	215.8200	231.8904	240.3906	264.7901	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.3582	20.3433	18.3169	13.4197	10.3658	8.4689	9.4560	12.2913	15.9652	20.9471	23.6598	26.0630	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3424	-31.5676	-47.5704	-56.1485	-62.8691	-59.5233	-58.7993	-54.3654	-46.9365	-37.2699	-23.9846	-18.2835	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9342	-17.0411	-34.5369	-52.8648	-70.8844	-71.5905	-70.7461	-59.4418	-42.9727	-24.6882	-10.6939	-6.2480	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1909.9393	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2796.0887	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	204.6551	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4008.3801	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1909.9393	0.2100	401.0873	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2796.0887	0.2100	587.1786	(264)
Space and water heating			988.2659	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	204.6551	0.1443	29.5381	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	0.1336	-69.2911	
PV Unit electricity exported	-469.6425	0.1253	-58.8667	
Total			-128.1578	(269)
Total CO2, kg/year			901.5754	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.2700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1909.9393	1.1300	2158.2314	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2796.0887	1.1300	3159.5802	(278)
Space and water heating			5317.8117	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	204.6551	1.5338	313.9068	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	1.4937	-774.7198	
PV Unit electricity exported	-469.6425	0.4601	-216.0686	
Total			-990.7884	(283)
Total Primary energy kWh/year			4771.0309	(286)
Target Primary Energy Rate (TPER)			59.6500	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.75	**TER**	11.27
Environmental	99 A	**% DER < TER**			84.47
CO_2 Emissions (t/year)	0.11	**DFEE**	21.56	**TFEE**	28.31
Compliance Check	See BREL	**% DFEE < TFEE**			23.84
% DPER < TPER	61.65	**DPER**	22.87	**TPER**	59.65

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6723	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	33.5192	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	610.7421	608.5956	590.7266	557.3213	524.1652	494.1729	476.4438	479.4976	496.5901	527.0115	563.7339	595.7477	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.8800	36.7938	0.6800	0.7000	0.7700	119.9146	(77)

Solar gains	119.9146	204.2590	279.4760	346.2844	387.8673	385.0625	371.2413	340.2186	302.6134	225.7497	143.6301	102.6219	(83)
Total gains	730.6567	812.8546	870.2027	903.6057	912.0325	879.2353	847.6851	819.7161	799.2036	752.7612	707.3640	698.3696	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)		

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area													
	0.9667	0.9404	0.8896	0.7945	0.6481	0.4758	0.3414	0.3688	0.5591	0.8099	0.9385	0.9734	(86)
MIT	20.3617	20.5200	20.7068	20.8721	20.9654	20.9950	20.9994	20.9990	20.9878	20.8780	20.5920	20.3078	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house													
	0.9594	0.9283	0.8690	0.7609	0.6014	0.4203	0.2821	0.3077	0.5006	0.7714	0.9240	0.9673	(89)
MIT 2	19.5081	19.7019	19.9247	20.1108	20.2052	20.2302	20.2329	20.2328	20.2252	20.1214	19.7933	19.4414	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.7490	19.9327	20.1454	20.3256	20.4197	20.4460	20.4492	20.4490	20.4404	20.3349	20.0187	19.6859	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7490	19.9327	20.1454	20.3256	20.4197	20.4460	20.4492	20.4490	20.4404	20.3349	20.0187	19.6859	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9540	0.9229	0.8664	0.7652	0.6130	0.4358	0.2988	0.3250	0.5166	0.7768	0.9193	0.9622	(94)
Useful gains	697.0131	750.1903	753.9806	691.4004	559.0787	383.1727	253.3149	266.3668	412.8737	584.7823	650.3083	671.9468	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1017.3326	989.9233	898.5663	752.3905	574.2015	384.9655	253.4750	266.6312	417.5208	641.0556	850.7102	1019.7647	(97)
Space heating kWh													
	238.3178	161.1006	107.5718	43.9128	11.2513	0.0000	0.0000	0.0000	0.0000	41.8673	144.2894	258.7765	(98a)
Space heating requirement - total per year (kWh/year)												1007.0876	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	238.3178	161.1006	107.5718	43.9128	11.2513	0.0000	0.0000	0.0000	0.0000	41.8673	144.2894	258.7765	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1007.0876	
Space heating per m2											(98c) / (4) =	12.5917	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	238.3178	161.1006	107.5718	43.9128	11.2513	0.0000	0.0000	0.0000	0.0000	41.8673	144.2894	258.7765	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	357.4766	241.6509	161.3577	65.8693	16.8770	0.0000	0.0000	0.0000	0.0000	62.8010	216.4341	388.1648	
Space heating requirement													
	357.4766	241.6509	161.3577	65.8693	16.8770	0.0000	0.0000	0.0000	0.0000	62.8010	216.4341	388.1648	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1510.6314	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												15.1063	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)
Total electricity for the above, kWh/year												21.9935	(331)
Electricity for lighting (calculated in Appendix L)												196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4807.6366	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1510.6314	4.4400	67.0720	(340a)
Space heating total			67.0720	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	196.1051	16.4900	32.3377	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	16.4900	-80.4802	
PV Unit electricity exported	-470.1661	5.5900	-26.2823	
Total			-106.7625	(352)
Total energy cost			267.5224	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7706 (357)
SAP value		87.5088
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1479.4024	0.1574	63.4029	(367)
Electrical energy for heat distribution (space & water)	15.1063	0.0000	8.0653	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			223.1406	(373)
Space and water heating			223.1406	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			133.0987	(383)
CO2 emissions per m2			1.6600	(384)
EI value			98.5730	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 79.9800						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate													
	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17097.8798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.6723	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 33.5192	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff													
	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m													
	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
327.4608 330.8588 322.2959 304.0665 281.0552 259.4278 244.9794 241.5813 250.1442 268.3736 291.3850 313.0124 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 (71)
Water heating gains (Table 5)
154.0336 151.5930 146.8914 136.5869 130.2751 123.6777 119.6256 122.9734 126.8986 134.2191 144.0972 152.7161 (72)
Total internal gains
610.7421 608.5956 590.7266 557.3213 524.1652 494.1729 476.4438 479.4976 496.5901 527.0115 563.7339 595.7477 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.8800	42.9509	0.6800	0.7000	0.7700	139.9812	(77)

Solar gains 139.9812 211.8913 286.3199 361.0906 392.1902 418.9836 395.8234 367.7813 327.9419 247.1876 165.1363 120.5201 (83)
Total gains 750.7233 820.4869 877.0465 918.4119 916.3554 913.1564 872.2672 847.2789 824.5320 774.1991 728.8702 716.2678 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9597	0.9336	0.8735	0.7691	0.6154	0.4167	0.2943	0.3184	0.5210	0.7710	0.9233	0.9678	(86)
MIT	20.4167	20.5547	20.7472	20.8959	20.9747	20.9977	20.9998	20.9996	20.9918	20.9107	20.6495	20.3617	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9510	0.9203	0.8504	0.7330	0.5670	0.3623	0.2365	0.2590	0.4629	0.7281	0.9058	0.9606	(89)
MIT 2	19.5762	19.7441	19.9716	20.1358	20.2135	20.2319	20.2331	20.2330	20.2281	20.1546	19.8618	19.5086	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.8134	19.9728	20.1905	20.3503	20.4283	20.4480	20.4494	20.4493	20.4436	20.3680	20.0841	19.7493	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8134	19.9728	20.1905	20.3503	20.4283	20.4480	20.4494	20.4493	20.4436	20.3680	20.0841	19.7493	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9454	0.9151	0.8490	0.7388	0.5796	0.3776	0.2528	0.2757	0.4790	0.7360	0.9019	0.9552	(94)
Useful gains	709.7664	750.8671	744.5796	678.5014	531.0757	344.8271	220.5074	233.6328	394.9623	569.8432	657.3674	684.1976	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	1001.8185	972.8067	868.6067	727.6760	541.8458	345.5885	220.5635	233.7283	397.9771	610.3071	828.6784	1004.1864	(97)
Space heating kWh	217.2868	149.1434	92.2762	35.4057	8.0129	0.0000	0.0000	0.0000	0.0000	30.1052	123.3439	238.0717	(98a)
Space heating requirement - total per year (kWh/year)												893.6458	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	217.2868	149.1434	92.2762	35.4057	8.0129	0.0000	0.0000	0.0000	0.0000	30.1052	123.3439	238.0717	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												893.6458	
Space heating per m2										(98c) / (4) =		11.1734	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement
217.2868 149.1434 92.2762 35.4057 8.0129 0.0000 0.0000 0.0000 0.0000 30.1052 123.3439 238.0717 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50
307a 325.9301 223.7151 138.4142 53.1086 12.0194 0.0000 0.0000 0.0000 0.0000 45.1578 185.0159 357.1076
Space heating requirement
325.9301 223.7151 138.4142 53.1086 12.0194 0.0000 0.0000 0.0000 0.0000 45.1578 185.0159 357.1076 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)

Water heating
Annual water heating requirement
266.9446 236.1786 250.9634 220.5542 213.7828 192.6005 189.9534 197.4446 199.5749 222.6078 236.8171 263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50
310a 400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948
Water heating fuel
400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948 (310)
Cooling System Energy Efficiency Ratio 0.0000 (314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (315)
Pumps and Fa 1.8679 1.6872 1.8679 1.8077 1.8679 1.8077 1.8679 1.8679 1.8077 1.8679 1.8077 1.8679 (331)
Lighting 24.2988 19.4934 17.5516 12.8591 9.9327 8.1151 9.0610 11.7778 15.2982 20.0720 22.6713 24.9741 (332)
Electricity generated by PVs (Appendix M) (negative quantity)
(333a)m -17.9780 -26.9243 -45.2366 -58.5173 -66.4974 -66.2241 -64.3099 -58.6197 -48.0109 -34.7929 -20.6435 -14.9664 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(334a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (334a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)

Electricity generated by PVs (Appendix M) (negative quantity)

(333b)m	-6.0204	-13.0409	-32.0085	-59.0559	-82.7431	-94.8946	-90.1802	-72.6219	-46.3379	-22.2034	-8.3869	-4.5323	(333b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1340.4687	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	13.4047	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4540.9477	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1340.4687	6.5500	87.8007	(340a)
Space heating total			87.8007	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	196.1051	28.4300	55.7527	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	28.4300	-148.6096	
PV Unit electricity exported	-532.0259	5.8100	-30.9107	
Total			-179.5203	(352)
Total energy cost			338.7177	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1434.0256	0.1578	56.4178	(367)
Electrical energy for heat distribution (space & water)	13.4047	0.0000	7.8034	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			215.8935	(373)
Space and water heating			215.8935	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	0.1322	-69.1017	
PV Unit electricity exported	-532.0259	0.1213	-64.5494	
Total			-133.6511	(380)
Total CO2, kg/year			113.5973	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1434.0256	1.5843	566.3075	(467)
Electrical energy for heat distribution (space & water)	13.4047	0.0000	82.6389	(472)
Overall CO2 factor for heat network			0.4252	(486)
Total CO2 associated with community systems			2286.3422	(473)
Space and water heating			2286.3422	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	1.4884	-778.0360	
PV Unit electricity exported	-532.0259	0.4451	-236.7863	
Total			-1014.8223	(480)
Total Primary energy kWh/year			1605.5844	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Southeast

Current energy efficiency rating:	B 88
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£62	£62	£0
Community scheme	£456	£456	£0
Space heating	£198	£198	£0
Water heating	£264	£264	£0
Lighting	£56	£56	£0
Generated (PV)	-£180	-£180	£0
Total cost of fuels	£338	£338	£0
Total cost of uses	£338	£338	£0
Delivered energy	57 kWh/m²	57 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	20 kWh/m²	20 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17097.8798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6723 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
									Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)

Water heating gains (Table 5)

154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)

Total internal gains

610.7421	608.5956	590.7266	557.3213	524.1652	494.1729	476.4438	479.4976	496.5901	527.0115	563.7339	595.7477	(73)

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6. Solar gains

[Jan]													
							Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast							9.8800	36.7938	0.6800	0.7000	0.7700	119.9146	(77)
Solar gains	119.9146	204.2590	279.4760	346.2844	387.8673	385.0625	371.2413	340.2186	302.6134	225.7497	143.6301	102.6219	(83)
Total gains	730.6567	812.8546	870.2027	903.6057	912.0325	879.2353	847.6851	819.7161	799.2036	752.7612	707.3640	698.3696	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9667	0.9404	0.8896	0.7945	0.6481	0.4758	0.3414	0.3688	0.5591	0.8099	0.9385	0.9734	(86)
MIT	20.3617	20.5200	20.7068	20.8721	20.9654	20.9950	20.9994	20.9990	20.9878	20.8780	20.5920	20.3078	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9594	0.9283	0.8690	0.7609	0.6014	0.4203	0.2821	0.3077	0.5006	0.7714	0.9240	0.9673	(89)
MIT 2	19.5081	19.7019	19.9247	20.1108	20.2052	20.2302	20.2329	20.2328	20.2252	20.1214	19.7933	19.4414	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.7490	19.9327	20.1454	20.3256	20.4197	20.4460	20.4492	20.4490	20.4404	20.3349	20.0187	19.6859	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7490	19.9327	20.1454	20.3256	20.4197	20.4460	20.4492	20.4490	20.4404	20.3349	20.0187	19.6859	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9540	0.9229	0.8664	0.7652	0.6130	0.4358	0.2988	0.3250	0.5166	0.7768	0.9193	0.9622	(94)
Useful gains	697.0131	750.1903	753.9806	691.4004	559.0787	383.1727	253.3149	266.3668	412.8737	584.7823	650.3083	671.9468	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1017.3326	989.9233	898.5663	752.3905	574.2015	384.9655	253.4750	266.6312	417.5208	641.0556	850.7102	1019.7647	(97)
Space heating kWh	238.3178	161.1006	107.5718	43.9128	11.2513	0.0000	0.0000	0.0000	0.0000	41.8673	144.2894	258.7765	(98a)
Space heating requirement - total per year (kWh/year)												1007.0876	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	238.3178	161.1006	107.5718	43.9128	11.2513	0.0000	0.0000	0.0000	0.0000	41.8673	144.2894	258.7765	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1007.0876	
Space heating per m2											(98c) / (4) =	12.5917	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	238.3178	161.1006	107.5718	43.9128	11.2513	0.0000	0.0000	0.0000	0.0000	41.8673	144.2894	258.7765	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	357.4766	241.6509	161.3577	65.8693	16.8770	0.0000	0.0000	0.0000	0.0000	62.8010	216.4341	388.1648	
Space heating requirement	357.4766	241.6509	161.3577	65.8693	16.8770	0.0000	0.0000	0.0000	0.0000	62.8010	216.4341	388.1648	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1510.6314	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												15.1063	(313)
Space cooling fuel												0.0000	(321)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)

mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4807.6366	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1510.6314	4.4400	67.0720	(340a)
Space heating total			67.0720	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	196.1051	16.4900	32.3377	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	16.4900	-80.4802	
PV Unit electricity exported	-470.1661	5.5900	-26.2823	
Total			-106.7625	(352)
Total energy cost			267.5224	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7706	(357)
SAP value		87.5088	
SAP rating (Section 12)		88	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1479.4024	0.1574	63.4029	(367)
Electrical energy for heat distribution (space & water)	15.1063	0.0000	8.0653	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			223.1406	(373)
Space and water heating			223.1406	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			133.0987	(383)
CO2 emissions per m2			1.6600	(384)
EI value			98.5730	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)

Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17097.8798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.6723 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)
Total storage loss	

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)

											Total per year (kWh/year) = Sum(64)m =	2691.4183	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000		(64a)
Heat gains from water heating, kWh/month													
114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207		(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains													
	610.7421	608.5956	590.7266	557.3213	524.1652	494.1729	476.4438	479.4976	496.5901	527.0115	563.7339	595.7477	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.8800	42.9509	0.6800	0.7000	0.7700	139.9812	(77)

Solar gains	139.9812	211.8913	286.3199	361.0906	392.1902	418.9836	395.8234	367.7813	327.9419	247.1876	165.1363	120.5201	(83)
Total gains	750.7233	820.4869	877.0465	918.4119	916.3554	913.1564	872.2672	847.2789	824.5320	774.1991	728.8702	716.2678	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area													
	0.9597	0.9336	0.8735	0.7691	0.6154	0.4167	0.2943	0.3184	0.5210	0.7710	0.9233	0.9678	(86)
MIT	20.4167	20.5547	20.7472	20.8959	20.9747	20.9977	20.9998	20.9996	20.9918	20.9107	20.6495	20.3617	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house													
	0.9510	0.9203	0.8504	0.7330	0.5670	0.3623	0.2365	0.2590	0.4629	0.7281	0.9058	0.9606	(89)
MIT 2	19.5762	19.7441	19.9716	20.1358	20.2135	20.2319	20.2331	20.2330	20.2281	20.1546	19.8618	19.5086	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.8134	19.9728	20.1905	20.3503	20.4283	20.4480	20.4494	20.4493	20.4436	20.3680	20.0841	19.7493	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8134	19.9728	20.1905	20.3503	20.4283	20.4480	20.4494	20.4493	20.4436	20.3680	20.0841	19.7493	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9454	0.9151	0.8490	0.7388	0.5796	0.3776	0.2528	0.2757	0.4790	0.7360	0.9019	0.9552	(94)
Useful gains	709.7664	750.8671	744.5796	678.5014	531.0757	344.8271	220.5074	233.6328	394.9623	569.8432	657.3674	684.1976	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
1001.8185	972.8067	868.6067	727.6760	541.8458	345.5885	220.5635	233.7283	397.9771	610.3071	828.6784	1004.1864		(97)
Space heating kWh													
217.2868	149.1434	92.2762	35.4057	8.0129	0.0000	0.0000	0.0000	0.0000	30.1052	123.3439	238.0717		(98a)
Space heating requirement - total per year (kWh/year)												893.6458	
Solar heating kWh													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
217.2868	149.1434	92.2762	35.4057	8.0129	0.0000	0.0000	0.0000	0.0000	30.1052	123.3439	238.0717		(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												893.6458	
Space heating per m2											(98c) / (4) =	11.1734	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:													
Space heating requirement													
217.2868	149.1434	92.2762	35.4057	8.0129	0.0000	0.0000	0.0000	0.0000	30.1052	123.3439	238.0717		(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	325.9301	223.7151	138.4142	53.1086	12.0194	0.0000	0.0000	0.0000	0.0000	45.1578	185.0159	357.1076	
Space heating requirement													
	325.9301	223.7151	138.4142	53.1086	12.0194	0.0000	0.0000	0.0000	0.0000	45.1578	185.0159	357.1076	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.9780	-26.9243	-45.2366	-58.5173	-66.4974	-66.2241	-64.3099	-58.6197	-48.0109	-34.7929	-20.6435	-14.9664	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.0204	-13.0409	-32.0085	-59.0559	-82.7431	-94.8946	-90.1802	-72.6219	-46.3379	-22.2034	-8.3869	-4.5323	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1340.4687	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	13.4047	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4540.9477	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1340.4687	6.5500	87.8007	(340a)
Space heating total			87.8007	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	196.1051	28.4300	55.7527	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	28.4300	-148.6096	
PV Unit electricity exported	-532.0259	5.8100	-30.9107	
Total			-179.5203	(352)
Total energy cost			338.7177	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1434.0256	0.1578	56.4178	(367)
Electrical energy for heat distribution (space & water)	13.4047	0.0000	7.8034	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			215.8935	(373)
Space and water heating			215.8935	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	0.1322	-69.1017	
PV Unit electricity exported	-532.0259	0.1213	-64.5494	
Total			-133.6511	(380)
Total CO2, kg/year			113.5973	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1434.0256	1.5843	566.3075	(467)
Electrical energy for heat distribution (space & water)	13.4047	0.0000	82.6389	(472)
Overall CO2 factor for heat network			0.4252	(486)
Total CO2 associated with community systems			2286.3422	(473)
Space and water heating			2286.3422	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)

Energy saving/generation technologies			
PV Unit electricity used in dwelling	-522.7211	1.4884	-778.0360
PV Unit electricity exported	-532.0259	0.4451	-236.7863
Total			-1014.8223 (480)
Total Primary energy kWh/year			1605.5844 (483)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.75	**TER**	11.27
Environmental	99 A	**% DER < TER**			84.47
CO_2 Emissions (t/year)	0.11	**DFEE**	21.56	**TFEE**	28.31
Compliance Check	See BREL	**% DFEE < TFEE**			23.84
% DPER < TPER	61.65	**DPER**	22.87	**TPER**	59.65

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6723 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4625 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)		122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.6786	139.1442	125.6786	129.8679	125.6786	129.8679	125.6786	125.6786	129.8679	125.6786	129.8679	125.6786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	559.0481	572.3498	548.4455	530.1166	504.1979	487.2994	469.3775	470.4487	484.3003	499.6452	529.1302	548.0502	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	9.8800	36.7938	0.6800	0.7000	0.7700	119.9146	(79)

Solar gains	119.9146	204.2590	279.4760	346.2844	387.8673	385.0625	371.2413	340.2186	302.6134	225.7497	143.6301	102.6219	(83)
Total gains	678.9628	776.6087	827.9216	876.4009	892.0653	872.3619	840.6189	810.6673	786.9137	725.3949	672.7603	650.6721	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)		21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9759	0.9501	0.9066	0.8096	0.6603	0.4794	0.3442	0.3729	0.5671	0.8275	0.9495	0.9806	(86)
MIT	20.2906	20.4770	20.6685	20.8584	20.9620	20.9948	20.9994	20.9990	20.9869	20.8627	20.5512	20.2402	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9703	0.9396	0.8880	0.7768	0.6133	0.4235	0.2845	0.3111	0.5080	0.7904	0.9370	0.9760	(89)
MIT 2	19.4202	19.6502	19.8809	20.0968	20.2023	20.2300	20.2329	20.2327	20.2246	20.1061	19.7449	19.3571	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.6658	19.8835	20.1032	20.3117	20.4167	20.4459	20.4492	20.4490	20.4397	20.3196	19.9724	19.6063	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6658	19.8835	20.1032	20.3117	20.4167	20.4459	20.4492	20.4490	20.4397	20.3196	19.9724	19.6063	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9653	0.9341	0.8845	0.7804	0.6248	0.4391	0.3013	0.3286	0.5242	0.7949	0.9320	0.9714	(94)
Useful gains	655.3944	725.4170	732.3099	683.9141	557.3682	383.0911	253.3065	266.3486	412.4731	576.5838	627.0072	632.0830	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1011.8572	986.6792	895.7850	751.4731	574.0019	384.9561	253.4740	266.6291	417.4745	640.0470	847.6638	1014.5227	(97)
Space heating kWh	265.2084	175.5682	121.6255	48.6425	12.3755	0.0000	0.0000	0.0000	0.0000	47.2166	158.8727	284.5351	(98a)
Space heating requirement - total per year (kWh/year)												1114.0445	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	265.2084	175.5682	121.6255	48.6425	12.3755	0.0000	0.0000	0.0000	0.0000	47.2166	158.8727	284.5351	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1114.0445	
Space heating per m2										(98c) / (4) =		13.9290	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	265.2084	175.5682	121.6255	48.6425	12.3755	0.0000	0.0000	0.0000	0.0000	47.2166	158.8727	284.5351	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	397.8126	263.3523	182.4382	72.9638	18.5632	0.0000	0.0000	0.0000	0.0000	70.8250	238.3091	426.8027	
Space heating requirement													
	397.8126	263.3523	182.4382	72.9638	18.5632	0.0000	0.0000	0.0000	0.0000	70.8250	238.3091	426.8027	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1671.0668	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												16.7107	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)
Total electricity for the above, kWh/year												21.9935	(331)
Electricity for lighting (calculated in Appendix L)												196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4968.0720	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1522.1851	0.1574	70.1234	(367)
Electrical energy for heat distribution (space & water)	16.7107	0.0000	8.3173	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			230.1131	(373)
Space and water heating			230.1131	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			140.0712	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.7500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1522.1851	1.5825	705.2040	(467)
Electrical energy for heat distribution (space & water)	16.7107	0.0000	87.8475	(472)
Overall CO2 factor for heat network			0.4258	(486)
Total CO2 associated with community systems			2430.4473	(473)
Space and water heating			2430.4473	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	1.4873	-725.8942	
PV Unit electricity exported	-470.1661	0.4450	-209.2081	
Total			-935.1023	(480)
Total Primary energy kWh/year			1829.4095	(483)
Dwelling Primary energy Rate (DPER)			22.8700	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Semi-glazed door			3.5800	1.0000	3.5800			(26a)
TER Opening Type			9.8800	1.1450	11.3130			(27)
Heatloss Floor			39.9900	0.1300	5.1987			(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.1800	7.0326			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.5045			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			213.7769 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.4500	0.0500	0.4225
E3 Sill	6.7500	0.0500	0.3375
E4 Jamb	22.0000	0.0500	1.1000
E6 Intermediate floor within a dwelling	19.5200	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	6.0900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E5 Ground floor (normal)	19.5200	0.1600	3.1232
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
P1 Party wall - Ground floor	6.0900	0.0800	0.4872
E7 Party floor between dwellings (in blocks of flats)	14.1200	0.0700	0.9884
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.7208 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	41.2253 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	77.7420	77.5795	77.4202	76.6720	76.5321	75.8805	75.8805	75.7598	76.1315	76.5321	76.8152	77.1113	(39)
Average = Sum(39)m / 12 =												76.6714	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9700	0.9680	0.9586	0.9569	0.9487	0.9487	0.9472	0.9519	0.9569	0.9604	0.9641	(40)
HLP (average)												0.9586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers													
	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths													
	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses													
	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m													
	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
										Total per year (kWh/year) = Sum(64)m =		2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	122.0433	135.1194	122.0433	126.1114	122.0433	126.1114	122.0433	122.0433	126.1114	122.0433	126.1114	122.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													
	549.0775	561.9896	538.4748	520.0247	494.2273	474.2076	456.4069	457.4780	471.2084	489.6746	519.0383	538.0795	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	9.8800	36.7938	0.6300	0.7000	0.7700	111.0974	(79)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	111.0974	189.2399	258.9263	320.8223	359.3477	356.7491	343.9442	315.2025	280.3625	209.1504	133.0691	95.0762	(83)
Total gains	660.1748	751.2295	797.4012	840.8470	853.5749	830.9566	800.3510	772.6805	751.5709	698.8250	652.1074	633.1557	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.0920	61.2199	61.3459	61.9445	62.0578	62.5907	62.5907	62.6904	62.3843	62.0578	61.8290	61.5917	
alpha	5.0728	5.0813	5.0897	5.1296	5.1372	5.1727	5.1727	5.1794	5.1590	5.1372	5.1219	5.1061	
util living area	0.9838	0.9685	0.9420	0.8751	0.7528	0.5688	0.4145	0.4470	0.6617	0.8863	0.9673	0.9866	(86)
MIT	19.9806	20.1803	20.4159	20.6976	20.8910	20.9795	20.9966	20.9951	20.9558	20.7217	20.3117	19.9443	(87)
Th 2	20.1067	20.1084	20.1101	20.1179	20.1194	20.1263	20.1263	20.1275	20.1236	20.1194	20.1164	20.1133	(88)
util rest of house	0.9797	0.9608	0.9279	0.8462	0.7018	0.4973	0.3336	0.3642	0.5906	0.8540	0.9580	0.9832	(89)
MIT 2	18.9332	19.1845	19.4769	19.8175	20.0277	20.1138	20.1250	20.1256	20.0939	19.8529	19.3582	18.8924	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.2288	19.4655	19.7419	20.0659	20.2713	20.3581	20.3710	20.3709	20.3371	20.0981	19.6273	19.1892	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2288	19.4655	19.7419	20.0659	20.2713	20.3581	20.3710	20.3709	20.3371	20.0981	19.6273	19.1892	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9745	0.9541	0.9211	0.8443	0.7111	0.5167	0.3564	0.3875	0.6087	0.8531	0.9516	0.9785	(94)
Useful gains	643.3588	716.7140	734.4602	709.9191	606.9822	429.3322	285.2436	299.4450	457.4518	596.1606	620.5439	619.5621	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1160.5941	1129.9856	1025.1895	856.1088	655.9821	436.9284	286.1443	300.8368	474.8417	726.9071	962.2849	1155.8369	(97)
Space heating kWh	384.8230	277.7185	216.3026	105.2566	36.4559	0.0000	0.0000	0.0000	0.0000	97.2754	246.0535	398.9885	(98a)
Space heating requirement - total per year (kWh/year)												1762.8740	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	384.8230	277.7185	216.3026	105.2566	36.4559	0.0000	0.0000	0.0000	0.0000	97.2754	246.0535	398.9885	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1762.8740	
Space heating per m2											(98c) / (4) =	22.0414	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 92.3000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	384.8230	277.7185	216.3026	105.2566	36.4559	0.0000	0.0000	0.0000	0.0000	97.2754	246.0535	398.9885	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	416.9263	300.8868	234.3474	114.0375	39.4972	0.0000	0.0000	0.0000	0.0000	105.3905	266.5802	432.2735	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.2210	84.7757	84.0781	82.7999	81.1621	79.8000	79.8000	79.8000	79.8000	82.6198	84.4910	85.3211	(217)
Fuel for water heating, kWh/month	267.9098	238.1004	255.1762	228.4874	226.3350	207.8751	205.6450	213.6686	215.8200	231.8904	240.3906	264.7901	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.3582	20.3433	18.3169	13.4197	10.3658	8.4689	9.4560	12.2913	15.9652	20.9471	23.6598	26.0630	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3424	-31.5676	-47.5704	-56.1485	-62.8691	-59.5233	-58.7993	-54.3654	-46.9365	-37.2699	-23.9846	-18.2835	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9342	-17.0411	-34.5369	-52.8648	-70.8844	-71.5905	-70.7461	-59.4418	-42.9727	-24.6882	-10.6939	-6.2480	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1909.9393	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2796.0887	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	204.6551	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4008.3801	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1909.9393	0.2100	401.0873	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2796.0887	0.2100	587.1786	(264)
Space and water heating			988.2659	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	204.6551	0.1443	29.5381	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	0.1336	-69.2911	
PV Unit electricity exported	-469.6425	0.1253	-58.8667	
Total			-128.1578	(269)
Total CO2, kg/year			901.5754	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.2700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1909.9393	1.1300	2158.2314	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2796.0887	1.1300	3159.5802	(278)
Space and water heating			5317.8117	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	204.6551	1.5338	313.9068	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	1.4937	-774.7198	
PV Unit electricity exported	-469.6425	0.4601	-216.0686	
Total			-990.7884	(283)
Total Primary energy kWh/year			4771.0309	(286)
Target Primary Energy Rate (TPER)			59.6500	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.75	**TER**	11.27
Environmental	99 A	**% DER < TER**			84.47
CO_2 Emissions (t/year)	0.11	**DFEE**	21.56	**TFEE**	28.31
Compliance Check	See BREL	**% DFEE < TFEE**			23.84
% DPER < TPER	61.65	**DPER**	22.87	**TPER**	59.65

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		3 * 10 =	30.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2122	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2705	0.2652	0.2599	0.2334	0.2281	0.2016	0.2016	0.1963	0.2122	0.2281	0.2387	0.2493	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5366	0.5352	0.5338	0.5272	0.5260	0.5203	0.5203	0.5193	0.5225	0.5260	0.5285	0.5311	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							3.6723	(36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.6979	34.6061	34.5160	34.0930	34.0139	33.6455	33.6455	33.5772	33.7874	34.0139	34.1740	34.3414	(38)
Heat transfer coeff	68.2172	68.1253	68.0352	67.6122	67.5331	67.1647	67.1647	67.0965	67.3066	67.5331	67.6932	67.8606	(39)
Average = Sum(39)m / 12 =												67.6118	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8529	0.8518	0.8507	0.8454	0.8444	0.8398	0.8398	0.8389	0.8415	0.8444	0.8464	0.8485	(40)
HLP (average)												0.8454	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.6786	139.1442	125.6786	129.8679	125.6786	129.8679	125.6786	125.6786	129.8679	125.6786	129.8679	125.6786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains	453.4664	467.9883	446.9019	435.3676	413.4459	400.7688	385.7326	384.8800	396.4077	407.0433	430.0429	443.3929	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	9.8800	36.7938	0.6800	0.7000	0.7700	119.9146	(79)

Solar gains	119.9146	204.2590	279.4760	346.2844	387.8673	385.0625	371.2413	340.2186	302.6134	225.7497	143.6301	102.6219	(83)
Total gains	573.3810	672.2473	726.3779	781.6519	801.3133	785.8313	756.9740	725.0986	699.0212	632.7930	573.6729	546.0148	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.6219	69.7158	69.8081	70.2449	70.3272	70.7129	70.7129	70.7848	70.5638	70.3272	70.1608	69.9878	
alpha	5.6415	5.6477	5.6539	5.6830	5.6885	5.7142	5.7142	5.7190	5.7043	5.6885	5.6774	5.6659	
util living area	0.9896	0.9746	0.9463	0.8690	0.7311	0.5390	0.3893	0.4238	0.6412	0.8910	0.9756	0.9919	(86)
MIT	20.0781	20.2878	20.5175	20.7758	20.9318	20.9898	20.9986	20.9978	20.9739	20.7763	20.3844	20.0342	(87)

Th 2	20.2077	20.2087	20.2096	20.2142	20.2150	20.2190	20.2190	20.2197	20.2175	20.2150	20.2133	20.2115	(88)
util rest of house	0.9869	0.9685	0.9336	0.8410	0.6832	0.4764	0.3208	0.3529	0.5769	0.8612	0.9686	0.9898	(89)
MIT 2	19.3705	19.5769	19.7990	20.0405	20.1705	20.2142	20.2186	20.2190	20.2037	20.0465	19.6773	19.3302	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.5702	19.7775	20.0018	20.2480	20.3853	20.4330	20.4387	20.4388	20.4211	20.2524	19.8768	19.5289	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5702	19.7775	20.0018	20.2480	20.3853	20.4330	20.4387	20.4388	20.4211	20.2524	19.8768	19.5289	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9842	0.9646	0.9298	0.8424	0.6940	0.4938	0.3401	0.3729	0.5941	0.8628	0.9650	0.9875	(94)
Useful gains	564.3288	648.4197	675.3800	658.4269	556.1217	388.0595	257.4652	270.3789	415.2814	545.9831	553.6016	539.1924	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1041.6872	1013.5331	918.5946	767.2626	586.5454	391.7747	257.8265	270.9894	425.4483	651.8589	864.9054	1040.2278	(97)
Space heating kWh	355.1546	245.3562	180.9516	78.3617	22.6352	0.0000	0.0000	0.0000	0.0000	78.7716	224.1388	372.7703	(98a)
Space heating requirement - total per year (kWh/year)												1558.1401	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	355.1546	245.3562	180.9516	78.3617	22.6352	0.0000	0.0000	0.0000	0.0000	78.7716	224.1388	372.7703	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1558.1401	
Space heating per m2											(98c) / (4) =	19.4816	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	631.3480	497.0186	509.9330	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9478	0.9777	0.9700	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	598.3942	485.9187	494.6202	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	859.1313	828.2474	793.5758	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	187.7308	254.6926	222.4229	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	46.9327	63.6731	55.6057	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												166.2116	(107)
Energy for space heating												19.4816	(99)
Energy for space cooling												2.0782	(108)
Total												21.5598	(109)
Fabric Energy Efficiency (DFEE)												21.6	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Semi-glazed door			3.5800	1.0000	3.5800			(26a)
TER Opening Type			9.8800	1.1450	11.3130			(27)
Heatloss Floor			39.9900	0.1300	5.1987			(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.1800	7.0326			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.5045			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 213.7769 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.4500	0.0500	0.4225
E3 Sill	6.7500	0.0500	0.3375
E4 Jamb	22.0000	0.0500	1.1000
E6 Intermediate floor within a dwelling	19.5200	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	6.0900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E5 Ground floor (normal)	19.5200	0.1600	3.1232
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
P1 Party wall - Ground floor	6.0900	0.0800	0.4872
E7 Party floor between dwellings (in blocks of flats)	14.1200	0.0700	0.9884

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.7208 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.2253 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	77.7420	77.5795	77.4202	76.6720	76.5321	75.8805	75.8805	75.7598	76.1315	76.5321	76.8152	77.1113	(39)

Average = Sum(39)m / 12 = 76.6714

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9700	0.9680	0.9586	0.9569	0.9487	0.9487	0.9472	0.9519	0.9569	0.9604	0.9641	(40)
HLP (average)												0.9586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	122.0433	135.1194	122.0433	126.1114	122.0433	126.1114	122.0433	122.0433	126.1114	122.0433	126.1114	122.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains													
	449.8311	463.9635	443.2666	431.6111	409.8106	397.0124	382.0973	381.2447	392.6512	403.4080	426.2864	439.7576	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	9.8800	36.7938	0.6300	0.7000	0.7700	111.0974	(79)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	111.0974	189.2399	258.9263	320.8223	359.3477	356.7491	343.9442	315.2025	280.3625	209.1504	133.0691	95.0762	(83)
Total gains	560.9284	653.2035	702.1929	752.4334	769.1583	753.7614	726.0415	696.4472	673.0137	612.5585	559.3554	534.8338	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.0920	61.2199	61.3459	61.9445	62.0578	62.5907	62.5907	62.6904	62.3843	62.0578	61.8290	61.5917	
alpha	5.0728	5.0813	5.0897	5.1296	5.1372	5.1727	5.1727	5.1794	5.1590	5.1372	5.1219	5.1061	
util living area													
	0.9919	0.9819	0.9635	0.9107	0.8029	0.6190	0.4554	0.4934	0.7196	0.9249	0.9823	0.9936	(86)
MIT	19.8343	20.0449	20.2986	20.6180	20.8516	20.9699	20.9948	20.9923	20.9353	20.6385	20.1837	19.7974	(87)
Th 2	20.1067	20.1084	20.1101	20.1179	20.1194	20.1263	20.1263	20.1275	20.1236	20.1194	20.1164	20.1133	(88)
util rest of house													
	0.9897	0.9772	0.9538	0.8873	0.7551	0.5441	0.3672	0.4032	0.6483	0.9003	0.9768	0.9918	(89)
MIT 2	19.0482	19.2572	19.5063	19.8147	20.0193	20.1117	20.1247	20.1251	20.0884	19.8403	19.4022	19.0169	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.2701	19.4795	19.7299	20.0414	20.2541	20.3539	20.3703	20.3698	20.3274	20.0655	19.6227	19.2372	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2701	19.4795	19.7299	20.0414	20.2541	20.3539	20.3703	20.3698	20.3274	20.0655	19.6227	19.2372	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9871	0.9731	0.9488	0.8850	0.7630	0.5643	0.3921	0.4286	0.6658	0.8985	0.9730	0.9895	(94)
Useful gains	553.6755	635.6260	666.2643	665.9184	586.8755	425.3205	284.6836	298.5301	448.1062	550.3884	544.2408	529.2428	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1163.8026	1131.0695	1024.2629	854.2319	654.6655	436.6095	286.0902	300.7497	474.1022	724.4171	961.9361	1159.5367	(97)
Space heating kWh													
	453.9346	332.9381	266.3509	135.5857	50.4357	0.0000	0.0000	0.0000	0.0000	129.4773	300.7407	468.9387	(98a)
Space heating requirement - total per year (kWh/year)												2138.4017	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	453.9346	332.9381	266.3509	135.5857	50.4357	0.0000	0.0000	0.0000	0.0000	129.4773	300.7407	468.9387	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2138.4017	
Space heating per m2										(98c) / (4) =		26.7367	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	713.2763	561.5154	575.7744	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8926	0.9452	0.9310	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	636.7049	530.7410	536.0632	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	825.7196	795.9980	763.8895	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	136.0906	197.3512	169.5027	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	34.0226	49.3378	42.3757	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												125.7361	(107)
Energy for space heating												26.7367	(99)
Energy for space cooling												1.5721	(108)
Total												28.3088	(109)
Fabric Energy Efficiency (TFEE)												28.3	(109)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.75	**TER**	11.27
Environmental	99 A	**% DER < TER**			84.47
CO_2 Emissions (t/year)	0.11	**DFEE**	21.56	**TFEE**	28.31
Compliance Check	See BREL	**% DFEE < TFEE**			23.84
% DPER < TPER	61.65	**DPER**	22.87	**TPER**	59.65

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6723 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4625 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)		122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.6786	139.1442	125.6786	129.8679	125.6786	129.8679	125.6786	125.6786	129.8679	125.6786	129.8679	125.6786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	559.0481	572.3498	548.4455	530.1166	504.1979	487.2994	469.3775	470.4487	484.3003	499.6452	529.1302	548.0502	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	9.8800	36.7938	0.6800	0.7000	0.7700	119.9146	(79)

Solar gains	119.9146	204.2590	279.4760	346.2844	387.8673	385.0625	371.2413	340.2186	302.6134	225.7497	143.6301	102.6219	(83)
Total gains	678.9628	776.6087	827.9216	876.4009	892.0653	872.3619	840.6189	810.6673	786.9137	725.3949	672.7603	650.6721	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)		21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9759	0.9501	0.9066	0.8096	0.6603	0.4794	0.3442	0.3729	0.5671	0.8275	0.9495	0.9806	(86)
MIT	20.2906	20.4770	20.6685	20.8584	20.9620	20.9948	20.9994	20.9990	20.9869	20.8627	20.5512	20.2402	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9703	0.9396	0.8880	0.7768	0.6133	0.4235	0.2845	0.3111	0.5080	0.7904	0.9370	0.9760	(89)
MIT 2	19.4202	19.6502	19.8809	20.0968	20.2023	20.2300	20.2329	20.2327	20.2246	20.1061	19.7449	19.3571	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.6658	19.8835	20.1032	20.3117	20.4167	20.4459	20.4492	20.4490	20.4397	20.3196	19.9724	19.6063	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6658	19.8835	20.1032	20.3117	20.4167	20.4459	20.4492	20.4490	20.4397	20.3196	19.9724	19.6063	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9653	0.9341	0.8845	0.7804	0.6248	0.4391	0.3013	0.3286	0.5242	0.7949	0.9320	0.9714	(94)
Useful gains	655.3944	725.4170	732.3099	683.9141	557.3682	383.0911	253.3065	266.3486	412.4731	576.5838	627.0072	632.0830	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1011.8572	986.6792	895.7850	751.4731	574.0019	384.9561	253.4740	266.6291	417.4745	640.0470	847.6638	1014.5227	(97)
Space heating kWh	265.2084	175.5682	121.6255	48.6425	12.3755	0.0000	0.0000	0.0000	0.0000	47.2166	158.8727	284.5351	(98a)
Space heating requirement - total per year (kWh/year)												1114.0445	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	265.2084	175.5682	121.6255	48.6425	12.3755	0.0000	0.0000	0.0000	0.0000	47.2166	158.8727	284.5351	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1114.0445	
Space heating per m2										(98c) / (4) =		13.9290	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	265.2084	175.5682	121.6255	48.6425	12.3755	0.0000	0.0000	0.0000	0.0000	47.2166	158.8727	284.5351	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	397.8126	263.3523	182.4382	72.9638	18.5632	0.0000	0.0000	0.0000	0.0000	70.8250	238.3091	426.8027	
Space heating requirement													
	397.8126	263.3523	182.4382	72.9638	18.5632	0.0000	0.0000	0.0000	0.0000	70.8250	238.3091	426.8027	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1671.0668	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												16.7107	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)
Total electricity for the above, kWh/year												21.9935	(331)
Electricity for lighting (calculated in Appendix L)												196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4968.0720	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1522.1851	0.1574	70.1234	(367)
Electrical energy for heat distribution (space & water)	16.7107	0.0000	8.3173	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			230.1131	(373)
Space and water heating			230.1131	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			140.0712	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.7500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1522.1851	1.5825	705.2040	(467)
Electrical energy for heat distribution (space & water)	16.7107	0.0000	87.8475	(472)
Overall CO2 factor for heat network			0.4258	(486)
Total CO2 associated with community systems			2430.4473	(473)
Space and water heating			2430.4473	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	1.4873	-725.8942	
PV Unit electricity exported	-470.1661	0.4450	-209.2081	
Total			-935.1023	(480)
Total Primary energy kWh/year			1829.4095	(483)
Dwelling Primary energy Rate (DPER)			22.8700	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Semi-glazed door			3.5800	1.0000	3.5800			(26a)
TER Opening Type			9.8800	1.1450	11.3130			(27)
Heatloss Floor			39.9900	0.1300	5.1987			(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.1800	7.0326			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.5045			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			213.7769 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.4500	0.0500	0.4225
E3 Sill	6.7500	0.0500	0.3375
E4 Jamb	22.0000	0.0500	1.1000
E6 Intermediate floor within a dwelling	19.5200	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	6.0900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E5 Ground floor (normal)	19.5200	0.1600	3.1232
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
P1 Party wall - Ground floor	6.0900	0.0800	0.4872
E7 Party floor between dwellings (in blocks of flats)	14.1200	0.0700	0.9884
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.7208 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	41.2253 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	77.7420	77.5795	77.4202	76.6720	76.5321	75.8805	75.8805	75.7598	76.1315	76.5321	76.8152	77.1113	(39)
Average = Sum(39)m / 12 =												76.6714	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9700	0.9680	0.9586	0.9569	0.9487	0.9487	0.9472	0.9519	0.9569	0.9604	0.9641	(40)
HLP (average)												0.9586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers													
	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths													
	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses													
	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m													
	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
										Total per year (kWh/year) = Sum(64)m =		2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	122.0433	135.1194	122.0433	126.1114	122.0433	126.1114	122.0433	122.0433	126.1114	122.0433	126.1114	122.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													
	549.0775	561.9896	538.4748	520.0247	494.2273	474.2076	456.4069	457.4780	471.2084	489.6746	519.0383	538.0795	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	9.8800	36.7938	0.6300	0.7000	0.7700	111.0974	(79)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	111.0974	189.2399	258.9263	320.8223	359.3477	356.7491	343.9442	315.2025	280.3625	209.1504	133.0691	95.0762	(83)
Total gains	660.1748	751.2295	797.4012	840.8470	853.5749	830.9566	800.3510	772.6805	751.5709	698.8250	652.1074	633.1557	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.0920	61.2199	61.3459	61.9445	62.0578	62.5907	62.5907	62.6904	62.3843	62.0578	61.8290	61.5917	
alpha	5.0728	5.0813	5.0897	5.1296	5.1372	5.1727	5.1727	5.1794	5.1590	5.1372	5.1219	5.1061	
util living area	0.9838	0.9685	0.9420	0.8751	0.7528	0.5688	0.4145	0.4470	0.6617	0.8863	0.9673	0.9866	(86)
MIT	19.9806	20.1803	20.4159	20.6976	20.8910	20.9795	20.9966	20.9951	20.9558	20.7217	20.3117	19.9443	(87)
Th 2	20.1067	20.1084	20.1101	20.1179	20.1194	20.1263	20.1263	20.1275	20.1236	20.1194	20.1164	20.1133	(88)
util rest of house	0.9797	0.9608	0.9279	0.8462	0.7018	0.4973	0.3336	0.3642	0.5906	0.8540	0.9580	0.9832	(89)
MIT 2	18.9332	19.1845	19.4769	19.8175	20.0277	20.1138	20.1250	20.1256	20.0939	19.8529	19.3582	18.8924	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.2288	19.4655	19.7419	20.0659	20.2713	20.3581	20.3710	20.3709	20.3371	20.0981	19.6273	19.1892	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2288	19.4655	19.7419	20.0659	20.2713	20.3581	20.3710	20.3709	20.3371	20.0981	19.6273	19.1892	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9745	0.9541	0.9211	0.8443	0.7111	0.5167	0.3564	0.3875	0.6087	0.8531	0.9516	0.9785	(94)
Useful gains	643.3588	716.7140	734.4602	709.9191	606.9822	429.3322	285.2436	299.4450	457.4518	596.1606	620.5439	619.5621	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1160.5941	1129.9856	1025.1895	856.1088	655.9821	436.9284	286.1443	300.8368	474.8417	726.9071	962.2849	1155.8369	(97)
Space heating kWh	384.8230	277.7185	216.3026	105.2566	36.4559	0.0000	0.0000	0.0000	0.0000	97.2754	246.0535	398.9885	(98a)
Space heating requirement - total per year (kWh/year)												1762.8740	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	384.8230	277.7185	216.3026	105.2566	36.4559	0.0000	0.0000	0.0000	0.0000	97.2754	246.0535	398.9885	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1762.8740	
Space heating per m2											(98c) / (4) =	22.0414	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 92.3000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	384.8230	277.7185	216.3026	105.2566	36.4559	0.0000	0.0000	0.0000	0.0000	97.2754	246.0535	398.9885	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	416.9263	300.8868	234.3474	114.0375	39.4972	0.0000	0.0000	0.0000	0.0000	105.3905	266.5802	432.2735	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.2210	84.7757	84.0781	82.7999	81.1621	79.8000	79.8000	79.8000	79.8000	82.6198	84.4910	85.3211	(217)
Fuel for water heating, kWh/month	267.9098	238.1004	255.1762	228.4874	226.3350	207.8751	205.6450	213.6686	215.8200	231.8904	240.3906	264.7901	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.3582	20.3433	18.3169	13.4197	10.3658	8.4689	9.4560	12.2913	15.9652	20.9471	23.6598	26.0630	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3424	-31.5676	-47.5704	-56.1485	-62.8691	-59.5233	-58.7993	-54.3654	-46.9365	-37.2699	-23.9846	-18.2835	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9342	-17.0411	-34.5369	-52.8648	-70.8844	-71.5905	-70.7461	-59.4418	-42.9727	-24.6882	-10.6939	-6.2480	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1909.9393	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2796.0887	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	204.6551	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4008.3801	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1909.9393	0.2100	401.0873	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2796.0887	0.2100	587.1786	(264)
Space and water heating			988.2659	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	204.6551	0.1443	29.5381	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	0.1336	-69.2911	
PV Unit electricity exported	-469.6425	0.1253	-58.8667	
Total			-128.1578	(269)
Total CO2, kg/year			901.5754	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.2700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1909.9393	1.1300	2158.2314	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2796.0887	1.1300	3159.5802	(278)
Space and water heating			5317.8117	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	204.6551	1.5338	313.9068	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	1.4937	-774.7198	
PV Unit electricity exported	-469.6425	0.4601	-216.0686	
Total			-990.7884	(283)
Total Primary energy kWh/year			4771.0309	(286)
Target Primary Energy Rate (TPER)			59.6500	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.75	**TER**	11.27
Environmental	99 A	**% DER < TER**			84.47
CO_2 Emissions (t/year)	0.11	**DFEE**	21.56	**TFEE**	28.31
Compliance Check	See BREL	**% DFEE < TFEE**			23.84
% DPER < TPER	61.65	**DPER**	22.87	**TPER**	59.65

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6723	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	33.5192	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	610.7421	608.5956	590.7266	557.3213	524.1652	494.1729	476.4438	479.4976	496.5901	527.0115	563.7339	595.7477	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	9.8800	36.7938	0.6800	0.7000	0.7700	119.9146	(79)

Solar gains	119.9146	204.2590	279.4760	346.2844	387.8673	385.0625	371.2413	340.2186	302.6134	225.7497	143.6301	102.6219	(83)
Total gains	730.6567	812.8546	870.2027	903.6057	912.0325	879.2353	847.6851	819.7161	799.2036	752.7612	707.3640	698.3696	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)		

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area													
	0.9667	0.9404	0.8896	0.7945	0.6481	0.4758	0.3414	0.3688	0.5591	0.8099	0.9385	0.9734	(86)
MIT	20.3617	20.5200	20.7068	20.8721	20.9654	20.9950	20.9994	20.9990	20.9878	20.8780	20.5920	20.3078	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house													
	0.9594	0.9283	0.8690	0.7609	0.6014	0.4203	0.2821	0.3077	0.5006	0.7714	0.9240	0.9673	(89)
MIT 2	19.5081	19.7019	19.9247	20.1108	20.2052	20.2302	20.2329	20.2328	20.2252	20.1214	19.7933	19.4414	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.7490	19.9327	20.1454	20.3256	20.4197	20.4460	20.4492	20.4490	20.4404	20.3349	20.0187	19.6859	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7490	19.9327	20.1454	20.3256	20.4197	20.4460	20.4492	20.4490	20.4404	20.3349	20.0187	19.6859	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9540	0.9229	0.8664	0.7652	0.6130	0.4358	0.2988	0.3250	0.5166	0.7768	0.9193	0.9622	(94)
Useful gains	697.0131	750.1903	753.9806	691.4004	559.0787	383.1727	253.3149	266.3668	412.8737	584.7823	650.3083	671.9468	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1017.3326	989.9233	898.5663	752.3905	574.2015	384.9655	253.4750	266.6312	417.5208	641.0556	850.7102	1019.7647	(97)
Space heating kWh													
	238.3178	161.1006	107.5718	43.9128	11.2513	0.0000	0.0000	0.0000	0.0000	41.8673	144.2894	258.7765	(98a)
Space heating requirement - total per year (kWh/year)												1007.0876	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	238.3178	161.1006	107.5718	43.9128	11.2513	0.0000	0.0000	0.0000	0.0000	41.8673	144.2894	258.7765	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1007.0876	
Space heating per m2											(98c) / (4) =	12.5917	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	238.3178	161.1006	107.5718	43.9128	11.2513	0.0000	0.0000	0.0000	0.0000	41.8673	144.2894	258.7765	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	357.4766	241.6509	161.3577	65.8693	16.8770	0.0000	0.0000	0.0000	0.0000	62.8010	216.4341	388.1648	
Space heating requirement													
	357.4766	241.6509	161.3577	65.8693	16.8770	0.0000	0.0000	0.0000	0.0000	62.8010	216.4341	388.1648	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1510.6314	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												15.1063	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)
Total electricity for the above, kWh/year												21.9935	(331)
Electricity for lighting (calculated in Appendix L)												196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4807.6366	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1510.6314	4.4400	67.0720	(340a)
Space heating total			67.0720	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	196.1051	16.4900	32.3377	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	16.4900	-80.4802	
PV Unit electricity exported	-470.1661	5.5900	-26.2823	
Total			-106.7625	(352)
Total energy cost			267.5224	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7706 (357)
SAP value		87.5088
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1479.4024	0.1574	63.4029	(367)
Electrical energy for heat distribution (space & water)	15.1063	0.0000	8.0653	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			223.1406	(373)
Space and water heating			223.1406	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			133.0987	(383)
CO2 emissions per m2			1.6600	(384)
EI value			98.5730	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 79.9800						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate													
	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17097.8798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.6723	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 33.5192	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff													
	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m													
	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
327.4608 330.8588 322.2959 304.0665 281.0552 259.4278 244.9794 241.5813 250.1442 268.3736 291.3850 313.0124 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 (71)
Water heating gains (Table 5)
154.0336 151.5930 146.8914 136.5869 130.2751 123.6777 119.6256 122.9734 126.8986 134.2191 144.0972 152.7161 (72)
Total internal gains
610.7421 608.5956 590.7266 557.3213 524.1652 494.1729 476.4438 479.4976 496.5901 527.0115 563.7339 595.7477 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	9.8800	42.9509	0.6800	0.7000	0.7700	139.9812	(79)

Solar gains 139.9812 211.8913 286.3199 361.0906 392.1902 418.9836 395.8234 367.7813 327.9419 247.1876 165.1363 120.5201 (83)
Total gains 750.7233 820.4869 877.0465 918.4119 916.3554 913.1564 872.2672 847.2789 824.5320 774.1991 728.8702 716.2678 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9597	0.9336	0.8735	0.7691	0.6154	0.4167	0.2943	0.3184	0.5210	0.7710	0.9233	0.9678	(86)
MIT	20.4167	20.5547	20.7472	20.8959	20.9747	20.9977	20.9998	20.9996	20.9918	20.9107	20.6495	20.3617	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9510	0.9203	0.8504	0.7330	0.5670	0.3623	0.2365	0.2590	0.4629	0.7281	0.9058	0.9606	(89)
MIT 2	19.5762	19.7441	19.9716	20.1358	20.2135	20.2319	20.2331	20.2330	20.2281	20.1546	19.8618	19.5086	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.8134	19.9728	20.1905	20.3503	20.4283	20.4480	20.4494	20.4493	20.4436	20.3680	20.0841	19.7493	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8134	19.9728	20.1905	20.3503	20.4283	20.4480	20.4494	20.4493	20.4436	20.3680	20.0841	19.7493	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9454	0.9151	0.8490	0.7388	0.5796	0.3776	0.2528	0.2757	0.4790	0.7360	0.9019	0.9552	(94)
Useful gains	709.7664	750.8671	744.5796	678.5014	531.0757	344.8271	220.5074	233.6328	394.9623	569.8432	657.3674	684.1976	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	1001.8185	972.8067	868.6067	727.6760	541.8458	345.5885	220.5635	233.7283	397.9771	610.3071	828.6784	1004.1864	(97)
Space heating kWh	217.2868	149.1434	92.2762	35.4057	8.0129	0.0000	0.0000	0.0000	0.0000	30.1052	123.3439	238.0717	(98a)
Space heating requirement - total per year (kWh/year)												893.6458	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	217.2868	149.1434	92.2762	35.4057	8.0129	0.0000	0.0000	0.0000	0.0000	30.1052	123.3439	238.0717	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												893.6458	
Space heating per m2										(98c) / (4) =		11.1734	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement
217.2868 149.1434 92.2762 35.4057 8.0129 0.0000 0.0000 0.0000 0.0000 30.1052 123.3439 238.0717 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50
307a 325.9301 223.7151 138.4142 53.1086 12.0194 0.0000 0.0000 0.0000 0.0000 45.1578 185.0159 357.1076
Space heating requirement
325.9301 223.7151 138.4142 53.1086 12.0194 0.0000 0.0000 0.0000 0.0000 45.1578 185.0159 357.1076 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)

Water heating
Annual water heating requirement
266.9446 236.1786 250.9634 220.5542 213.7828 192.6005 189.9534 197.4446 199.5749 222.6078 236.8171 263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50
310a 400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948
Water heating fuel
400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948 (310)
Cooling System Energy Efficiency Ratio 0.0000 (314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (315)
Pumps and Fa 1.8679 1.6872 1.8679 1.8077 1.8679 1.8077 1.8679 1.8679 1.8077 1.8679 1.8077 1.8679 (331)
Lighting 24.2988 19.4934 17.5516 12.8591 9.9327 8.1151 9.0610 11.7778 15.2982 20.0720 22.6713 24.9741 (332)
Electricity generated by PVs (Appendix M) (negative quantity)
(333a)m -17.9780 -26.9243 -45.2366 -58.5173 -66.4974 -66.2241 -64.3099 -58.6197 -48.0109 -34.7929 -20.6435 -14.9664 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(334a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (334a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)

Electricity generated by PVs (Appendix M) (negative quantity)

(333b)m	-6.0204	-13.0409	-32.0085	-59.0559	-82.7431	-94.8946	-90.1802	-72.6219	-46.3379	-22.2034	-8.3869	-4.5323	(333b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1340.4687	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	13.4047	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4540.9477	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1340.4687	6.5500	87.8007	(340a)
Space heating total			87.8007	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	196.1051	28.4300	55.7527	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	28.4300	-148.6096	
PV Unit electricity exported	-532.0259	5.8100	-30.9107	
Total			-179.5203	(352)
Total energy cost			338.7177	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1434.0256	0.1578	56.4178	(367)
Electrical energy for heat distribution (space & water)	13.4047	0.0000	7.8034	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			215.8935	(373)
Space and water heating			215.8935	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	0.1322	-69.1017	
PV Unit electricity exported	-532.0259	0.1213	-64.5494	
Total			-133.6511	(380)
Total CO2, kg/year			113.5973	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1434.0256	1.5843	566.3075	(467)
Electrical energy for heat distribution (space & water)	13.4047	0.0000	82.6389	(472)
Overall CO2 factor for heat network			0.4252	(486)
Total CO2 associated with community systems			2286.3422	(473)
Space and water heating			2286.3422	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	1.4884	-778.0360	
PV Unit electricity exported	-532.0259	0.4451	-236.7863	
Total			-1014.8223	(480)
Total Primary energy kWh/year			1605.5844	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Southwest

Current energy efficiency rating:	B 88
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£62	£62	£0
Community scheme	£456	£456	£0
Space heating	£198	£198	£0
Water heating	£264	£264	£0
Lighting	£56	£56	£0
Generated (PV)	-£180	-£180	£0
Total cost of fuels	£338	£338	£0
Total cost of uses	£338	£338	£0
Delivered energy	57 kWh/m²	57 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	20 kWh/m²	20 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17097.8798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6723 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
									Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)

Water heating gains (Table 5)

154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)

Total internal gains

610.7421	608.5956	590.7266	557.3213	524.1652	494.1729	476.4438	479.4976	496.5901	527.0115	563.7339	595.7477	(73)

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6. Solar gains

[Jan]													
				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d				Gains W	
Southwest				9.8800	36.7938	0.6800	0.7000	0.7700				119.9146	(79)
Solar gains	119.9146	204.2590	279.4760	346.2844	387.8673	385.0625	371.2413	340.2186	302.6134	225.7497	143.6301	102.6219	(83)
Total gains	730.6567	812.8546	870.2027	903.6057	912.0325	879.2353	847.6851	819.7161	799.2036	752.7612	707.3640	698.3696	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9667	0.9404	0.8896	0.7945	0.6481	0.4758	0.3414	0.3688	0.5591	0.8099	0.9385	0.9734	(86)
MIT	20.3617	20.5200	20.7068	20.8721	20.9654	20.9950	20.9994	20.9990	20.9878	20.8780	20.5920	20.3078	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9594	0.9283	0.8690	0.7609	0.6014	0.4203	0.2821	0.3077	0.5006	0.7714	0.9240	0.9673	(89)
MIT 2	19.5081	19.7019	19.9247	20.1108	20.2052	20.2302	20.2329	20.2328	20.2252	20.1214	19.7933	19.4414	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.7490	19.9327	20.1454	20.3256	20.4197	20.4460	20.4492	20.4490	20.4404	20.3349	20.0187	19.6859	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7490	19.9327	20.1454	20.3256	20.4197	20.4460	20.4492	20.4490	20.4404	20.3349	20.0187	19.6859	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9540	0.9229	0.8664	0.7652	0.6130	0.4358	0.2988	0.3250	0.5166	0.7768	0.9193	0.9622	(94)
Useful gains	697.0131	750.1903	753.9806	691.4004	559.0787	383.1727	253.3149	266.3668	412.8737	584.7823	650.3083	671.9468	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1017.3326	989.9233	898.5663	752.3905	574.2015	384.9655	253.4750	266.6312	417.5208	641.0556	850.7102	1019.7647	(97)
Space heating kWh	238.3178	161.1006	107.5718	43.9128	11.2513	0.0000	0.0000	0.0000	0.0000	41.8673	144.2894	258.7765	(98a)
Space heating requirement - total per year (kWh/year)												1007.0876	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	238.3178	161.1006	107.5718	43.9128	11.2513	0.0000	0.0000	0.0000	0.0000	41.8673	144.2894	258.7765	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1007.0876	
Space heating per m2											(98c) / (4) =	12.5917	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	238.3178	161.1006	107.5718	43.9128	11.2513	0.0000	0.0000	0.0000	0.0000	41.8673	144.2894	258.7765	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	357.4766	241.6509	161.3577	65.8693	16.8770	0.0000	0.0000	0.0000	0.0000	62.8010	216.4341	388.1648	
Space heating requirement	357.4766	241.6509	161.3577	65.8693	16.8770	0.0000	0.0000	0.0000	0.0000	62.8010	216.4341	388.1648	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1510.6314	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												15.1063	(313)
Space cooling fuel												0.0000	(321)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)

mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4807.6366	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1510.6314	4.4400	67.0720	(340a)
Space heating total			67.0720	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	196.1051	16.4900	32.3377	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	16.4900	-80.4802	
PV Unit electricity exported	-470.1661	5.5900	-26.2823	
Total			-106.7625	(352)
Total energy cost			267.5224	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7706	(357)
SAP value		87.5088	
SAP rating (Section 12)		88	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1479.4024	0.1574	63.4029	(367)
Electrical energy for heat distribution (space & water)	15.1063	0.0000	8.0653	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			223.1406	(373)
Space and water heating			223.1406	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			133.0987	(383)
CO2 emissions per m2			1.6600	(384)
EI value			98.5730	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)

Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17097.8798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.6723 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)
Total storage loss	

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)

											Total per year (kWh/year) = Sum(64)m =	2691.4183	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000		(64a)
Heat gains from water heating, kWh/month													
114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207		(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains													
	610.7421	608.5956	590.7266	557.3213	524.1652	494.1729	476.4438	479.4976	496.5901	527.0115	563.7339	595.7477	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	9.8800	42.9509	0.6800	0.7000	0.7700	139.9812	(79)

Solar gains	139.9812	211.8913	286.3199	361.0906	392.1902	418.9836	395.8234	367.7813	327.9419	247.1876	165.1363	120.5201	(83)
Total gains	750.7233	820.4869	877.0465	918.4119	916.3554	913.1564	872.2672	847.2789	824.5320	774.1991	728.8702	716.2678	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area													
	0.9597	0.9336	0.8735	0.7691	0.6154	0.4167	0.2943	0.3184	0.5210	0.7710	0.9233	0.9678	(86)
MIT	20.4167	20.5547	20.7472	20.8959	20.9747	20.9977	20.9998	20.9996	20.9918	20.9107	20.6495	20.3617	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house													
	0.9510	0.9203	0.8504	0.7330	0.5670	0.3623	0.2365	0.2590	0.4629	0.7281	0.9058	0.9606	(89)
MIT 2	19.5762	19.7441	19.9716	20.1358	20.2135	20.2319	20.2331	20.2330	20.2281	20.1546	19.8618	19.5086	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.8134	19.9728	20.1905	20.3503	20.4283	20.4480	20.4494	20.4493	20.4436	20.3680	20.0841	19.7493	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8134	19.9728	20.1905	20.3503	20.4283	20.4480	20.4494	20.4493	20.4436	20.3680	20.0841	19.7493	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9454	0.9151	0.8490	0.7388	0.5796	0.3776	0.2528	0.2757	0.4790	0.7360	0.9019	0.9552	(94)
Useful gains	709.7664	750.8671	744.5796	678.5014	531.0757	344.8271	220.5074	233.6328	394.9623	569.8432	657.3674	684.1976	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
1001.8185	972.8067	868.6067	727.6760	541.8458	345.5885	220.5635	233.7283	397.9771	610.3071	828.6784	1004.1864		(97)
Space heating kWh													
217.2868	149.1434	92.2762	35.4057	8.0129	0.0000	0.0000	0.0000	0.0000	30.1052	123.3439	238.0717		(98a)
Space heating requirement - total per year (kWh/year)												893.6458	
Solar heating kWh													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
217.2868	149.1434	92.2762	35.4057	8.0129	0.0000	0.0000	0.0000	0.0000	30.1052	123.3439	238.0717		(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												893.6458	
Space heating per m2											(98c) / (4) =	11.1734	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:													
Space heating requirement													
217.2868	149.1434	92.2762	35.4057	8.0129	0.0000	0.0000	0.0000	0.0000	30.1052	123.3439	238.0717		(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	325.9301	223.7151	138.4142	53.1086	12.0194	0.0000	0.0000	0.0000	0.0000	45.1578	185.0159	357.1076	
Space heating requirement													
	325.9301	223.7151	138.4142	53.1086	12.0194	0.0000	0.0000	0.0000	0.0000	45.1578	185.0159	357.1076	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.9780	-26.9243	-45.2366	-58.5173	-66.4974	-66.2241	-64.3099	-58.6197	-48.0109	-34.7929	-20.6435	-14.9664	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.0204	-13.0409	-32.0085	-59.0559	-82.7431	-94.8946	-90.1802	-72.6219	-46.3379	-22.2034	-8.3869	-4.5323	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1340.4687	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	13.4047	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4540.9477	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1340.4687	6.5500	87.8007	(340a)
Space heating total			87.8007	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	196.1051	28.4300	55.7527	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	28.4300	-148.6096	
PV Unit electricity exported	-532.0259	5.8100	-30.9107	
Total			-179.5203	(352)
Total energy cost			338.7177	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1434.0256	0.1578	56.4178	(367)
Electrical energy for heat distribution (space & water)	13.4047	0.0000	7.8034	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			215.8935	(373)
Space and water heating			215.8935	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	0.1322	-69.1017	
PV Unit electricity exported	-532.0259	0.1213	-64.5494	
Total			-133.6511	(380)
Total CO2, kg/year			113.5973	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1434.0256	1.5843	566.3075	(467)
Electrical energy for heat distribution (space & water)	13.4047	0.0000	82.6389	(472)
Overall CO2 factor for heat network			0.4252	(486)
Total CO2 associated with community systems			2286.3422	(473)
Space and water heating			2286.3422	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)

Energy saving/generation technologies			
PV Unit electricity used in dwelling	-522.7211	1.4884	-778.0360
PV Unit electricity exported	-532.0259	0.4451	-236.7863
Total			-1014.8223 (480)
Total Primary energy kWh/year			1605.5844 (483)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.90	**TER**	11.80
Environmental	98 A	**% DER < TER**			83.90
CO_2 Emissions (t/year)	0.12	**DFEE**	24.18	**TFEE**	30.94
Compliance Check	See BREL	**% DFEE < TFEE**			21.83
% DPER < TPER	61.05	**DPER**	24.34	**TPER**	62.49

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6723	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	33.5192	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.6786	139.1442	125.6786	129.8679	125.6786	129.8679	125.6786	125.6786	129.8679	125.6786	129.8679	125.6786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	559.0481	572.3498	548.4455	530.1166	504.1979	487.2994	469.3775	470.4487	484.3003	499.6452	529.1302	548.0502	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.8800	19.6403	0.6800	0.7000	0.7700	64.0095	(80)

Solar gains	64.0095	125.2162	206.2132	300.7496	368.5800	377.3072	359.2118	308.5577	239.8345	148.5795	79.8123	52.6383	(83)
Total gains	623.0576	697.5659	754.6587	830.8662	872.7779	864.6066	828.5894	779.0064	724.1348	648.2248	608.9425	600.6885	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9837	0.9681	0.9331	0.8347	0.6723	0.4836	0.3492	0.3879	0.6112	0.8755	0.9665	0.9866	(86)
MIT	20.2100	20.3754	20.5932	20.8324	20.9584	20.9946	20.9993	20.9988	20.9809	20.8096	20.4698	20.1665	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9797	0.9608	0.9183	0.8037	0.6251	0.4272	0.2886	0.3237	0.5493	0.8437	0.9575	0.9834	(89)
MIT 2	19.3195	19.5262	19.7931	20.0696	20.1992	20.2299	20.2329	20.2326	20.2204	20.0511	19.6465	19.2647	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.5708	19.7658	20.0189	20.2849	20.4134	20.4457	20.4492	20.4488	20.4350	20.2652	19.8788	19.5192	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5708	19.7658	20.0189	20.2849	20.4134	20.4457	20.4492	20.4488	20.4350	20.2652	19.8788	19.5192	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9755	0.9554	0.9136	0.8059	0.6365	0.4430	0.3057	0.3418	0.5659	0.8452	0.9525	0.9795	(94)
Useful gains	607.7719	666.4585	689.4700	669.6153	555.5383	382.9945	253.2911	266.2736	409.8086	547.8754	580.0350	588.3625	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1005.5988	978.9322	890.2326	749.7060	573.7879	384.9450	253.4721	266.6201	417.1663	636.4612	841.4986	1008.7841	(97)
Space heating kWh	295.9833	209.9823	149.3674	57.6653	13.5777	0.0000	0.0000	0.0000	0.0000	65.9078	188.2538	312.7936	(98a)
Space heating requirement - total per year (kWh/year)												1293.5312	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	295.9833	209.9823	149.3674	57.6653	13.5777	0.0000	0.0000	0.0000	0.0000	65.9078	188.2538	312.7936	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1293.5312	
Space heating per m2										(98c) / (4) =		16.1732	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	295.9833	209.9823	149.3674	57.6653	13.5777	0.0000	0.0000	0.0000	0.0000	65.9078	188.2538	312.7936 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	443.9749	314.9735	224.0511	86.4979	20.3665	0.0000	0.0000	0.0000	0.0000	98.8618	282.3807	469.1904
Space heating requirement												
	443.9749	314.9735	224.0511	86.4979	20.3665	0.0000	0.0000	0.0000	0.0000	98.8618	282.3807	469.1904 (307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement

	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948
Water heating fuel												
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679 (331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												1940.2968 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												4037.1274 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												19.4030 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)												
mechanical ventilation fans (SFP = 0.0920)												21.9935 (330a)
Total electricity for the above, kWh/year												21.9935 (331)
Electricity for lighting (calculated in Appendix L)												196.1051 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-958.2209 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												
Energy saved or generated												-0.0000 (336)
Energy used												0.0000 (337)
Total delivered energy for all uses												5237.3020 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1593.9798	0.1570	81.2437	(367)
Electrical energy for heat distribution (space & water)	19.4030	0.0000	8.7343	(372)
Overall CO2 factor for heat network			0.0404	(386)
Total CO2 associated with community systems			241.6503	(373)
Space and water heating			241.6503	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			151.6085	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.9000	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1593.9798	1.5813	818.1755	(467)
Electrical energy for heat distribution (space & water)	19.4030	0.0000	92.0839	(472)
Overall CO2 factor for heat network			0.4262	(486)
Total CO2 associated with community systems			2547.6553	(473)
Space and water heating			2547.6553	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	1.4873	-725.8942	
PV Unit electricity exported	-470.1661	0.4450	-209.2081	
Total			-935.1023	(480)
Total Primary energy kWh/year			1946.6174	(483)
Dwelling Primary energy Rate (DPER)			24.3400	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Semi-glazed door			3.5800	1.0000	3.5800			(26a)
TER Opening Type			9.8800	1.1450	11.3130			(27)
Heatloss Floor			39.9900	0.1300	5.1987			(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.1800	7.0326			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.5045			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			213.7769 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.4500	0.0500	0.4225
E3 Sill	6.7500	0.0500	0.3375
E4 Jamb	22.0000	0.0500	1.1000
E6 Intermediate floor within a dwelling	19.5200	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	6.0900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E5 Ground floor (normal)	19.5200	0.1600	3.1232
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
P1 Party wall - Ground floor	6.0900	0.0800	0.4872
E7 Party floor between dwellings (in blocks of flats)	14.1200	0.0700	0.9884
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.7208 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	41.2253 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	77.7420	77.5795	77.4202	76.6720	76.5321	75.8805	75.8805	75.7598	76.1315	76.5321	76.8152	77.1113	(39)
Average = Sum(39)m / 12 =												76.6714	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9700	0.9680	0.9586	0.9569	0.9487	0.9487	0.9472	0.9519	0.9569	0.9604	0.9641	(40)
HLP (average)												0.9586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers													
	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths													
	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses													
	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m													
	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
										Total per year (kWh/year) = Sum(64)m =		2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	122.0433	135.1194	122.0433	126.1114	122.0433	126.1114	122.0433	122.0433	126.1114	122.0433	126.1114	122.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													
	549.0775	561.9896	538.4748	520.0247	494.2273	474.2076	456.4069	457.4780	471.2084	489.6746	519.0383	538.0795	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.8800	19.6403	0.6300	0.7000	0.7700	59.3029	(80)

Solar gains	59.3029	116.0091	191.0505	278.6357	341.4785	349.5640	332.7992	285.8696	222.1996	137.6546	73.9438	48.7678	(83)
Total gains	608.3804	677.9987	729.5253	798.6604	835.7058	823.7716	789.2061	743.3476	693.4080	627.3291	592.9821	586.8473	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.0920	61.2199	61.3459	61.9445	62.0578	62.5907	62.5907	62.6904	62.3843	62.0578	61.8290	61.5917	
alpha	5.0728	5.0813	5.0897	5.1296	5.1372	5.1727	5.1727	5.1794	5.1590	5.1372	5.1219	5.1061	
util living area	0.9885	0.9790	0.9579	0.8926	0.7633	0.5732	0.4202	0.4638	0.7040	0.9188	0.9775	0.9903	(86)
MIT	19.9050	20.0800	20.3336	20.6615	20.8836	20.9787	20.9964	20.9942	20.9414	20.6539	20.2312	19.8758	(87)
Th 2	20.1067	20.1084	20.1101	20.1179	20.1194	20.1263	20.1263	20.1275	20.1236	20.1194	20.1164	20.1133	(88)
util rest of house	0.9855	0.9736	0.9470	0.8662	0.7128	0.5013	0.3382	0.3783	0.6326	0.8927	0.9708	0.9878	(89)
MIT 2	18.8380	19.0601	19.3779	19.7777	20.0210	20.1134	20.1249	20.1252	20.0832	19.7786	19.2591	18.8059	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.1391	19.3479	19.6476	20.0271	20.2644	20.3576	20.3709	20.3704	20.3254	20.0256	19.5334	19.1078	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1391	19.3479	19.6476	20.0271	20.2644	20.3576	20.3709	20.3704	20.3254	20.0256	19.5334	19.1078	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9812	0.9678	0.9401	0.8632	0.7216	0.5208	0.3613	0.4024	0.6499	0.8895	0.9651	0.9839	(94)
Useful gains	596.9506	656.1465	685.8487	689.3776	603.0790	429.0146	285.1742	299.1384	450.6478	558.0090	572.2933	577.4180	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1153.6230	1120.8598	1017.8906	853.1366	655.4525	436.8875	286.1350	300.7964	473.9480	721.3615	955.0754	1149.5584	(97)
Space heating kWh	414.1643	312.2873	247.0392	117.9065	38.9659	0.0000	0.0000	0.0000	0.0000	121.5343	275.6031	425.6725	(98a)
Space heating requirement - total per year (kWh/year)												1953.1730	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	414.1643	312.2873	247.0392	117.9065	38.9659	0.0000	0.0000	0.0000	0.0000	121.5343	275.6031	425.6725	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1953.1730	
Space heating per m2											(98c) / (4) =	24.4208	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	414.1643	312.2873	247.0392	117.9065	38.9659	0.0000	0.0000	0.0000	0.0000	121.5343	275.6031	425.6725	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	448.7154	338.3394	267.6481	127.7427	42.2166	0.0000	0.0000	0.0000	0.0000	131.6731	298.5949	461.1837	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.3781	85.0348	84.3768	83.0310	81.2409	79.8000	79.8000	79.8000	79.8000	83.0677	84.7448	85.4582	(217)
Fuel for water heating, kWh/month	267.4167	237.3749	254.2727	227.8515	226.1156	207.8751	205.6450	213.6686	215.8200	230.6400	239.6706	264.3653	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.3582	20.3433	18.3169	13.4197	10.3658	8.4689	9.4560	12.2913	15.9652	20.9471	23.6598	26.0630	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3424	-31.5676	-47.5704	-56.1485	-62.8691	-59.5233	-58.7993	-54.3654	-46.9365	-37.2699	-23.9846	-18.2835	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9342	-17.0411	-34.5369	-52.8648	-70.8844	-71.5905	-70.7461	-59.4418	-42.9727	-24.6882	-10.6939	-6.2480	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2116.1138	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2790.7159	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	204.6551	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4209.1818	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2116.1138	0.2100	444.3839	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2790.7159	0.2100	586.0503	(264)
Space and water heating			1030.4342	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	204.6551	0.1443	29.5381	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	0.1336	-69.2911	
PV Unit electricity exported	-469.6425	0.1253	-58.8667	
Total			-128.1578	(269)
Total CO2, kg/year			943.7437	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.8000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2116.1138	1.1300	2391.2086	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2790.7159	1.1300	3153.5090	(278)
Space and water heating			5544.7176	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	204.6551	1.5338	313.9068	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	1.4937	-774.7198	
PV Unit electricity exported	-469.6425	0.4601	-216.0686	
Total			-990.7884	(283)
Total Primary energy kWh/year			4997.9368	(286)
Target Primary Energy Rate (TPER)			62.4900	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.90	**TER**	11.80
Environmental	98 A	**% DER < TER**			83.90
CO_2 Emissions (t/year)	0.12	**DFEE**	24.18	**TFEE**	30.94
Compliance Check	See BREL	**% DFEE < TFEE**			21.83
% DPER < TPER	61.05	**DPER**	24.34	**TPER**	62.49

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2122	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2705	0.2652	0.2599	0.2334	0.2281	0.2016	0.2016	0.1963	0.2122	0.2281	0.2387	0.2493	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5366	0.5352	0.5338	0.5272	0.5260	0.5203	0.5203	0.5193	0.5225	0.5260	0.5285	0.5311	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							3.6723	(36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.6979	34.6061	34.5160	34.0930	34.0139	33.6455	33.6455	33.5772	33.7874	34.0139	34.1740	34.3414	(38)
Heat transfer coeff	68.2172	68.1253	68.0352	67.6122	67.5331	67.1647	67.1647	67.0965	67.3066	67.5331	67.6932	67.8606	(39)
Average = Sum(39)m / 12 =												67.6118	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8529	0.8518	0.8507	0.8454	0.8444	0.8398	0.8398	0.8389	0.8415	0.8444	0.8464	0.8485	(40)
HLP (average)												0.8454	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.6786	139.1442	125.6786	129.8679	125.6786	129.8679	125.6786	125.6786	129.8679	125.6786	129.8679	125.6786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains	453.4664	467.9883	446.9019	435.3676	413.4459	400.7688	385.7326	384.8800	396.4077	407.0433	430.0429	443.3929	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.8800	19.6403	0.6800	0.7000	0.7700	64.0095	(80)

Solar gains	64.0095	125.2162	206.2132	300.7496	368.5800	377.3072	359.2118	308.5577	239.8345	148.5795	79.8123	52.6383	(83)
Total gains	517.4759	593.2045	653.1151	736.1172	782.0259	778.0760	744.9445	693.4377	636.2422	555.6229	509.8552	496.0312	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.6219	69.7158	69.8081	70.2449	70.3272	70.7129	70.7129	70.7848	70.5638	70.3272	70.1608	69.9878	
alpha	5.6415	5.6477	5.6539	5.6830	5.6885	5.7142	5.7142	5.7190	5.7043	5.6885	5.6774	5.6659	
util living area	0.9936	0.9855	0.9649	0.8914	0.7441	0.5440	0.3955	0.4427	0.6927	0.9304	0.9856	0.9949	(86)
MIT	19.9923	20.1740	20.4253	20.7385	20.9254	20.9893	20.9985	20.9973	20.9617	20.7005	20.2922	19.9566	(87)

Th 2	20.2077	20.2087	20.2096	20.2142	20.2150	20.2190	20.2190	20.2197	20.2175	20.2150	20.2133	20.2115	(88)
util rest of house	0.9919	0.9818	0.9559	0.8662	0.6965	0.4810	0.3259	0.3688	0.6270	0.9081	0.9813	0.9936	(89)
MIT 2	19.2857	19.4660	19.7122	20.0085	20.1660	20.2139	20.2186	20.2189	20.1967	19.9812	19.5879	19.2534	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.4851	19.6658	19.9134	20.2145	20.3803	20.4327	20.4387	20.4385	20.4126	20.1842	19.7866	19.4519	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4851	19.6658	19.9134	20.2145	20.3803	20.4327	20.4387	20.4385	20.4126	20.1842	19.7866	19.4519	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9899	0.9786	0.9519	0.8662	0.7070	0.4985	0.3456	0.3897	0.6440	0.9071	0.9783	0.9919	(94)
Useful gains	512.2622	580.4959	621.7092	637.6455	552.8697	387.8600	257.4299	270.2037	409.7656	504.0266	498.7822	491.9992	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1035.8841	1005.9254	912.5839	765.0005	586.2074	391.7542	257.8226	270.9705	424.8800	647.2523	858.7989	1034.9994	(97)
Space heating kWh	389.5747	285.8886	216.4107	91.6956	24.8033	0.0000	0.0000	0.0000	0.0000	106.5599	259.2120	403.9922	(98a)
Space heating requirement - total per year (kWh/year)												1778.1371	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	389.5747	285.8886	216.4107	91.6956	24.8033	0.0000	0.0000	0.0000	0.0000	106.5599	259.2120	403.9922	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1778.1371	
Space heating per m2											(98c) / (4) =	22.2323	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	631.3480	497.0186	509.9330	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9456	0.9759	0.9633	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	597.0031	485.0461	491.1981	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	850.0667	814.1870	756.5695	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	182.2058	244.8808	197.4363	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	45.5514	61.2202	49.3591	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												156.1307	(107)
Energy for space heating												22.2323	(99)
Energy for space cooling												1.9521	(108)
Total												24.1844	(109)
Fabric Energy Efficiency (DFEE)												24.2	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Semi-glazed door			3.5800	1.0000	3.5800			(26a)
TER Opening Type			9.8800	1.1450	11.3130			(27)
Heatloss Floor			39.9900	0.1300	5.1987			(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.1800	7.0326			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.5045			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 213.7769 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.4500	0.0500	0.4225
E3 Sill	6.7500	0.0500	0.3375
E4 Jamb	22.0000	0.0500	1.1000
E6 Intermediate floor within a dwelling	19.5200	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	6.0900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E5 Ground floor (normal)	19.5200	0.1600	3.1232
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
P1 Party wall - Ground floor	6.0900	0.0800	0.4872
E7 Party floor between dwellings (in blocks of flats)	14.1200	0.0700	0.9884

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.7208 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.2253 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	77.7420	77.5795	77.4202	76.6720	76.5321	75.8805	75.8805	75.7598	76.1315	76.5321	76.8152	77.1113	(39)

Average = Sum(39)m / 12 = 76.6714

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9700	0.9680	0.9586	0.9569	0.9487	0.9487	0.9472	0.9519	0.9569	0.9604	0.9641	(40)
HLP (average)												0.9586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	122.0433	135.1194	122.0433	126.1114	122.0433	126.1114	122.0433	122.0433	126.1114	122.0433	126.1114	122.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains													
	449.8311	463.9635	443.2666	431.6111	409.8106	397.0124	382.0973	381.2447	392.6512	403.4080	426.2864	439.7576	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.8800	19.6403	0.6300	0.7000	0.7700	59.3029	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	59.3029	116.0091	191.0505	278.6357	341.4785	349.5640	332.7992	285.8696	222.1996	137.6546	73.9438	48.7678	(83)
Total gains	509.1340	579.9726	634.3170	710.2468	751.2891	746.5764	714.8965	667.1143	614.8508	541.0626	500.2302	488.5254	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.0920	61.2199	61.3459	61.9445	62.0578	62.5907	62.5907	62.6904	62.3843	62.0578	61.8290	61.5917	
alpha	5.0728	5.0813	5.0897	5.1296	5.1372	5.1727	5.1727	5.1794	5.1590	5.1372	5.1219	5.1061	
util living area													
	0.9947	0.9890	0.9754	0.9261	0.8136	0.6240	0.4621	0.5136	0.7654	0.9514	0.9890	0.9957	(86)
MIT	19.7558	19.9383	20.2077	20.5746	20.8416	20.9688	20.9945	20.9907	20.9137	20.5568	20.0974	19.7267	(87)
Th 2	20.1067	20.1084	20.1101	20.1179	20.1194	20.1263	20.1263	20.1275	20.1236	20.1194	20.1164	20.1133	(88)
util rest of house													
	0.9933	0.9860	0.9685	0.9055	0.7668	0.5489	0.3728	0.4205	0.6959	0.9335	0.9854	0.9945	(89)
MIT 2	18.9705	19.1527	19.4192	19.7761	20.0118	20.1112	20.1246	20.1245	20.0751	19.7672	19.3180	18.9467	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.1921	19.3744	19.6417	20.0014	20.2459	20.3532	20.3701	20.3690	20.3118	19.9900	19.5379	19.1668	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1921	19.3744	19.6417	20.0014	20.2459	20.3532	20.3701	20.3690	20.3118	19.9900	19.5379	19.1668	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9913	0.9829	0.9640	0.9024	0.7741	0.5690	0.3981	0.4467	0.7119	0.9303	0.9823	0.9928	(94)
Useful gains	504.6846	570.0264	611.4672	640.9187	581.5412	424.8309	284.5679	298.0052	437.7399	503.3443	491.3969	485.0121	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1157.7437	1122.9183	1017.4315	851.1676	654.0388	436.5542	286.0763	300.6879	472.9107	718.6344	955.4221	1154.1105	(97)
Space heating kWh													
	485.8759	371.5434	302.0375	151.3791	53.9383	0.0000	0.0000	0.0000	0.0000	160.1758	334.0982	497.8092	(98a)
Space heating requirement - total per year (kWh/year)												2356.8574	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	485.8759	371.5434	302.0375	151.3791	53.9383	0.0000	0.0000	0.0000	0.0000	160.1758	334.0982	497.8092	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2356.8574	
Space heating per m2										(98c) / (4) =		29.4681	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	713.2763	561.5154	575.7744	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8893	0.9419	0.9195	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	634.3061	528.8750	529.4361	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	817.3215	782.9714	729.6042	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	131.7711	189.0477	148.9251	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	32.9428	47.2619	37.2313	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												117.4360	(107)
Energy for space heating												29.4681	(99)
Energy for space cooling												1.4683	(108)
Total												30.9364	(109)
Fabric Energy Efficiency (TFEE)												30.9	(109)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.90	**TER**	11.80
Environmental	98 A	**% DER < TER**			83.90
CO_2 Emissions (t/year)	0.12	**DFEE**	24.18	**TFEE**	30.94
Compliance Check	See BREL	**% DFEE < TFEE**			21.83
% DPER < TPER	61.05	**DPER**	24.34	**TPER**	62.49

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.6723	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	33.5192	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	125.6786	139.1442	125.6786	129.8679	125.6786	129.8679	125.6786	125.6786	129.8679	125.6786	129.8679	125.6786	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	559.0481	572.3498	548.4455	530.1166	504.1979	487.2994	469.3775	470.4487	484.3003	499.6452	529.1302	548.0502	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.8800	19.6403	0.6800	0.7000	0.7700	64.0095	(80)

Solar gains	64.0095	125.2162	206.2132	300.7496	368.5800	377.3072	359.2118	308.5577	239.8345	148.5795	79.8123	52.6383	(83)
Total gains	623.0576	697.5659	754.6587	830.8662	872.7779	864.6066	828.5894	779.0064	724.1348	648.2248	608.9425	600.6885	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9837	0.9681	0.9331	0.8347	0.6723	0.4836	0.3492	0.3879	0.6112	0.8755	0.9665	0.9866	(86)
MIT	20.2100	20.3754	20.5932	20.8324	20.9584	20.9946	20.9993	20.9988	20.9809	20.8096	20.4698	20.1665	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9797	0.9608	0.9183	0.8037	0.6251	0.4272	0.2886	0.3237	0.5493	0.8437	0.9575	0.9834	(89)
MIT 2	19.3195	19.5262	19.7931	20.0696	20.1992	20.2299	20.2329	20.2326	20.2204	20.0511	19.6465	19.2647	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.5708	19.7658	20.0189	20.2849	20.4134	20.4457	20.4492	20.4488	20.4350	20.2652	19.8788	19.5192	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5708	19.7658	20.0189	20.2849	20.4134	20.4457	20.4492	20.4488	20.4350	20.2652	19.8788	19.5192	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9755	0.9554	0.9136	0.8059	0.6365	0.4430	0.3057	0.3418	0.5659	0.8452	0.9525	0.9795	(94)
Useful gains	607.7719	666.4585	689.4700	669.6153	555.5383	382.9945	253.2911	266.2736	409.8086	547.8754	580.0350	588.3625	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1005.5988	978.9322	890.2326	749.7060	573.7879	384.9450	253.4721	266.6201	417.1663	636.4612	841.4986	1008.7841	(97)
Space heating kWh	295.9833	209.9823	149.3674	57.6653	13.5777	0.0000	0.0000	0.0000	0.0000	65.9078	188.2538	312.7936	(98a)
Space heating requirement - total per year (kWh/year)												1293.5312	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	295.9833	209.9823	149.3674	57.6653	13.5777	0.0000	0.0000	0.0000	0.0000	65.9078	188.2538	312.7936	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1293.5312	
Space heating per m2										(98c) / (4) =		16.1732	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	295.9833	209.9823	149.3674	57.6653	13.5777	0.0000	0.0000	0.0000	0.0000	65.9078	188.2538	312.7936 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	443.9749	314.9735	224.0511	86.4979	20.3665	0.0000	0.0000	0.0000	0.0000	98.8618	282.3807	469.1904
Space heating requirement												
	443.9749	314.9735	224.0511	86.4979	20.3665	0.0000	0.0000	0.0000	0.0000	98.8618	282.3807	469.1904 (307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement

	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948
Water heating fuel												
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679 (331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												1940.2968 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												4037.1274 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												19.4030 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)												
mechanical ventilation fans (SFP = 0.0920)												21.9935 (330a)
Total electricity for the above, kWh/year												21.9935 (331)
Electricity for lighting (calculated in Appendix L)												196.1051 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-958.2209 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												
Energy saved or generated												-0.0000 (336)
Energy used												0.0000 (337)
Total delivered energy for all uses												5237.3020 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1593.9798	0.1570	81.2437	(367)
Electrical energy for heat distribution (space & water)	19.4030	0.0000	8.7343	(372)
Overall CO2 factor for heat network			0.0404	(386)
Total CO2 associated with community systems			241.6503	(373)
Space and water heating			241.6503	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			151.6085	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.9000	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1593.9798	1.5813	818.1755	(467)
Electrical energy for heat distribution (space & water)	19.4030	0.0000	92.0839	(472)
Overall CO2 factor for heat network			0.4262	(486)
Total CO2 associated with community systems			2547.6553	(473)
Space and water heating			2547.6553	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	1.4873	-725.8942	
PV Unit electricity exported	-470.1661	0.4450	-209.2081	
Total			-935.1023	(480)
Total Primary energy kWh/year			1946.6174	(483)
Dwelling Primary energy Rate (DPER)			24.3400	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Semi-glazed door			3.5800	1.0000	3.5800			(26a)
TER Opening Type			9.8800	1.1450	11.3130			(27)
Heatloss Floor			39.9900	0.1300	5.1987			(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.1800	7.0326			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.5045			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			213.7769 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.4500	0.0500	0.4225
E3 Sill	6.7500	0.0500	0.3375
E4 Jamb	22.0000	0.0500	1.1000
E6 Intermediate floor within a dwelling	19.5200	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	6.0900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E5 Ground floor (normal)	19.5200	0.1600	3.1232
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
P1 Party wall - Ground floor	6.0900	0.0800	0.4872
E7 Party floor between dwellings (in blocks of flats)	14.1200	0.0700	0.9884
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.7208 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	41.2253 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	77.7420	77.5795	77.4202	76.6720	76.5321	75.8805	75.8805	75.7598	76.1315	76.5321	76.8152	77.1113	(39)
Average = Sum(39)m / 12 =												76.6714	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9720	0.9700	0.9680	0.9586	0.9569	0.9487	0.9487	0.9472	0.9519	0.9569	0.9604	0.9641	(40)
HLP (average)												0.9586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers													
	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths													
	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses													
	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m													
	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
										Total per year (kWh/year) = Sum(64)m =		2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	122.0433	135.1194	122.0433	126.1114	122.0433	126.1114	122.0433	122.0433	126.1114	122.0433	126.1114	122.0433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													
	549.0775	561.9896	538.4748	520.0247	494.2273	474.2076	456.4069	457.4780	471.2084	489.6746	519.0383	538.0795	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.8800	19.6403	0.6300	0.7000	0.7700	59.3029	(80)

Solar gains	59.3029	116.0091	191.0505	278.6357	341.4785	349.5640	332.7992	285.8696	222.1996	137.6546	73.9438	48.7678	(83)
Total gains	608.3804	677.9987	729.5253	798.6604	835.7058	823.7716	789.2061	743.3476	693.4080	627.3291	592.9821	586.8473	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.0920	61.2199	61.3459	61.9445	62.0578	62.5907	62.5907	62.6904	62.3843	62.0578	61.8290	61.5917	
alpha	5.0728	5.0813	5.0897	5.1296	5.1372	5.1727	5.1727	5.1794	5.1590	5.1372	5.1219	5.1061	
util living area	0.9885	0.9790	0.9579	0.8926	0.7633	0.5732	0.4202	0.4638	0.7040	0.9188	0.9775	0.9903	(86)
MIT	19.9050	20.0800	20.3336	20.6615	20.8836	20.9787	20.9964	20.9942	20.9414	20.6539	20.2312	19.8758	(87)
Th 2	20.1067	20.1084	20.1101	20.1179	20.1194	20.1263	20.1263	20.1275	20.1236	20.1194	20.1164	20.1133	(88)
util rest of house	0.9855	0.9736	0.9470	0.8662	0.7128	0.5013	0.3382	0.3783	0.6326	0.8927	0.9708	0.9878	(89)
MIT 2	18.8380	19.0601	19.3779	19.7777	20.0210	20.1134	20.1249	20.1252	20.0832	19.7786	19.2591	18.8059	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.1391	19.3479	19.6476	20.0271	20.2644	20.3576	20.3709	20.3704	20.3254	20.0256	19.5334	19.1078	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1391	19.3479	19.6476	20.0271	20.2644	20.3576	20.3709	20.3704	20.3254	20.0256	19.5334	19.1078	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9812	0.9678	0.9401	0.8632	0.7216	0.5208	0.3613	0.4024	0.6499	0.8895	0.9651	0.9839	(94)
Useful gains	596.9506	656.1465	685.8487	689.3776	603.0790	429.0146	285.1742	299.1384	450.6478	558.0090	572.2933	577.4180	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1153.6230	1120.8598	1017.8906	853.1366	655.4525	436.8875	286.1350	300.7964	473.9480	721.3615	955.0754	1149.5584	(97)
Space heating kWh	414.1643	312.2873	247.0392	117.9065	38.9659	0.0000	0.0000	0.0000	0.0000	121.5343	275.6031	425.6725	(98a)
Space heating requirement - total per year (kWh/year)												1953.1730	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	414.1643	312.2873	247.0392	117.9065	38.9659	0.0000	0.0000	0.0000	0.0000	121.5343	275.6031	425.6725	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1953.1730	
Space heating per m2											(98c) / (4) =	24.4208	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	414.1643	312.2873	247.0392	117.9065	38.9659	0.0000	0.0000	0.0000	0.0000	121.5343	275.6031	425.6725	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	448.7154	338.3394	267.6481	127.7427	42.2166	0.0000	0.0000	0.0000	0.0000	131.6731	298.5949	461.1837	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.3781	85.0348	84.3768	83.0310	81.2409	79.8000	79.8000	79.8000	79.8000	83.0677	84.7448	85.4582	(217)
Fuel for water heating, kWh/month	267.4167	237.3749	254.2727	227.8515	226.1156	207.8751	205.6450	213.6686	215.8200	230.6400	239.6706	264.3653	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.3582	20.3433	18.3169	13.4197	10.3658	8.4689	9.4560	12.2913	15.9652	20.9471	23.6598	26.0630	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3424	-31.5676	-47.5704	-56.1485	-62.8691	-59.5233	-58.7993	-54.3654	-46.9365	-37.2699	-23.9846	-18.2835	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9342	-17.0411	-34.5369	-52.8648	-70.8844	-71.5905	-70.7461	-59.4418	-42.9727	-24.6882	-10.6939	-6.2480	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2116.1138	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2790.7159	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	204.6551	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4209.1818	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2116.1138	0.2100	444.3839	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2790.7159	0.2100	586.0503	(264)
Space and water heating			1030.4342	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	204.6551	0.1443	29.5381	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	0.1336	-69.2911	
PV Unit electricity exported	-469.6425	0.1253	-58.8667	
Total			-128.1578	(269)
Total CO2, kg/year			943.7437	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.8000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2116.1138	1.1300	2391.2086	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2790.7159	1.1300	3153.5090	(278)
Space and water heating			5544.7176	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	204.6551	1.5338	313.9068	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-518.6605	1.4937	-774.7198	
PV Unit electricity exported	-469.6425	0.4601	-216.0686	
Total			-990.7884	(283)
Total Primary energy kWh/year			4997.9368	(286)
Target Primary Energy Rate (TPER)			62.4900	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	1.90	**TER**	11.80
Environmental	98 A	**% DER < TER**			83.90
CO_2 Emissions (t/year)	0.12	**DFEE**	24.18	**TFEE**	30.94
Compliance Check	See BREL	**% DFEE < TFEE**			21.83
% DPER < TPER	61.05	**DPER**	24.34	**TPER**	62.49

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17097.8798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 3.6723 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
									Total per year (kWh/year) = Sum(64)m =			2691.4183	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	610.7421	608.5956	590.7266	557.3213	524.1652	494.1729	476.4438	479.4976	496.5901	527.0115	563.7339	595.7477	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.8800	19.6403	0.6800	0.7000	0.7700	64.0095	(80)

Solar gains	64.0095	125.2162	206.2132	300.7496	368.5800	377.3072	359.2118	308.5577	239.8345	148.5795	79.8123	52.6383	(83)
Total gains	674.7516	733.8118	796.9398	858.0709	892.7452	871.4801	835.6556	788.0552	736.4246	675.5910	643.5462	648.3860	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9765	0.9604	0.9182	0.8197	0.6599	0.4799	0.3462	0.3835	0.6021	0.8589	0.9578	0.9809	(86)
MIT	20.2847	20.4233	20.6380	20.8484	20.9621	20.9948	20.9993	20.9988	20.9822	20.8302	20.5149	20.2369	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9711	0.9517	0.9013	0.7876	0.6129	0.4239	0.2862	0.3200	0.5407	0.8250	0.9469	0.9764	(89)
MIT 2	19.4128	19.5849	19.8457	20.0864	20.2024	20.2300	20.2329	20.2327	20.2214	20.0728	19.7013	19.3530	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.6588	19.8215	20.0693	20.3014	20.4168	20.4458	20.4492	20.4489	20.4361	20.2865	19.9309	19.6024	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6588	19.8215	20.0693	20.3014	20.4168	20.4458	20.4492	20.4489	20.4361	20.2865	19.9309	19.6024	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9661	0.9462	0.8972	0.7907	0.6244	0.4396	0.3031	0.3379	0.5573	0.8275	0.9419	0.9718	(94)
Useful gains	651.8976	694.3109	715.0211	678.4355	557.4294	383.0804	253.3003	266.2970	410.4249	559.0686	606.1333	630.1248	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1011.3973	982.5949	893.5518	750.7983	574.0090	384.9549	253.4732	266.6229	417.2377	637.8686	844.9268	1014.2654	(97)
Space heating kWh	267.4678	193.7268	132.8269	52.1012	12.3353	0.0000	0.0000	0.0000	0.0000	58.6272	171.9314	285.8006	(98a)
Space heating requirement - total per year (kWh/year)												1174.8171	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	267.4678	193.7268	132.8269	52.1012	12.3353	0.0000	0.0000	0.0000	0.0000	58.6272	171.9314	285.8006	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1174.8171	
Space heating per m2											(98c) / (4) =	14.6889	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	267.4678	193.7268	132.8269	52.1012	12.3353	0.0000	0.0000	0.0000	0.0000	58.6272	171.9314	285.8006	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	401.2017	290.5902	199.2403	78.1518	18.5029	0.0000	0.0000	0.0000	0.0000	87.9408	257.8970	428.7009	
Space heating requirement	401.2017	290.5902	199.2403	78.1518	18.5029	0.0000	0.0000	0.0000	0.0000	87.9408	257.8970	428.7009	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1762.2256	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												17.6223	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)
Total electricity for the above, kWh/year												21.9935	(331)
Electricity for lighting (calculated in Appendix L)												196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5059.2308	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1762.2256	4.4400	78.2428	(340a)
Space heating total			78.2428	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	196.1051	16.4900	32.3377	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	16.4900	-80.4802	
PV Unit electricity exported	-470.1661	5.5900	-26.2823	
Total			-106.7625	(352)
Total energy cost			278.6932	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8028 (357)
SAP value		86.9872
SAP rating (Section 12)		87 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1546.4941	0.1571	73.8061	(367)
Electrical energy for heat distribution (space & water)	17.6223	0.0000	8.4554	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			233.9338	(373)
Space and water heating			233.9338	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			143.8920	(383)
CO2 emissions per m2			1.8000	(384)
EI value			98.4572	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 79.9800						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate													
	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17097.8798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	213.7769	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.6723	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 33.5192	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff													
	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m													
	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
327.4608 330.8588 322.2959 304.0665 281.0552 259.4278 244.9794 241.5813 250.1442 268.3736 291.3850 313.0124 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 (71)
Water heating gains (Table 5)
154.0336 151.5930 146.8914 136.5869 130.2751 123.6777 119.6256 122.9734 126.8986 134.2191 144.0972 152.7161 (72)
Total internal gains
610.7421 608.5956 590.7266 557.3213 524.1652 494.1729 476.4438 479.4976 496.5901 527.0115 563.7339 595.7477 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.8800	23.7835	0.6800	0.7000	0.7700	77.5127	(80)

Solar gains 77.5127 134.7327 218.2918 321.2659 378.6764 415.6011 388.3328 340.4966 267.7476 168.5975 95.2070 64.1092 (83)
Total gains 688.2548 743.3283 809.0184 878.5872 902.8416 909.7739 864.7766 819.9942 764.3377 695.6090 658.9409 659.8569 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9722	0.9549	0.9027	0.7918	0.6235	0.4182	0.2968	0.3289	0.5592	0.8241	0.9477	0.9776	(86)
MIT	20.3333	20.4635	20.6890	20.8786	20.9730	20.9977	20.9997	20.9995	20.9883	20.8723	20.5708	20.2836	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9658	0.9450	0.8829	0.7567	0.5747	0.3637	0.2385	0.2676	0.4979	0.7846	0.9345	0.9723	(89)
MIT 2	19.4737	19.6345	19.9059	20.1184	20.2121	20.2319	20.2331	20.2330	20.2258	20.1173	19.7694	19.4118	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.7163	19.8684	20.1269	20.3329	20.4269	20.4480	20.4494	20.4493	20.4409	20.3303	19.9955	19.6578	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7163	19.8684	20.1269	20.3329	20.4269	20.4480	20.4494	20.4493	20.4409	20.3303	19.9955	19.6578	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9606	0.9395	0.8798	0.7615	0.5873	0.3790	0.2550	0.2849	0.5148	0.7900	0.9297	0.9674	(94)
Useful gains	661.1516	698.3616	711.7907	669.0781	530.2384	344.8103	220.5043	233.6117	393.4550	549.5130	612.6054	638.3648	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	995.4243	965.9336	864.4192	726.5318	541.7487	345.5865	220.5631	233.7257	397.8031	607.8286	822.8449	998.1572	(97)
Space heating kWh	248.6989	179.8084	113.5556	41.3667	8.5637	0.0000	0.0000	0.0000	0.0000	43.3868	151.3725	267.6856	(98a)
Space heating requirement - total per year (kWh/year)												1054.4381	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	248.6989	179.8084	113.5556	41.3667	8.5637	0.0000	0.0000	0.0000	0.0000	43.3868	151.3725	267.6856	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1054.4381	
Space heating per m2										(98c) / (4) =		13.1838	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement
248.6989 179.8084 113.5556 41.3667 8.5637 0.0000 0.0000 0.0000 0.0000 43.3868 151.3725 267.6856 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50
307a 373.0484 269.7126 170.3334 62.0500 12.8455 0.0000 0.0000 0.0000 0.0000 65.0801 227.0587 401.5284
Space heating requirement
373.0484 269.7126 170.3334 62.0500 12.8455 0.0000 0.0000 0.0000 0.0000 65.0801 227.0587 401.5284 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)

Water heating
Annual water heating requirement
266.9446 236.1786 250.9634 220.5542 213.7828 192.6005 189.9534 197.4446 199.5749 222.6078 236.8171 263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50
310a 400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948
Water heating fuel
400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948 (310)
Cooling System Energy Efficiency Ratio 0.0000 (314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (315)
Pumps and Fa 1.8679 1.6872 1.8679 1.8077 1.8679 1.8077 1.8679 1.8679 1.8077 1.8679 1.8077 1.8679 (331)
Lighting 24.2988 19.4934 17.5516 12.8591 9.9327 8.1151 9.0610 11.7778 15.2982 20.0720 22.6713 24.9741 (332)
Electricity generated by PVs (Appendix M) (negative quantity)
(333a)m -17.9780 -26.9243 -45.2366 -58.5173 -66.4974 -66.2241 -64.3099 -58.6197 -48.0109 -34.7929 -20.6435 -14.9664 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(334a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (334a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)

Electricity generated by PVs (Appendix M) (negative quantity)

(333b)m	-6.0204	-13.0409	-32.0085	-59.0559	-82.7431	-94.8946	-90.1802	-72.6219	-46.3379	-22.2034	-8.3869	-4.5323	(333b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1581.6572	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	15.8166	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4782.1363	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1581.6572	6.5500	103.5985	(340a)
Space heating total			103.5985	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	196.1051	28.4300	55.7527	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	28.4300	-148.6096	
PV Unit electricity exported	-532.0259	5.8100	-30.9107	
Total			-179.5203	(352)
Total energy cost			354.5155	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1498.3426	0.1575	66.4471	(367)
Electrical energy for heat distribution (space & water)	15.8166	0.0000	8.1795	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			226.2989	(373)
Space and water heating			226.2989	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	0.1322	-69.1017	
PV Unit electricity exported	-532.0259	0.1213	-64.5494	
Total			-133.6511	(380)
Total CO2, kg/year			124.0026	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1498.3426	1.5832	667.7562	(467)
Electrical energy for heat distribution (space & water)	15.8166	0.0000	86.4432	(472)
Overall CO2 factor for heat network			0.4256	(486)
Total CO2 associated with community systems			2391.5953	(473)
Space and water heating			2391.5953	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	1.4884	-778.0360	
PV Unit electricity exported	-532.0259	0.4451	-236.7863	
Total			-1014.8223	(480)
Total Primary energy kWh/year			1710.8374	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - West

Current energy efficiency rating:	B 87
Current environmental impact rating:	A 98

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 87
Potential environmental impact rating: A 98

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£62	£62	£0
Community scheme	£472	£472	£0
Space heating	£214	£214	£0
Water heating	£264	£264	£0
Lighting	£56	£56	£0
Generated (PV)	-£180	-£180	£0
Total cost of fuels	£354	£354	£0
Total cost of uses	£354	£354	£0
Delivered energy	60 kWh/m²	60 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	2 kg/m²	2 kg/m²	0 kg/m²
Primary energy	21 kWh/m²	21 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17097.8798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.6723 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
									Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)

Water heating gains (Table 5)

154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)

Total internal gains

610.7421	608.5956	590.7266	557.3213	524.1652	494.1729	476.4438	479.4976	496.5901	527.0115	563.7339	595.7477	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.8800	19.6403	0.6800	0.7000	0.7700	64.0095	(80)

Solar gains	64.0095	125.2162	206.2132	300.7496	368.5800	377.3072	359.2118	308.5577	239.8345	148.5795	79.8123	52.6383	(83)
Total gains	674.7516	733.8118	796.9398	858.0709	892.7452	871.4801	835.6556	788.0552	736.4246	675.5910	643.5462	648.3860	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area	0.9765	0.9604	0.9182	0.8197	0.6599	0.4799	0.3462	0.3835	0.6021	0.8589	0.9578	0.9809	(86)
MIT	20.2847	20.4233	20.6380	20.8484	20.9621	20.9948	20.9993	20.9988	20.9822	20.8302	20.5149	20.2369	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house	0.9711	0.9517	0.9013	0.7876	0.6129	0.4239	0.2862	0.3200	0.5407	0.8250	0.9469	0.9764	(89)
MIT 2	19.4128	19.5849	19.8457	20.0864	20.2024	20.2300	20.2329	20.2327	20.2214	20.0728	19.7013	19.3530	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.6588	19.8215	20.0693	20.3014	20.4168	20.4458	20.4492	20.4489	20.4361	20.2865	19.9309	19.6024	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6588	19.8215	20.0693	20.3014	20.4168	20.4458	20.4492	20.4489	20.4361	20.2865	19.9309	19.6024	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9661	0.9462	0.8972	0.7907	0.6244	0.4396	0.3031	0.3379	0.5573	0.8275	0.9419	0.9718	(94)
Useful gains	651.8976	694.3109	715.0211	678.4355	557.4294	383.0804	253.3003	266.2970	410.4249	559.0686	606.1333	630.1248	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1011.3973	982.5949	893.5518	750.7983	574.0090	384.9549	253.4732	266.6229	417.2377	637.8686	844.9268	1014.2654	(97)
Space heating kWh	267.4678	193.7268	132.8269	52.1012	12.3353	0.0000	0.0000	0.0000	0.0000	58.6272	171.9314	285.8006	(98a)
Space heating requirement - total per year (kWh/year)												1174.8171	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	267.4678	193.7268	132.8269	52.1012	12.3353	0.0000	0.0000	0.0000	0.0000	58.6272	171.9314	285.8006	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1174.8171	
Space heating per m2											(98c) / (4) =	14.6889	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	267.4678	193.7268	132.8269	52.1012	12.3353	0.0000	0.0000	0.0000	0.0000	58.6272	171.9314	285.8006	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	401.2017	290.5902	199.2403	78.1518	18.5029	0.0000	0.0000	0.0000	0.0000	87.9408	257.8970	428.7009	
Space heating requirement	401.2017	290.5902	199.2403	78.1518	18.5029	0.0000	0.0000	0.0000	0.0000	87.9408	257.8970	428.7009	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0381	-25.0770	-42.9668	-55.6604	-65.1056	-62.4806	-61.2719	-54.9276	-44.2499	-31.2702	-17.5833	-12.4234	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4606	-11.5013	-29.0286	-53.2036	-78.8852	-82.6714	-80.4690	-62.8148	-39.2125	-18.2266	-6.3668	-3.3255	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1762.2256	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												17.6223	(313)
Space cooling fuel												0.0000	(321)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)

mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5059.2308	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1762.2256	4.4400	78.2428	(340a)
Space heating total			78.2428	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	196.1051	16.4900	32.3377	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	16.4900	-80.4802	
PV Unit electricity exported	-470.1661	5.5900	-26.2823	
Total			-106.7625	(352)
Total energy cost			278.6932	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8028	(357)
SAP value		86.9872	
SAP rating (Section 12)		87	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1546.4941	0.1571	73.8061	(367)
Electrical energy for heat distribution (space & water)	17.6223	0.0000	8.4554	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			233.9338	(373)
Space and water heating			233.9338	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.0548	0.1319	-64.3729	
PV Unit electricity exported	-470.1661	0.1213	-57.0238	
Total			-121.3967	(380)
Total CO2, kg/year			143.8920	(383)
CO2 emissions per m2			1.8000	(384)
EI value			98.4572	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)

Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			9.8800	0.7752	7.6589			(27)
Doors			3.5800	1.1000	3.9380			(26a)
Heatloss Floor			39.9900	0.1000	3.9990	100.0000	3999.0000	(28a)
100mm FullFill Cavity	52.5300	13.4600	39.0700	0.2500	9.7675	50.0000	1953.4999	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
Total net area of external elements Aum(A, m2)			122.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8469			(33)
Main dwelling								
Party Wall			43.0700	0.0000	0.0000	70.0000	3014.9000	(32)
Party Ceiling			39.9900			30.0000	1199.7000	(32b)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17097.8798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	213.7769 (35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.6723 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 33.5192 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	65.8511	(39)
Average = Sum(39)m / 12 =												65.8511	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	0.8233	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)
Total storage loss	

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)

											Total per year (kWh/year) = Sum(64)m =		2691.4183 (64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000 (64a)
Heat gains from water heating, kWh/month													
114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207		(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.7607	24.6568	20.0523	15.1809	11.3479	9.5804	10.3519	13.4558	18.0603	22.9318	26.7647	28.5323	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains													
	610.7421	608.5956	590.7266	557.3213	524.1652	494.1729	476.4438	479.4976	496.5901	527.0115	563.7339	595.7477	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.8800	23.7835	0.6800	0.7000	0.7700	77.5127	(80)

Solar gains	77.5127	134.7327	218.2918	321.2659	378.6764	415.6011	388.3328	340.4966	267.7476	168.5975	95.2070	64.1092	(83)
Total gains	688.2548	743.3283	809.0184	878.5872	902.8416	909.7739	864.7766	819.9942	764.3377	695.6090	658.9409	659.8569	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	72.1235	
alpha	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	5.8082	
util living area													
	0.9722	0.9549	0.9027	0.7918	0.6235	0.4182	0.2968	0.3289	0.5592	0.8241	0.9477	0.9776	(86)
MIT	20.3333	20.4635	20.6890	20.8786	20.9730	20.9977	20.9997	20.9995	20.9883	20.8723	20.5708	20.2836	(87)
Th 2	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	20.2331	(88)
util rest of house													
	0.9658	0.9450	0.8829	0.7567	0.5747	0.3637	0.2385	0.2676	0.4979	0.7846	0.9345	0.9723	(89)
MIT 2	19.4737	19.6345	19.9059	20.1184	20.2121	20.2319	20.2331	20.2330	20.2258	20.1173	19.7694	19.4118	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.7163	19.8684	20.1269	20.3329	20.4269	20.4480	20.4494	20.4493	20.4409	20.3303	19.9955	19.6578	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7163	19.8684	20.1269	20.3329	20.4269	20.4480	20.4494	20.4493	20.4409	20.3303	19.9955	19.6578	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9606	0.9395	0.8798	0.7615	0.5873	0.3790	0.2550	0.2849	0.5148	0.7900	0.9297	0.9674	(94)
Useful gains	661.1516	698.3616	711.7907	669.0781	530.2384	344.8103	220.5043	233.6117	393.4550	549.5130	612.6054	638.3648	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	995.4243	965.9336	864.4192	726.5318	541.7487	345.5865	220.5631	233.7257	397.8031	607.8286	822.8449	998.1572	(97)
Space heating kWh													
	248.6989	179.8084	113.5556	41.3667	8.5637	0.0000	0.0000	0.0000	0.0000	43.3868	151.3725	267.6856	(98a)
Space heating requirement - total per year (kWh/year)												1054.4381	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	248.6989	179.8084	113.5556	41.3667	8.5637	0.0000	0.0000	0.0000	0.0000	43.3868	151.3725	267.6856	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1054.4381	
Space heating per m2											(98c) / (4) =	13.1838	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	248.6989	179.8084	113.5556	41.3667	8.5637	0.0000	0.0000	0.0000	0.0000	43.3868	151.3725	267.6856	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	373.0484	269.7126	170.3334	62.0500	12.8455	0.0000	0.0000	0.0000	0.0000	65.0801	227.0587	401.5284	
Space heating requirement													
	373.0484	269.7126	170.3334	62.0500	12.8455	0.0000	0.0000	0.0000	0.0000	65.0801	227.0587	401.5284	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	24.2988	19.4934	17.5516	12.8591	9.9327	8.1151	9.0610	11.7778	15.2982	20.0720	22.6713	24.9741	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.9780	-26.9243	-45.2366	-58.5173	-66.4974	-66.2241	-64.3099	-58.6197	-48.0109	-34.7929	-20.6435	-14.9664	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.0204	-13.0409	-32.0085	-59.0559	-82.7431	-94.8946	-90.1802	-72.6219	-46.3379	-22.2034	-8.3869	-4.5323	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1581.6572	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	15.8166	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	196.1051	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4782.1363	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1581.6572	6.5500	103.5985	(340a)
Space heating total			103.5985	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	196.1051	28.4300	55.7527	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	28.4300	-148.6096	
PV Unit electricity exported	-532.0259	5.8100	-30.9107	
Total			-179.5203	(352)
Total energy cost			354.5155	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1498.3426	0.1575	66.4471	(367)
Electrical energy for heat distribution (space & water)	15.8166	0.0000	8.1795	(372)
Overall CO2 factor for heat network			0.0403	(386)
Total CO2 associated with community systems			226.2989	(373)
Space and water heating			226.2989	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	196.1051	0.1443	28.3040	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-522.7211	0.1322	-69.1017	
PV Unit electricity exported	-532.0259	0.1213	-64.5494	
Total			-133.6511	(380)
Total CO2, kg/year			124.0026	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1498.3426	1.5832	667.7562	(467)
Electrical energy for heat distribution (space & water)	15.8166	0.0000	86.4432	(472)
Overall CO2 factor for heat network			0.4256	(486)
Total CO2 associated with community systems			2391.5953	(473)
Space and water heating			2391.5953	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	196.1051	1.5338	300.7926	(479)

Energy saving/generation technologies				
PV Unit electricity used in dwelling		-522.7211	1.4884	-778.0360
PV Unit electricity exported		-532.0259	0.4451	-236.7863
Total				-1014.8223 (480)
Total Primary energy kWh/year				1710.8374 (483)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	83 B	**DER**	3.12	**TER**	10.74
Environmental	97 A	**% DER < TER**			70.95
CO_2 Emissions (t/year)	0.24	**DFEE**	18.72	**TFEE**	25.56
Compliance Check	See BREL	**% DFEE < TFEE**			26.77
% DPER < TPER	41.81	**DPER**	33.09	**TPER**	56.87

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			15583.4798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.2856	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.6117	146.8201	132.6117	137.0321	132.6117	137.0321	132.6117	132.6117	137.0321	132.6117	137.0321	132.6117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	565.9813	580.0257	555.3786	537.2808	511.1311	494.4637	476.3107	477.3819	491.4645	506.5784	536.2944	554.9833	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	19.6403	0.6800	0.7000	0.7700	49.2381	(80)
Solar gains	49.2381	96.3201	158.6255	231.3459	283.5231	290.2363	276.3168	237.3520	184.4881	114.2919	61.3941	40.4910	(83)
Total gains	615.2193	676.3458	714.0042	768.6267	794.6541	784.7000	752.6275	714.7339	675.9526	620.8703	597.6885	595.4743	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9734	0.9526	0.9117	0.8056	0.6439	0.4599	0.3310	0.3642	0.5696	0.8357	0.9477	0.9777	(86)
MIT	20.3749	20.5178	20.6929	20.8804	20.9723	20.9968	20.9996	20.9994	20.9892	20.8732	20.6021	20.3348	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9680	0.9435	0.8958	0.7764	0.6029	0.4129	0.2810	0.3117	0.5177	0.8035	0.9363	0.9731	(89)
MIT 2	19.6107	19.7876	20.0002	20.2152	20.3100	20.3313	20.3331	20.3330	20.3258	20.2117	19.8941	19.5607	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.8264	19.9937	20.1957	20.4029	20.4969	20.5191	20.5212	20.5211	20.5130	20.3984	20.0939	19.7791	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8264	19.9937	20.1957	20.4029	20.4969	20.5191	20.5212	20.5211	20.5130	20.3984	20.0939	19.7791	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9631	0.9383	0.8922	0.7796	0.6132	0.4261	0.2951	0.3265	0.5319	0.8068	0.9316	0.9685	(94)
Useful gains	592.5008	634.5932	637.0264	599.2031	487.2474	334.3382	222.1168	233.3604	359.5340	500.9488	556.8060	576.7276	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	879.8541	855.3333	776.1130	651.8520	498.5043	335.4237	222.2095	233.5330	363.4131	555.2558	736.3423	882.8423	(97)
Space heating kWh	213.7908	148.3374	103.4804	37.9072	8.3751	0.0000	0.0000	0.0000	0.0000	40.4044	129.2662	227.7493	(98a)
Space heating requirement - total per year (kWh/year)												909.3108	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	213.7908	148.3374	103.4804	37.9072	8.3751	0.0000	0.0000	0.0000	0.0000	40.4044	129.2662	227.7493	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												909.3108	
Space heating per m2										(98c) / (4) =		11.3692	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

213.7908	148.3374	103.4804	37.9072	8.3751	0.0000	0.0000	0.0000	0.0000	40.4044	129.2662	227.7493	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a 320.6862	222.5061	155.2206	56.8608	12.5627	0.0000	0.0000	0.0000	0.0000	60.6066	193.8992	341.6240	
Space heating requirement												
320.6862	222.5061	155.2206	56.8608	12.5627	0.0000	0.0000	0.0000	0.0000	60.6066	193.8992	341.6240	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a 400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel												
400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)

Cooling System Energy Efficiency Ratio											0.0000	(314)
Space coolin 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa 1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting 25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1363.9662	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	13.6397	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5630.0105	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1440.2916	0.1573	57.2312	(367)
Electrical energy for heat distribution (space & water)	13.6397	0.0000	7.8339	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			216.7374	(373)
Space and water heating			216.7374	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Total CO2, kg/year			249.6536	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.1200	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1440.2916	1.5825	575.5913	(467)
Electrical energy for heat distribution (space & water)	13.6397	0.0000	82.9870	(472)
Overall CO2 factor for heat network			0.4251	(486)
Total CO2 associated with community systems			2295.9741	(473)
Space and water heating			2295.9741	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)
Total Primary energy kWh/year			2646.6319	(483)
Dwelling Primary energy Rate (DPER)			33.0900	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type			7.6000	1.1450	8.7023			(27)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.1800	5.4450			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
500mm mineral wool	39.9900		39.9900	0.1100	4.3989			(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7164			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 194.8422 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.7300	0.0500	0.3365
E3 Sill	5.8800	0.0500	0.2940
E4 Jamb	10.3200	0.0500	0.5160
E6 Intermediate floor within a dwelling	14.1900	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	11.4900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
E7 Party floor between dwellings (in blocks of flats)	14.1900	0.0700	0.9933
P4 Party wall - Roof (insulation at ceiling level)	11.4900	0.1200	1.3788
E10 Eaves (insulation at ceiling level)	8.7100	0.0600	0.5226
E12 Gable (insulation at ceiling level)	5.4100	0.0600	0.3246

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.6278 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 32.3442 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)

Heat transfer coeff

	68.8609	68.6984	68.5391	67.7910	67.6510	66.9994	66.9994	66.8787	67.2504	67.6510	67.9342	68.2302	(39)

Average = Sum(39)m / 12 = 67.7903

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8610	0.8589	0.8570	0.8476	0.8458	0.8377	0.8377	0.8362	0.8408	0.8458	0.8494	0.8531	(40)
HLP (average)												0.8476	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

Hot water usage for mixer showers

65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)

Energy content (annual) Total = Sum(45)m = 2040.5785

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss / Combi loss

Total heat required for water heating calculated for each month

258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS / PV diverter / Solar input / FGHRS

Output from w/h

228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)

Total per year (kWh/year) = Sum(64)m = 2310.9385 (64)

12Total per year (kWh/year) 2311 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

129.1468	142.9840	129.1468	133.4517	129.1468	133.4517	129.1468	129.1468	133.4517	129.1468	133.4517	129.1468	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Pumps, fans / Losses e.g. evaporation (negative values) (Table 5)

-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)

Water heating gains (Table 5)

144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)

Total internal gains

556.1810	569.8542	545.5784	527.3650	501.3308	481.5479	463.5104	464.5816	478.5488	496.7781	526.3787	545.1830	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
West					7.6000	19.6403		0.6300	0.7000	0.7700		45.6176	(80)
Solar gains	45.6176	89.2378	146.9619	214.3352	262.6758	268.8954	255.9994	219.8997	170.9228	105.8881	56.8798	37.5137	(83)
Total gains	601.7986	659.0920	692.5403	741.7002	764.0066	750.4433	719.5098	684.4813	649.4715	602.6662	583.2585	582.6967	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.8622	63.0109	63.1573	63.8543	63.9864	64.6087	64.6087	64.7253	64.3676	63.9864	63.7197	63.4432	
alpha	5.1908	5.2007	5.2105	5.2570	5.2658	5.3072	5.3072	5.3150	5.2912	5.2658	5.2480	5.2295	
util living area													
	0.9832	0.9715	0.9484	0.8793	0.7492	0.5585	0.4076	0.4459	0.6753	0.8978	0.9679	0.9855	(86)
MIT	20.0319	20.1920	20.4150	20.7076	20.9012	20.9831	20.9973	20.9958	20.9557	20.7172	20.3397	20.0063	(87)
Th 2	20.2008	20.2025	20.2042	20.2123	20.2138	20.2208	20.2208	20.2221	20.2181	20.2138	20.2107	20.2076	(88)
util rest of house													
	0.9793	0.9652	0.9368	0.8539	0.7034	0.4953	0.3365	0.3722	0.6115	0.8706	0.9597	0.9822	(89)
MIT 2	19.0758	19.2784	19.5572	19.9141	20.1276	20.2098	20.2197	20.2202	20.1862	19.9331	19.4724	19.0486	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.3456	19.5362	19.7993	20.1381	20.3459	20.4280	20.4391	20.4390	20.4033	20.1544	19.7172	19.3189	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3456	19.5362	19.7993	20.1381	20.3459	20.4280	20.4391	20.4390	20.4033	20.1544	19.7172	19.3189	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9741	0.9587	0.9299	0.8512	0.7115	0.5124	0.3565	0.3929	0.6272	0.8683	0.9534	0.9774	(94)
Useful gains	586.2231	631.8626	643.9713	631.3458	543.5623	384.5337	256.5134	268.9541	407.3704	523.2921	556.0918	569.5320	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1036.0557	1005.4847	911.5210	761.8383	584.9046	390.4746	257.2179	270.1253	423.9001	646.3623	857.1371	1031.5631	(97)
Space heating kWh													
	334.6754	251.0741	199.0570	93.9545	30.7587	0.0000	0.0000	0.0000	0.0000	91.5642	216.7526	343.7511	(98a)
Space heating requirement - total per year (kWh/year)												1561.5877	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	334.6754	251.0741	199.0570	93.9545	30.7587	0.0000	0.0000	0.0000	0.0000	91.5642	216.7526	343.7511	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1561.5877	
Space heating per m2											(98c) / (4) =	19.5247	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	334.6754	251.0741	199.0570	93.9545	30.7587	0.0000	0.0000	0.0000	0.0000	91.5642	216.7526	343.7511	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	362.5953	272.0196	215.6630	101.7926	33.3247	0.0000	0.0000	0.0000	0.0000	99.2028	234.8349	372.4281	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9161	84.5503	83.8921	82.5772	80.9771	79.8000	79.8000	79.8000	79.8000	82.5040	84.2059	84.9983	(217)
Fuel for water heating, kWh/month													
	268.8716	238.7352	255.7420	229.1037	226.8522	207.8751	205.6450	213.6686	215.8200	232.2159	241.2047	265.7959	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	26.8342	21.5274	19.3830	14.2008	10.9691	8.9619	10.0064	13.0067	16.8944	22.1664	25.0369	27.5800	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3597	-31.5987	-47.6203	-56.2064	-62.9289	-59.5773	-58.8595	-54.4329	-47.0022	-37.3178	-24.0087	-18.2981	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9169	-17.0101	-34.4870	-52.8069	-70.8246	-71.5366	-70.6859	-59.3742	-42.9070	-24.6402	-10.6698	-6.2334	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1691.8610	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2801.5299	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	216.5670	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3807.6549	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1691.8610	0.2100	355.2908	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2801.5299	0.2100	588.3213	(264)
Space and water heating			943.6121	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	216.5670	0.1443	31.2573	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	0.1336	-69.3640	
PV Unit electricity exported	-469.0927	0.1253	-58.7938	
Total			-128.1578	(269)
Total CO2, kg/year			858.6409	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.7400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1691.8610	1.1300	1911.8029	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2801.5299	1.1300	3165.7288	(278)
Space and water heating			5077.5317	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	216.5670	1.5338	332.1777	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	1.4937	-775.5387	
PV Unit electricity exported	-469.0927	0.4600	-215.8009	
Total			-991.3396	(283)
Total Primary energy kWh/year			4548.4706	(286)
Target Primary Energy Rate (TPER)			56.8700	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	83 B	**DER**	3.12	**TER**	10.74
Environmental	97 A	**% DER < TER**			70.95
CO_2 Emissions (t/year)	0.24	**DFEE**	18.72	**TFEE**	25.56
Compliance Check	See BREL	**% DFEE < TFEE**			26.77
% DPER < TPER	41.81	**DPER**	33.09	**TPER**	56.87

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2122	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2705	0.2652	0.2599	0.2334	0.2281	0.2016	0.2016	0.1963	0.2122	0.2281	0.2387	0.2493	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5366	0.5352	0.5338	0.5272	0.5260	0.5203	0.5203	0.5193	0.5225	0.5260	0.5285	0.5311	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15583.4798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.2856	(36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.6979	34.6061	34.5160	34.0930	34.0139	33.6455	33.6455	33.5772	33.7874	34.0139	34.1740	34.3414	(38)
Heat transfer coeff	59.0343	58.9424	58.8524	58.4294	58.3502	57.9818	57.9818	57.9136	58.1237	58.3502	58.5103	58.6777	(39)
Average = Sum(39)m / 12 =												58.4290	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7381	0.7370	0.7358	0.7305	0.7296	0.7250	0.7250	0.7241	0.7267	0.7296	0.7316	0.7337	(40)
HLP (average)												0.7305	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.6117	146.8201	132.6117	137.0321	132.6117	137.0321	132.6117	132.6117	137.0321	132.6117	137.0321	132.6117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains	460.3995	475.6643	453.8350	442.5318	420.3791	407.9331	392.6658	391.8132	403.5720	413.9765	437.2071	450.3260	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	19.6403	0.6800	0.7000	0.7700	49.2381	(80)

Solar gains	49.2381	96.3201	158.6255	231.3459	283.5231	290.2363	276.3168	237.3520	184.4881	114.2919	61.3941	40.4910	(83)
Total gains	509.6376	571.9844	612.4605	673.8777	703.9021	698.1694	668.9826	629.1652	588.0600	528.2684	498.6012	490.8170	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.3259	73.4402	73.5526	74.0851	74.1855	74.6569	74.6569	74.7449	74.4746	74.1855	73.9825	73.7715	
alpha	5.8884	5.8960	5.9035	5.9390	5.9457	5.9771	5.9771	5.9830	5.9650	5.9457	5.9322	5.9181	
util living area	0.9900	0.9793	0.9557	0.8756	0.7259	0.5257	0.3806	0.4220	0.6582	0.9082	0.9780	0.9918	(86)
MIT	20.1404	20.3055	20.5211	20.7908	20.9433	20.9928	20.9991	20.9984	20.9750	20.7726	20.4176	20.1080	(87)

Th 2	20.3073	20.3083	20.3093	20.3139	20.3148	20.3188	20.3188	20.3196	20.3173	20.3148	20.3130	20.3112	(88)
util rest of house	0.9877	0.9747	0.9460	0.8514	0.6836	0.4720	0.3221	0.3603	0.6011	0.8844	0.9724	0.9900	(89)
MIT 2	19.5187	19.6819	19.8924	20.1472	20.2764	20.3152	20.3185	20.3190	20.3031	20.1364	19.7974	19.4898	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.6941	19.8579	20.0698	20.3288	20.4646	20.5064	20.5106	20.5107	20.4927	20.3160	19.9724	19.6643	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6941	19.8579	20.0698	20.3288	20.4646	20.5064	20.5106	20.5107	20.4927	20.3160	19.9724	19.6643	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9852	0.9711	0.9421	0.8520	0.6932	0.4870	0.3386	0.3777	0.6162	0.8844	0.9690	0.9877	(94)
Useful gains	502.0704	555.4803	576.9841	574.1225	487.9318	339.9763	226.5104	237.6249	362.3464	467.2173	483.1270	484.7967	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	908.7822	881.6531	798.6135	667.7803	511.4149	342.4638	226.7434	238.0670	371.5693	566.9289	753.1698	907.4073	(97)
Space heating kWh	302.5936	219.1881	164.8922	67.4336	17.4714	0.0000	0.0000	0.0000	0.0000	74.1854	194.4308	314.4223	(98a)
Space heating requirement - total per year (kWh/year)												1354.6174	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	302.5936	219.1881	164.8922	67.4336	17.4714	0.0000	0.0000	0.0000	0.0000	74.1854	194.4308	314.4223	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1354.6174	
Space heating per m2											(98c) / (4) =	16.9370	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	545.0293	429.0656	440.1434	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9543	0.9809	0.9715	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	520.1083	420.8815	427.5884	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	748.9021	717.9521	674.1942	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	164.7315	221.0206	183.4747	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	41.1829	55.2551	45.8687	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												142.3067	(107)
Energy for space heating												16.9370	(99)
Energy for space cooling												1.7793	(108)
Total												18.7162	(109)
Fabric Energy Efficiency (DFEE)												18.7	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type			7.6000	1.1450	8.7023			(27)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.1800	5.4450			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
500mm mineral wool	39.9900		39.9900	0.1100	4.3989			(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7164			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 194.8422 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.7300	0.0500	0.3365
E3 Sill	5.8800	0.0500	0.2940
E4 Jamb	10.3200	0.0500	0.5160
E6 Intermediate floor within a dwelling	14.1900	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	11.4900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
E7 Party floor between dwellings (in blocks of flats)	14.1900	0.0700	0.9933
P4 Party wall - Roof (insulation at ceiling level)	11.4900	0.1200	1.3788
E10 Eaves (insulation at ceiling level)	8.7100	0.0600	0.5226
E12 Gable (insulation at ceiling level)	5.4100	0.0600	0.3246

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.6278 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.3442 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	68.8609	68.6984	68.5391	67.7910	67.6510	66.9994	66.9994	66.8787	67.2504	67.6510	67.9342	68.2302	(39)
Average = Sum(39)m / 12 =												67.7903	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8610	0.8589	0.8570	0.8476	0.8458	0.8377	0.8377	0.8362	0.8408	0.8458	0.8494	0.8531	(40)
HLP (average)												0.8476	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	129.1468	142.9840	129.1468	133.4517	129.1468	133.4517	129.1468	129.1468	133.4517	129.1468	133.4517	129.1468	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains													
	456.9346	471.8282	450.3701	438.9514	416.9142	404.3527	389.2009	388.3482	399.9916	410.5116	433.6267	446.8611	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	19.6403	0.6300	0.7000	0.7700	45.6176	(80)

Solar gains	45.6176	89.2378	146.9619	214.3352	262.6758	268.8954	255.9994	219.8997	170.9228	105.8881	56.8798	37.5137	(83)
Total gains	502.5522	561.0659	597.3320	653.2866	679.5899	673.2481	645.2002	608.2479	570.9143	516.3997	490.5065	484.3748	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.8622	63.0109	63.1573	63.8543	63.9864	64.6087	64.6087	64.7253	64.3676	63.9864	63.7197	63.4432	
alpha	5.1908	5.2007	5.2105	5.2570	5.2658	5.3072	5.3072	5.3150	5.2912	5.2658	5.2480	5.2295	
util living area													
	0.9923	0.9853	0.9706	0.9190	0.8063	0.6145	0.4530	0.4990	0.7430	0.9390	0.9843	0.9936	(86)
MIT	19.8706	20.0403	20.2814	20.6174	20.8587	20.9737	20.9956	20.9928	20.9306	20.6195	20.1976	19.8447	(87)
Th 2	20.2008	20.2025	20.2042	20.2123	20.2138	20.2208	20.2208	20.2221	20.2181	20.2138	20.2107	20.2076	(88)
util rest of house													
	0.9904	0.9818	0.9634	0.8993	0.7637	0.5478	0.3747	0.4178	0.6799	0.9200	0.9799	0.9920	(89)
MIT 2	19.1652	19.3344	19.5728	19.9002	20.1147	20.2072	20.2193	20.2195	20.1775	19.9087	19.4978	19.1449	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.3643	19.5336	19.7727	20.1026	20.3246	20.4235	20.4384	20.4377	20.3901	20.1093	19.6953	19.3424	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3643	19.5336	19.7727	20.1026	20.3246	20.4235	20.4384	20.4377	20.3901	20.1093	19.6953	19.3424	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9879	0.9781	0.9586	0.8962	0.7702	0.5656	0.3968	0.4406	0.6946	0.9170	0.9763	0.9898	(94)
Useful gains	496.4624	548.7942	572.6030	585.4698	523.3918	380.8002	255.9920	268.0202	396.5753	473.5615	478.8580	479.4335	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1037.3405	1005.3059	909.7014	759.4376	583.4652	390.1699	257.1685	270.0373	423.0082	643.3135	855.6488	1033.1682	(97)
Space heating kWh													
	402.4133	306.7759	250.8012	125.2568	44.6946	0.0000	0.0000	0.0000	0.0000	126.2955	271.2894	411.9786	(98a)
Space heating requirement - total per year (kWh/year)												1939.5053	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	402.4133	306.7759	250.8012	125.2568	44.6946	0.0000	0.0000	0.0000	0.0000	126.2955	271.2894	411.9786	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1939.5053	
Space heating per m2											(98c) / (4) =	24.2499	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	629.7941	495.7954	508.2782	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8937	0.9455	0.9265	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	562.8363	468.7781	470.9138	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	723.6551	693.8769	653.3695	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	115.7895	167.4735	135.7471	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	28.9474	41.8684	33.9368	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												104.7525	(107)
Energy for space heating												24.2499	(99)
Energy for space cooling												1.3097	(108)
Total												25.5596	(109)
Fabric Energy Efficiency (TFEE)												25.6	(109)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	83 B	**DER**	3.12	**TER**	10.74
Environmental	97 A	**% DER < TER**			70.95
CO_2 Emissions (t/year)	0.24	**DFEE**	18.72	**TFEE**	25.56
Compliance Check	See BREL	**% DFEE < TFEE**			26.77
% DPER < TPER	41.81	**DPER**	33.09	**TPER**	56.87

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			15583.4798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.2856	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.6117	146.8201	132.6117	137.0321	132.6117	137.0321	132.6117	132.6117	137.0321	132.6117	137.0321	132.6117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	565.9813	580.0257	555.3786	537.2808	511.1311	494.4637	476.3107	477.3819	491.4645	506.5784	536.2944	554.9833	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	19.6403	0.6800	0.7000	0.7700	49.2381	(80)
Solar gains	49.2381	96.3201	158.6255	231.3459	283.5231	290.2363	276.3168	237.3520	184.4881	114.2919	61.3941	40.4910	(83)
Total gains	615.2193	676.3458	714.0042	768.6267	794.6541	784.7000	752.6275	714.7339	675.9526	620.8703	597.6885	595.4743	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9734	0.9526	0.9117	0.8056	0.6439	0.4599	0.3310	0.3642	0.5696	0.8357	0.9477	0.9777	(86)
MIT	20.3749	20.5178	20.6929	20.8804	20.9723	20.9968	20.9996	20.9994	20.9892	20.8732	20.6021	20.3348	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9680	0.9435	0.8958	0.7764	0.6029	0.4129	0.2810	0.3117	0.5177	0.8035	0.9363	0.9731	(89)
MIT 2	19.6107	19.7876	20.0002	20.2152	20.3100	20.3313	20.3331	20.3330	20.3258	20.2117	19.8941	19.5607	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.8264	19.9937	20.1957	20.4029	20.4969	20.5191	20.5212	20.5211	20.5130	20.3984	20.0939	19.7791	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8264	19.9937	20.1957	20.4029	20.4969	20.5191	20.5212	20.5211	20.5130	20.3984	20.0939	19.7791	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9631	0.9383	0.8922	0.7796	0.6132	0.4261	0.2951	0.3265	0.5319	0.8068	0.9316	0.9685	(94)
Useful gains	592.5008	634.5932	637.0264	599.2031	487.2474	334.3382	222.1168	233.3604	359.5340	500.9488	556.8060	576.7276	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	879.8541	855.3333	776.1130	651.8520	498.5043	335.4237	222.2095	233.5330	363.4131	555.2558	736.3423	882.8423	(97)
Space heating kWh	213.7908	148.3374	103.4804	37.9072	8.3751	0.0000	0.0000	0.0000	0.0000	40.4044	129.2662	227.7493	(98a)
Space heating requirement - total per year (kWh/year)												909.3108	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	213.7908	148.3374	103.4804	37.9072	8.3751	0.0000	0.0000	0.0000	0.0000	40.4044	129.2662	227.7493	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												909.3108	
Space heating per m2										(98c) / (4) =		11.3692	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

213.7908	148.3374	103.4804	37.9072	8.3751	0.0000	0.0000	0.0000	0.0000	40.4044	129.2662	227.7493	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a 320.6862	222.5061	155.2206	56.8608	12.5627	0.0000	0.0000	0.0000	0.0000	60.6066	193.8992	341.6240	
Space heating requirement												
320.6862	222.5061	155.2206	56.8608	12.5627	0.0000	0.0000	0.0000	0.0000	60.6066	193.8992	341.6240	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a 400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel												
400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)

Cooling System Energy Efficiency Ratio											0.0000	(314)
Space coolin 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa 1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting 25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1363.9662	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	13.6397	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5630.0105	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1440.2916	0.1573	57.2312	(367)
Electrical energy for heat distribution (space & water)	13.6397	0.0000	7.8339	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			216.7374	(373)
Space and water heating			216.7374	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Total CO2, kg/year			249.6536	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.1200	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1440.2916	1.5825	575.5913	(467)
Electrical energy for heat distribution (space & water)	13.6397	0.0000	82.9870	(472)
Overall CO2 factor for heat network			0.4251	(486)
Total CO2 associated with community systems			2295.9741	(473)
Space and water heating			2295.9741	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)
Total Primary energy kWh/year			2646.6319	(483)
Dwelling Primary energy Rate (DPER)			33.0900	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type			7.6000	1.1450	8.7023			(27)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.1800	5.4450			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
500mm mineral wool	39.9900		39.9900	0.1100	4.3989			(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7164			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 194.8422 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.7300	0.0500	0.3365
E3 Sill	5.8800	0.0500	0.2940
E4 Jamb	10.3200	0.0500	0.5160
E6 Intermediate floor within a dwelling	14.1900	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	11.4900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
E7 Party floor between dwellings (in blocks of flats)	14.1900	0.0700	0.9933
P4 Party wall - Roof (insulation at ceiling level)	11.4900	0.1200	1.3788
E10 Eaves (insulation at ceiling level)	8.7100	0.0600	0.5226
E12 Gable (insulation at ceiling level)	5.4100	0.0600	0.3246

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.6278 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 32.3442 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)

Heat transfer coeff

	68.8609	68.6984	68.5391	67.7910	67.6510	66.9994	66.9994	66.8787	67.2504	67.6510	67.9342	68.2302	(39)

Average = Sum(39)m / 12 = 67.7903

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8610	0.8589	0.8570	0.8476	0.8458	0.8377	0.8377	0.8362	0.8408	0.8458	0.8494	0.8531	(40)
HLP (average)												0.8476	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

Hot water usage for mixer showers

65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)

Energy content (annual) Total = Sum(45)m = 2040.5785

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss / Combi loss

Total heat required for water heating calculated for each month

258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS / PV diverter / Solar input / FGHRS

Output from w/h

228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)

Total per year (kWh/year) = Sum(64)m = 2310.9385 (64)

12Total per year (kWh/year) 2311 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

129.1468	142.9840	129.1468	133.4517	129.1468	133.4517	129.1468	129.1468	133.4517	129.1468	133.4517	129.1468	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Pumps, fans / Losses e.g. evaporation (negative values) (Table 5)

-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)

Water heating gains (Table 5)

144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)

Total internal gains

556.1810	569.8542	545.5784	527.3650	501.3308	481.5479	463.5104	464.5816	478.5488	496.7781	526.3787	545.1830	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
West					7.6000	19.6403		0.6300	0.7000	0.7700		45.6176	(80)
Solar gains	45.6176	89.2378	146.9619	214.3352	262.6758	268.8954	255.9994	219.8997	170.9228	105.8881	56.8798	37.5137	(83)
Total gains	601.7986	659.0920	692.5403	741.7002	764.0066	750.4433	719.5098	684.4813	649.4715	602.6662	583.2585	582.6967	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.8622	63.0109	63.1573	63.8543	63.9864	64.6087	64.6087	64.7253	64.3676	63.9864	63.7197	63.4432	
alpha	5.1908	5.2007	5.2105	5.2570	5.2658	5.3072	5.3072	5.3150	5.2912	5.2658	5.2480	5.2295	
util living area													
	0.9832	0.9715	0.9484	0.8793	0.7492	0.5585	0.4076	0.4459	0.6753	0.8978	0.9679	0.9855	(86)
MIT	20.0319	20.1920	20.4150	20.7076	20.9012	20.9831	20.9973	20.9958	20.9557	20.7172	20.3397	20.0063	(87)
Th 2	20.2008	20.2025	20.2042	20.2123	20.2138	20.2208	20.2208	20.2221	20.2181	20.2138	20.2107	20.2076	(88)
util rest of house													
	0.9793	0.9652	0.9368	0.8539	0.7034	0.4953	0.3365	0.3722	0.6115	0.8706	0.9597	0.9822	(89)
MIT 2	19.0758	19.2784	19.5572	19.9141	20.1276	20.2098	20.2197	20.2202	20.1862	19.9331	19.4724	19.0486	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.3456	19.5362	19.7993	20.1381	20.3459	20.4280	20.4391	20.4390	20.4033	20.1544	19.7172	19.3189	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3456	19.5362	19.7993	20.1381	20.3459	20.4280	20.4391	20.4390	20.4033	20.1544	19.7172	19.3189	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9741	0.9587	0.9299	0.8512	0.7115	0.5124	0.3565	0.3929	0.6272	0.8683	0.9534	0.9774	(94)
Useful gains	586.2231	631.8626	643.9713	631.3458	543.5623	384.5337	256.5134	268.9541	407.3704	523.2921	556.0918	569.5320	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1036.0557	1005.4847	911.5210	761.8383	584.9046	390.4746	257.2179	270.1253	423.9001	646.3623	857.1371	1031.5631	(97)
Space heating kWh													
	334.6754	251.0741	199.0570	93.9545	30.7587	0.0000	0.0000	0.0000	0.0000	91.5642	216.7526	343.7511	(98a)
Space heating requirement - total per year (kWh/year)												1561.5877	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	334.6754	251.0741	199.0570	93.9545	30.7587	0.0000	0.0000	0.0000	0.0000	91.5642	216.7526	343.7511	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1561.5877	
Space heating per m2											(98c) / (4) =	19.5247	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	334.6754	251.0741	199.0570	93.9545	30.7587	0.0000	0.0000	0.0000	0.0000	91.5642	216.7526	343.7511	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	362.5953	272.0196	215.6630	101.7926	33.3247	0.0000	0.0000	0.0000	0.0000	99.2028	234.8349	372.4281	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9161	84.5503	83.8921	82.5772	80.9771	79.8000	79.8000	79.8000	79.8000	82.5040	84.2059	84.9983	(217)
Fuel for water heating, kWh/month													
	268.8716	238.7352	255.7420	229.1037	226.8522	207.8751	205.6450	213.6686	215.8200	232.2159	241.2047	265.7959	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	26.8342	21.5274	19.3830	14.2008	10.9691	8.9619	10.0064	13.0067	16.8944	22.1664	25.0369	27.5800	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3597	-31.5987	-47.6203	-56.2064	-62.9289	-59.5773	-58.8595	-54.4329	-47.0022	-37.3178	-24.0087	-18.2981	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9169	-17.0101	-34.4870	-52.8069	-70.8246	-71.5366	-70.6859	-59.3742	-42.9070	-24.6402	-10.6698	-6.2334	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1691.8610	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2801.5299	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	216.5670	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3807.6549	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1691.8610	0.2100	355.2908	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2801.5299	0.2100	588.3213	(264)
Space and water heating			943.6121	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	216.5670	0.1443	31.2573	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	0.1336	-69.3640	
PV Unit electricity exported	-469.0927	0.1253	-58.7938	
Total			-128.1578	(269)
Total CO2, kg/year			858.6409	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.7400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1691.8610	1.1300	1911.8029	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2801.5299	1.1300	3165.7288	(278)
Space and water heating			5077.5317	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	216.5670	1.5338	332.1777	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	1.4937	-775.5387	
PV Unit electricity exported	-469.0927	0.4600	-215.8009	
Total			-991.3396	(283)
Total Primary energy kWh/year			4548.4706	(286)
Target Primary Energy Rate (TPER)			56.8700	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	83 B	**DER**	3.12	**TER**	10.74
Environmental	97 A	**% DER < TER**			70.95
CO_2 Emissions (t/year)	0.24	**DFEE**	18.72	**TFEE**	25.56
Compliance Check	See BREL	**% DFEE < TFEE**			26.77
% DPER < TPER	41.81	**DPER**	33.09	**TPER**	56.87

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			15583.4798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.2856	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	612.2735	609.9558	591.8328	558.1588	524.7912	494.7014	477.0149	480.2399	497.5865	528.2765	565.2104	597.3217	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	19.6403	0.6800	0.7000	0.7700	49.2381	(80)

Solar gains	49.2381	96.3201	158.6255	231.3459	283.5231	290.2363	276.3168	237.3520	184.4881	114.2919	61.3941	40.4910	(83)
Total gains	661.5116	706.2759	750.4584	789.5046	808.3143	784.9377	753.3317	717.5919	682.0745	642.5685	626.6045	637.8127	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area													
	0.9631	0.9433	0.8948	0.7920	0.6344	0.4598	0.3307	0.3628	0.5649	0.8193	0.9368	0.9695	(86)
MIT	20.4438	20.5573	20.7299	20.8913	20.9744	20.9968	20.9996	20.9994	20.9897	20.8869	20.6390	20.3998	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house													
	0.9560	0.9329	0.8770	0.7621	0.5937	0.4128	0.2807	0.3104	0.5133	0.7859	0.9236	0.9634	(89)
MIT 2	19.6960	19.8356	20.0431	20.2266	20.3118	20.3313	20.3332	20.3330	20.3261	20.2258	19.9382	19.6415	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.9070	20.0392	20.2369	20.4142	20.4988	20.5191	20.5212	20.5211	20.5134	20.4124	20.1360	19.8555	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9070	20.0392	20.2369	20.4142	20.4988	20.5191	20.5212	20.5211	20.5134	20.4124	20.1360	19.8555	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9508	0.9278	0.8742	0.7659	0.6040	0.4259	0.2948	0.3252	0.5274	0.7901	0.9192	0.9583	(94)
Useful gains	628.9398	655.2678	656.0766	604.6618	488.2081	334.3402	222.1173	233.3647	359.7257	507.6884	575.9619	611.2458	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	884.4213	857.9142	778.4476	652.4891	498.6111	335.4240	222.2095	233.5335	363.4342	556.0496	738.7267	887.1689	(97)
Space heating kWh													
	190.0782	136.1784	91.0440	34.4357	7.7398	0.0000	0.0000	0.0000	0.0000	35.9808	117.1907	205.2868	(98a)
Space heating requirement - total per year (kWh/year)												817.9344	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	190.0782	136.1784	91.0440	34.4357	7.7398	0.0000	0.0000	0.0000	0.0000	35.9808	117.1907	205.2868	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												817.9344	
Space heating per m2											(98c) / (4) =	10.2267	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	190.0782	136.1784	91.0440	34.4357	7.7398	0.0000	0.0000	0.0000	0.0000	35.9808	117.1907	205.2868	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	285.1173	204.2676	136.5660	51.6535	11.6098	0.0000	0.0000	0.0000	0.0000	53.9712	175.7860	307.9302	
Space heating requirement													
	285.1173	204.2676	136.5660	51.6535	11.6098	0.0000	0.0000	0.0000	0.0000	53.9712	175.7860	307.9302	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1226.9016	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												12.2690	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)
Total electricity for the above, kWh/year												21.9935	(331)
Electricity for lighting (calculated in Appendix L)												206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5492.9459	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1226.9016	4.4400	54.4744	(340a)
Space heating total			54.4744	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	206.9234	16.4900	34.1217	(350)
Additional standing charges			92.0000	(351)
Total energy cost			363.4713	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0470 (357)
SAP value		83.0287
SAP rating (Section 12)		83 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1403.7411	0.1573	51.4792	(367)
Electrical energy for heat distribution (space & water)	12.2690	0.0000	7.6182	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			210.7697	(373)
Space and water heating			210.7697	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Total CO2, kg/year			243.6859	(383)
CO2 emissions per m2			3.0500	(384)
EI value			97.3873	(384a)
EI rating			97	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15583.4798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		194.8422 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.2856 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains													

	612.2735	609.9558	591.8328	558.1588	524.7912	494.7014	477.0149	480.2399	497.5865	528.2765	565.2104	597.3217 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	23.7835	0.6800	0.7000	0.7700	59.6251	(80)

Solar gains	59.6251	103.6406	167.9167	247.1276	291.2895	319.6931	298.7175	261.9205	205.9597	129.6904	73.2361	49.3147 (83)
Total gains	671.8987	713.5964	759.7496	805.2864	816.0807	814.3945	775.7324	742.1603	703.5461	657.9669	638.4465	646.6364 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9573	0.9363	0.8769	0.7638	0.5989	0.4026	0.2848	0.3129	0.5262	0.7824	0.9239	0.9648	(86)
MIT	20.4854	20.5913	20.7713	20.9138	20.9821	20.9986	20.9999	20.9998	20.9932	20.9169	20.6850	20.4404	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9492	0.9248	0.8566	0.7319	0.5571	0.3568	0.2362	0.2621	0.4751	0.7450	0.9084	0.9579	(89)
MIT 2	19.7475	19.8771	20.0915	20.2505	20.3188	20.3325	20.3333	20.3332	20.3288	20.2571	19.9934	19.6921	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.9557	20.0787	20.2834	20.4377	20.5060	20.5205	20.5214	20.5213	20.5163	20.4433	20.1886	19.9032	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9557	20.0787	20.2834	20.4377	20.5060	20.5205	20.5214	20.5213	20.5163	20.4433	20.1886	19.9032	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9439	0.9198	0.8550	0.7371	0.5680	0.3697	0.2499	0.2764	0.4893	0.7515	0.9046	0.9527	(94)
Useful gains	634.1980	656.3948	649.5837	593.5428	463.5728	301.0551	193.8520	205.1543	344.2286	494.4496	577.5599	616.0490	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	870.1828	843.1482	752.7460	631.1540	470.6858	301.5014	193.8831	205.2132	346.5988	529.4663	719.0389	872.8755	(97)
Space heating kWh	175.5727	125.4983	76.7527	27.0801	5.2920	0.0000	0.0000	0.0000	0.0000	26.0524	101.8648	191.0789	(98a)
Space heating requirement - total per year (kWh/year)												729.1921	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	175.5727	125.4983	76.7527	27.0801	5.2920	0.0000	0.0000	0.0000	0.0000	26.0524	101.8648	191.0789	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												729.1921	
Space heating per m2										(98c) / (4) =		9.1172	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	175.5727	125.4983	76.7527	27.0801	5.2920	0.0000	0.0000	0.0000	0.0000	26.0524	101.8648	191.0789	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	263.3590	188.2475	115.1291	40.6202	7.9380	0.0000	0.0000	0.0000	0.0000	39.0787	152.7973	286.6184	
Space heating requirement	263.3590	188.2475	115.1291	40.6202	7.9380	0.0000	0.0000	0.0000	0.0000	39.0787	152.7973	286.6184	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1093.7881	(307)

Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	10.9379	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5359.8325	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1093.7881	6.5500	71.6431	(340a)
Space heating total			71.6431	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	206.9234	28.4300	58.8283	(350)
Additional standing charges			104.0000	(351)
Total energy cost			505.1560	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1368.2441	0.1578	46.0331	(367)
Electrical energy for heat distribution (space & water)	10.9379	0.0000	7.4140	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			205.1194	(373)
Space and water heating			205.1194	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Total CO2, kg/year			238.0356	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1368.2441	1.5842	462.0861	(467)
Electrical energy for heat distribution (space & water)	10.9379	0.0000	78.7306	(472)
Overall CO2 factor for heat network			0.4245	(486)
Total CO2 associated with community systems			2178.2125	(473)
Space and water heating			2178.2125	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)
Total Primary energy kWh/year			2528.8703	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Be Clean

Current energy efficiency rating: B 83
Current environmental impact rating: A 97

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 83
Potential environmental impact rating: A 97

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

Current	Potential	Saving

Electricity	£65	£65	£0
Community scheme	£440	£440	£0
Space heating	£182	£182	£0
Water heating	£264	£264	£0
Lighting	£59	£59	£0
Total cost of fuels	£505	£505	£0
Total cost of uses	£505	£505	£0
Delivered energy	67 kWh/m²	67 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	3 kg/m²	3 kg/m²	0 kg/m²
Primary energy	32 kWh/m²	32 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15583.4798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.2856	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)

Heat transfer coeff

	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =											56.6683	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.4625	(42)
Hot water usage for mixer showers												
	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths												
	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses												
	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m													
	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						0.0000	(64a)
Heat gains from water heating, kWh/month													
	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains													
	612.2735	609.9558	591.8328	558.1588	524.7912	494.7014	477.0149	480.2399	497.5865	528.2765	565.2104	597.3217	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	19.6403	0.6800	0.7000	0.7700	49.2381	(80)

Solar gains	49.2381	96.3201	158.6255	231.3459	283.5231	290.2363	276.3168	237.3520	184.4881	114.2919	61.3941	40.4910	(83)
Total gains	661.5116	706.2759	750.4584	789.5046	808.3143	784.9377	753.3317	717.5919	682.0745	642.5685	626.6045	637.8127	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)											21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area													
	0.9631	0.9433	0.8948	0.7920	0.6344	0.4598	0.3307	0.3628	0.5649	0.8193	0.9368	0.9695	(86)
MIT	20.4438	20.5573	20.7299	20.8913	20.9744	20.9968	20.9996	20.9994	20.9897	20.8869	20.6390	20.3998	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house													

	0.9560	0.9329	0.8770	0.7621	0.5937	0.4128	0.2807	0.3104	0.5133	0.7859	0.9236	0.9634	(89)
MIT 2	19.6960	19.8356	20.0431	20.2266	20.3118	20.3313	20.3332	20.3330	20.3261	20.2258	19.9382	19.6415	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.9070	20.0392	20.2369	20.4142	20.4988	20.5191	20.5212	20.5211	20.5134	20.4124	20.1360	19.8555	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9070	20.0392	20.2369	20.4142	20.4988	20.5191	20.5212	20.5211	20.5134	20.4124	20.1360	19.8555	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9508	0.9278	0.8742	0.7659	0.6040	0.4259	0.2948	0.3252	0.5274	0.7901	0.9192	0.9583	(94)
Useful gains	628.9398	655.2678	656.0766	604.6618	488.2081	334.3402	222.1173	233.3647	359.7257	507.6884	575.9619	611.2458	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	884.4213	857.9142	778.4476	652.4891	498.6111	335.4240	222.2095	233.5335	363.4342	556.0496	738.7267	887.1689	(97)
Space heating kWh	190.0782	136.1784	91.0440	34.4357	7.7398	0.0000	0.0000	0.0000	0.0000	35.9808	117.1907	205.2868	(98a)
Space heating requirement - total per year (kWh/year)												817.9344	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	190.0782	136.1784	91.0440	34.4357	7.7398	0.0000	0.0000	0.0000	0.0000	35.9808	117.1907	205.2868	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												817.9344	
Space heating per m2											(98c) / (4) =	10.2267	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	190.0782	136.1784	91.0440	34.4357	7.7398	0.0000	0.0000	0.0000	0.0000	35.9808	117.1907	205.2868	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	285.1173	204.2676	136.5660	51.6535	11.6098	0.0000	0.0000	0.0000	0.0000	53.9712	175.7860	307.9302	
Space heating requirement													
	285.1173	204.2676	136.5660	51.6535	11.6098	0.0000	0.0000	0.0000	0.0000	53.9712	175.7860	307.9302	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1226.9016	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												12.2690	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)
Total electricity for the above, kWh/year												21.9935	(331)
Electricity for lighting (calculated in Appendix L)												206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5492.9459	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1226.9016	4.4400	54.4744	(340a)
Space heating total			54.4744	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)

Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	206.9234	16.4900	34.1217	(350)
Additional standing charges			92.0000	(351)
Total energy cost			363.4713	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0470	(357)
SAP value		83.0287	
SAP rating (Section 12)		83	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1403.7411	0.1573	51.4792	(367)
Electrical energy for heat distribution (space & water)	12.2690	0.0000	7.6182	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			210.7697	(373)
Space and water heating			210.7697	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Total CO2, kg/year			243.6859	(383)
CO2 emissions per m2			3.0500	(384)
EI value			97.3873	(384a)
EI rating			97	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	195.9510	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15583.4798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		194.8422 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.2856 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	612.2735	609.9558	591.8328	558.1588	524.7912	494.7014	477.0149	480.2399	497.5865	528.2765	565.2104	597.3217	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

				m2		Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c		factor Table 6d		W	
West				7.6000		23.7835	0.6800	0.7000		0.7700		59.6251	(80)
Solar gains	59.6251	103.6406	167.9167	247.1276	291.2895	319.6931	298.7175	261.9205	205.9597	129.6904	73.2361	49.3147	(83)
Total gains	671.8987	713.5964	759.7496	805.2864	816.0807	814.3945	775.7324	742.1603	703.5461	657.9669	638.4465	646.6364	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9573	0.9363	0.8769	0.7638	0.5989	0.4026	0.2848	0.3129	0.5262	0.7824	0.9239	0.9648	(86)
MIT	20.4854	20.5913	20.7713	20.9138	20.9821	20.9986	20.9999	20.9998	20.9932	20.9169	20.6850	20.4404	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9492	0.9248	0.8566	0.7319	0.5571	0.3568	0.2362	0.2621	0.4751	0.7450	0.9084	0.9579	(89)
MIT 2	19.7475	19.8771	20.0915	20.2505	20.3188	20.3325	20.3333	20.3332	20.3288	20.2571	19.9934	19.6921	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.9557	20.0787	20.2834	20.4377	20.5060	20.5205	20.5214	20.5213	20.5163	20.4433	20.1886	19.9032	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9557	20.0787	20.2834	20.4377	20.5060	20.5205	20.5214	20.5213	20.5163	20.4433	20.1886	19.9032	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9439	0.9198	0.8550	0.7371	0.5680	0.3697	0.2499	0.2764	0.4893	0.7515	0.9046	0.9527	(94)
Useful gains	634.1980	656.3948	649.5837	593.5428	463.5728	301.0551	193.8520	205.1543	344.2286	494.4496	577.5599	616.0490	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	870.1828	843.1482	752.7460	631.1540	470.6858	301.5014	193.8831	205.2132	346.5988	529.4663	719.0389	872.8755	(97)
Space heating kWh	175.5727	125.4983	76.7527	27.0801	5.2920	0.0000	0.0000	0.0000	0.0000	26.0524	101.8648	191.0789	(98a)
Space heating requirement - total per year (kWh/year)												729.1921	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	175.5727	125.4983	76.7527	27.0801	5.2920	0.0000	0.0000	0.0000	0.0000	26.0524	101.8648	191.0789	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												729.1921	
Space heating per m2										(98c) / (4) =		9.1172	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	175.5727	125.4983	76.7527	27.0801	5.2920	0.0000	0.0000	0.0000	0.0000	26.0524	101.8648	191.0789	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	263.3590	188.2475	115.1291	40.6202	7.9380	0.0000	0.0000	0.0000	0.0000	39.0787	152.7973	286.6184	
Space heating requirement	263.3590	188.2475	115.1291	40.6202	7.9380	0.0000	0.0000	0.0000	0.0000	39.0787	152.7973	286.6184	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1093.7881	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												10.9379	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)

Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5359.8325	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1093.7881	6.5500	71.6431	(340a)
Space heating total			71.6431	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	206.9234	28.4300	58.8283	(350)
Additional standing charges			104.0000	(351)
Total energy cost			505.1560	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1368.2441	0.1578	46.0331	(367)
Electrical energy for heat distribution (space & water)	10.9379	0.0000	7.4140	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			205.1194	(373)
Space and water heating			205.1194	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Total CO2, kg/year			238.0356	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1368.2441	1.5842	462.0861	(467)
Electrical energy for heat distribution (space & water)	10.9379	0.0000	78.7306	(472)
Overall CO2 factor for heat network			0.4245	(486)
Total CO2 associated with community systems			2178.2125	(473)
Space and water heating			2178.2125	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)
Total Primary energy kWh/year			2528.8703	(483)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.60	**TER**	10.74
Environmental	99 A	**% DER < TER**			85.10
CO_2 Emissions (t/year)	0.1	**DFEE**	18.72	**TFEE**	25.56
Compliance Check	See BREL	**% DFEE < TFEE**			26.77
% DPER < TPER	62.38	**DPER**	21.39	**TPER**	56.87

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				4	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			15583.4798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.2856	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.6117	146.8201	132.6117	137.0321	132.6117	137.0321	132.6117	132.6117	137.0321	132.6117	137.0321	132.6117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	565.9813	580.0257	555.3786	537.2808	511.1311	494.4637	476.3107	477.3819	491.4645	506.5784	536.2944	554.9833	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	19.6403	0.6800	0.7000	0.7700	49.2381	(80)
Solar gains	49.2381	96.3201	158.6255	231.3459	283.5231	290.2363	276.3168	237.3520	184.4881	114.2919	61.3941	40.4910	(83)
Total gains	615.2193	676.3458	714.0042	768.6267	794.6541	784.7000	752.6275	714.7339	675.9526	620.8703	597.6885	595.4743	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9734	0.9526	0.9117	0.8056	0.6439	0.4599	0.3310	0.3642	0.5696	0.8357	0.9477	0.9777	(86)
MIT	20.3749	20.5178	20.6929	20.8804	20.9723	20.9968	20.9996	20.9994	20.9892	20.8732	20.6021	20.3348	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9680	0.9435	0.8958	0.7764	0.6029	0.4129	0.2810	0.3117	0.5177	0.8035	0.9363	0.9731	(89)
MIT 2	19.6107	19.7876	20.0002	20.2152	20.3100	20.3313	20.3331	20.3330	20.3258	20.2117	19.8941	19.5607	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.8264	19.9937	20.1957	20.4029	20.4969	20.5191	20.5212	20.5211	20.5130	20.3984	20.0939	19.7791	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8264	19.9937	20.1957	20.4029	20.4969	20.5191	20.5212	20.5211	20.5130	20.3984	20.0939	19.7791	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9631	0.9383	0.8922	0.7796	0.6132	0.4261	0.2951	0.3265	0.5319	0.8068	0.9316	0.9685	(94)
Useful gains	592.5008	634.5932	637.0264	599.2031	487.2474	334.3382	222.1168	233.3604	359.5340	500.9488	556.8060	576.7276	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	879.8541	855.3333	776.1130	651.8520	498.5043	335.4237	222.2095	233.5330	363.4131	555.2558	736.3423	882.8423	(97)
Space heating kWh	213.7908	148.3374	103.4804	37.9072	8.3751	0.0000	0.0000	0.0000	0.0000	40.4044	129.2662	227.7493	(98a)
Space heating requirement - total per year (kWh/year)												909.3108	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	213.7908	148.3374	103.4804	37.9072	8.3751	0.0000	0.0000	0.0000	0.0000	40.4044	129.2662	227.7493	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												909.3108	
Space heating per m2										(98c) / (4) =		11.3692	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	213.7908	148.3374	103.4804	37.9072	8.3751	0.0000	0.0000	0.0000	0.0000	40.4044	129.2662	227.7493 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	320.6862	222.5061	155.2206	56.8608	12.5627	0.0000	0.0000	0.0000	0.0000	60.6066	193.8992	341.6240
Space heating requirement												
	320.6862	222.5061	155.2206	56.8608	12.5627	0.0000	0.0000	0.0000	0.0000	60.6066	193.8992	341.6240 (307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement												
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948
Water heating fuel												
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679 (331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year	
Space heating fuel - community heating	1363.9662 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4037.1274 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	13.6397 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)	
mechanical ventilation fans (SFP = 0.0920)	21.9935 (330a)
Total electricity for the above, kWh/year	21.9935 (331)
Electricity for lighting (calculated in Appendix L)	206.9234 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-958.2209 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4671.7896 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1440.2916	0.1573	57.2312	(367)
Electrical energy for heat distribution (space & water)	13.6397	0.0000	7.8339	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			216.7374	(373)
Space and water heating			216.7374	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			128.2557	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6000	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1440.2916	1.5825	575.5913	(467)
Electrical energy for heat distribution (space & water)	13.6397	0.0000	82.9870	(472)
Overall CO2 factor for heat network			0.4251	(486)
Total CO2 associated with community systems			2295.9741	(473)
Space and water heating			2295.9741	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	1.4873	-726.6034	
PV Unit electricity exported	-469.6869	0.4449	-208.9838	
Total			-935.5872	(480)
Total Primary energy kWh/year			1711.0447	(483)
Dwelling Primary energy Rate (DPER)			21.3900	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type			7.6000	1.1450	8.7023			(27)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.1800	5.4450			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
500mm mineral wool	39.9900		39.9900	0.1100	4.3989			(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7164			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.7300	0.0500	0.3365
E3 Sill	5.8800	0.0500	0.2940
E4 Jamb	10.3200	0.0500	0.5160
E6 Intermediate floor within a dwelling	14.1900	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	11.4900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
E7 Party floor between dwellings (in blocks of flats)	14.1900	0.0700	0.9933
P4 Party wall - Roof (insulation at ceiling level)	11.4900	0.1200	1.3788
E10 Eaves (insulation at ceiling level)	8.7100	0.0600	0.5226
E12 Gable (insulation at ceiling level)	5.4100	0.0600	0.3246

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.6278	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	32.3442	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	68.8609	68.6984	68.5391	67.7910	67.6510	66.9994	66.9994	66.8787	67.2504	67.6510	67.9342	68.2302	(39)
Average = Sum(39)m / 12 =												67.7903	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8610	0.8589	0.8570	0.8476	0.8458	0.8377	0.8377	0.8362	0.8408	0.8458	0.8494	0.8531	(40)
HLP (average)												0.8476	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
									Total per year (kWh/year) = Sum(64)m =			2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.1468	142.9840	129.1468	133.4517	129.1468	133.4517	129.1468	129.1468	133.4517	129.1468	133.4517	129.1468	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													

	556.1810	569.8542	545.5784	527.3650	501.3308	481.5479	463.5104	464.5816	478.5488	496.7781	526.3787	545.1830 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	19.6403	0.6300	0.7000	0.7700	45.6176	(80)

Solar gains	45.6176	89.2378	146.9619	214.3352	262.6758	268.8954	255.9994	219.8997	170.9228	105.8881	56.8798	37.5137 (83)
Total gains	601.7986	659.0920	692.5403	741.7002	764.0066	750.4433	719.5098	684.4813	649.4715	602.6662	583.2585	582.6967 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.8622	63.0109	63.1573	63.8543	63.9864	64.6087	64.6087	64.7253	64.3676	63.9864	63.7197	63.4432	
alpha	5.1908	5.2007	5.2105	5.2570	5.2658	5.3072	5.3072	5.3150	5.2912	5.2658	5.2480	5.2295	
util living area	0.9832	0.9715	0.9484	0.8793	0.7492	0.5585	0.4076	0.4459	0.6753	0.8978	0.9679	0.9855	(86)
MIT	20.0319	20.1920	20.4150	20.7076	20.9012	20.9831	20.9973	20.9958	20.9557	20.7172	20.3397	20.0063	(87)
Th 2	20.2008	20.2025	20.2042	20.2123	20.2138	20.2208	20.2208	20.2221	20.2181	20.2138	20.2107	20.2076	(88)
util rest of house	0.9793	0.9652	0.9368	0.8539	0.7034	0.4953	0.3365	0.3722	0.6115	0.8706	0.9597	0.9822	(89)
MIT 2	19.0758	19.2784	19.5572	19.9141	20.1276	20.2098	20.2197	20.2202	20.1862	19.9331	19.4724	19.0486	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.3456	19.5362	19.7993	20.1381	20.3459	20.4280	20.4391	20.4390	20.4033	20.1544	19.7172	19.3189	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3456	19.5362	19.7993	20.1381	20.3459	20.4280	20.4391	20.4390	20.4033	20.1544	19.7172	19.3189	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9741	0.9587	0.9299	0.8512	0.7115	0.5124	0.3565	0.3929	0.6272	0.8683	0.9534	0.9774	(94)
Useful gains	586.2231	631.8626	643.9713	631.3458	543.5623	384.5337	256.5134	268.9541	407.3704	523.2921	556.0918	569.5320	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1036.0557	1005.4847	911.5210	761.8383	584.9046	390.4746	257.2179	270.1253	423.9001	646.3623	857.1371	1031.5631	(97)
Space heating kWh	334.6754	251.0741	199.0570	93.9545	30.7587	0.0000	0.0000	0.0000	0.0000	91.5642	216.7526	343.7511	(98a)
Space heating requirement - total per year (kWh/year)												1561.5877	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	334.6754	251.0741	199.0570	93.9545	30.7587	0.0000	0.0000	0.0000	0.0000	91.5642	216.7526	343.7511	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1561.5877	
Space heating per m2											(98c) / (4) =	19.5247	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	334.6754	251.0741	199.0570	93.9545	30.7587	0.0000	0.0000	0.0000	0.0000	91.5642	216.7526	343.7511	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	362.5953	272.0196	215.6630	101.7926	33.3247	0.0000	0.0000	0.0000	0.0000	99.2028	234.8349	372.4281	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9161	84.5503	83.8921	82.5772	80.9771	79.8000	79.8000	79.8000	79.8000	82.5040	84.2059	84.9983	(217)
Fuel for water heating, kWh/month	268.8716	238.7352	255.7420	229.1037	226.8522	207.8751	205.6450	213.6686	215.8200	232.2159	241.2047	265.7959	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	26.8342	21.5274	19.3830	14.2008	10.9691	8.9619	10.0064	13.0067	16.8944	22.1664	25.0369	27.5800	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3597	-31.5987	-47.6203	-56.2064	-62.9289	-59.5773	-58.8595	-54.4329	-47.0022	-37.3178	-24.0087	-18.2981	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9169	-17.0101	-34.4870	-52.8069	-70.8246	-71.5366	-70.6859	-59.3742	-42.9070	-24.6402	-10.6698	-6.2334	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1691.8610	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2801.5299	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	216.5670	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3807.6549	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1691.8610	0.2100	355.2908	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2801.5299	0.2100	588.3213	(264)
Space and water heating			943.6121	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	216.5670	0.1443	31.2573	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	0.1336	-69.3640	
PV Unit electricity exported	-469.0927	0.1253	-58.7938	
Total			-128.1578	(269)
Total CO2, kg/year			858.6409	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.7400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1691.8610	1.1300	1911.8029	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2801.5299	1.1300	3165.7288	(278)
Space and water heating			5077.5317	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	216.5670	1.5338	332.1777	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	1.4937	-775.5387	
PV Unit electricity exported	-469.0927	0.4600	-215.8009	
Total			-991.3396	(283)
Total Primary energy kWh/year			4548.4706	(286)
Target Primary Energy Rate (TPER)			56.8700	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.60	**TER**	10.74
Environmental	99 A	**% DER < TER**			85.10
CO_2 Emissions (t/year)	0.1	**DFEE**	18.72	**TFEE**	25.56
Compliance Check	See BREL	**% DFEE < TFEE**			26.77
% DPER < TPER	62.38	**DPER**	21.39	**TPER**	56.87

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2122	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2705	0.2652	0.2599	0.2334	0.2281	0.2016	0.2016	0.1963	0.2122	0.2281	0.2387	0.2493	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5366	0.5352	0.5338	0.5272	0.5260	0.5203	0.5203	0.5193	0.5225	0.5260	0.5285	0.5311	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15583.4798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.2856	(36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.6979	34.6061	34.5160	34.0930	34.0139	33.6455	33.6455	33.5772	33.7874	34.0139	34.1740	34.3414	(38)
Heat transfer coeff	59.0343	58.9424	58.8524	58.4294	58.3502	57.9818	57.9818	57.9136	58.1237	58.3502	58.5103	58.6777	(39)
Average = Sum(39)m / 12 =												58.4290	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7381	0.7370	0.7358	0.7305	0.7296	0.7250	0.7250	0.7241	0.7267	0.7296	0.7316	0.7337	(40)
HLP (average)												0.7305	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.6117	146.8201	132.6117	137.0321	132.6117	137.0321	132.6117	132.6117	137.0321	132.6117	137.0321	132.6117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains	460.3995	475.6643	453.8350	442.5318	420.3791	407.9331	392.6658	391.8132	403.5720	413.9765	437.2071	450.3260	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	19.6403	0.6800	0.7000	0.7700	49.2381	(80)

Solar gains	49.2381	96.3201	158.6255	231.3459	283.5231	290.2363	276.3168	237.3520	184.4881	114.2919	61.3941	40.4910	(83)
Total gains	509.6376	571.9844	612.4605	673.8777	703.9021	698.1694	668.9826	629.1652	588.0600	528.2684	498.6012	490.8170	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.3259	73.4402	73.5526	74.0851	74.1855	74.6569	74.6569	74.7449	74.4746	74.1855	73.9825	73.7715	
alpha	5.8884	5.8960	5.9035	5.9390	5.9457	5.9771	5.9771	5.9830	5.9650	5.9457	5.9322	5.9181	
util living area	0.9900	0.9793	0.9557	0.8756	0.7259	0.5257	0.3806	0.4220	0.6582	0.9082	0.9780	0.9918	(86)
MIT	20.1404	20.3055	20.5211	20.7908	20.9433	20.9928	20.9991	20.9984	20.9750	20.7726	20.4176	20.1080	(87)

Th 2	20.3073	20.3083	20.3093	20.3139	20.3148	20.3188	20.3188	20.3196	20.3173	20.3148	20.3130	20.3112	(88)
util rest of house	0.9877	0.9747	0.9460	0.8514	0.6836	0.4720	0.3221	0.3603	0.6011	0.8844	0.9724	0.9900	(89)
MIT 2	19.5187	19.6819	19.8924	20.1472	20.2764	20.3152	20.3185	20.3190	20.3031	20.1364	19.7974	19.4898	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.6941	19.8579	20.0698	20.3288	20.4646	20.5064	20.5106	20.5107	20.4927	20.3160	19.9724	19.6643	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6941	19.8579	20.0698	20.3288	20.4646	20.5064	20.5106	20.5107	20.4927	20.3160	19.9724	19.6643	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9852	0.9711	0.9421	0.8520	0.6932	0.4870	0.3386	0.3777	0.6162	0.8844	0.9690	0.9877	(94)
Useful gains	502.0704	555.4803	576.9841	574.1225	487.9318	339.9763	226.5104	237.6249	362.3464	467.2173	483.1270	484.7967	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	908.7822	881.6531	798.6135	667.7803	511.4149	342.4638	226.7434	238.0670	371.5693	566.9289	753.1698	907.4073	(97)
Space heating kWh	302.5936	219.1881	164.8922	67.4336	17.4714	0.0000	0.0000	0.0000	0.0000	74.1854	194.4308	314.4223	(98a)
Space heating requirement - total per year (kWh/year)												1354.6174	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	302.5936	219.1881	164.8922	67.4336	17.4714	0.0000	0.0000	0.0000	0.0000	74.1854	194.4308	314.4223	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1354.6174	
Space heating per m2											(98c) / (4) =	16.9370	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	545.0293	429.0656	440.1434	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9543	0.9809	0.9715	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	520.1083	420.8815	427.5884	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	748.9021	717.9521	674.1942	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	164.7315	221.0206	183.4747	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	41.1829	55.2551	45.8687	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												142.3067	(107)
Energy for space heating												16.9370	(99)
Energy for space cooling												1.7793	(108)
Total												18.7162	(109)
Fabric Energy Efficiency (DFEE)												18.7	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type			7.6000	1.1450	8.7023			(27)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.1800	5.4450			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
500mm mineral wool	39.9900		39.9900	0.1100	4.3989			(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7164			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 194.8422 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.7300	0.0500	0.3365
E3 Sill	5.8800	0.0500	0.2940
E4 Jamb	10.3200	0.0500	0.5160
E6 Intermediate floor within a dwelling	14.1900	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	11.4900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
E7 Party floor between dwellings (in blocks of flats)	14.1900	0.0700	0.9933
P4 Party wall - Roof (insulation at ceiling level)	11.4900	0.1200	1.3788
E10 Eaves (insulation at ceiling level)	8.7100	0.0600	0.5226
E12 Gable (insulation at ceiling level)	5.4100	0.0600	0.3246

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.6278 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.3442 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	68.8609	68.6984	68.5391	67.7910	67.6510	66.9994	66.9994	66.8787	67.2504	67.6510	67.9342	68.2302	(39)
Average = Sum(39)m / 12 =												67.7903	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8610	0.8589	0.8570	0.8476	0.8458	0.8377	0.8377	0.8362	0.8408	0.8458	0.8494	0.8531	(40)
HLP (average)												0.8476	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	129.1468	142.9840	129.1468	133.4517	129.1468	133.4517	129.1468	129.1468	133.4517	129.1468	133.4517	129.1468	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains													
	456.9346	471.8282	450.3701	438.9514	416.9142	404.3527	389.2009	388.3482	399.9916	410.5116	433.6267	446.8611	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	19.6403	0.6300	0.7000	0.7700	45.6176	(80)

Solar gains	45.6176	89.2378	146.9619	214.3352	262.6758	268.8954	255.9994	219.8997	170.9228	105.8881	56.8798	37.5137	(83)
Total gains	502.5522	561.0659	597.3320	653.2866	679.5899	673.2481	645.2002	608.2479	570.9143	516.3997	490.5065	484.3748	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.8622	63.0109	63.1573	63.8543	63.9864	64.6087	64.6087	64.7253	64.3676	63.9864	63.7197	63.4432	
alpha	5.1908	5.2007	5.2105	5.2570	5.2658	5.3072	5.3072	5.3150	5.2912	5.2658	5.2480	5.2295	
util living area													
	0.9923	0.9853	0.9706	0.9190	0.8063	0.6145	0.4530	0.4990	0.7430	0.9390	0.9843	0.9936	(86)
MIT	19.8706	20.0403	20.2814	20.6174	20.8587	20.9737	20.9956	20.9928	20.9306	20.6195	20.1976	19.8447	(87)
Th 2	20.2008	20.2025	20.2042	20.2123	20.2138	20.2208	20.2208	20.2221	20.2181	20.2138	20.2107	20.2076	(88)
util rest of house													
	0.9904	0.9818	0.9634	0.8993	0.7637	0.5478	0.3747	0.4178	0.6799	0.9200	0.9799	0.9920	(89)
MIT 2	19.1652	19.3344	19.5728	19.9002	20.1147	20.2072	20.2193	20.2195	20.1775	19.9087	19.4978	19.1449	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.3643	19.5336	19.7727	20.1026	20.3246	20.4235	20.4384	20.4377	20.3901	20.1093	19.6953	19.3424	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3643	19.5336	19.7727	20.1026	20.3246	20.4235	20.4384	20.4377	20.3901	20.1093	19.6953	19.3424	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9879	0.9781	0.9586	0.8962	0.7702	0.5656	0.3968	0.4406	0.6946	0.9170	0.9763	0.9898	(94)
Useful gains	496.4624	548.7942	572.6030	585.4698	523.3918	380.8002	255.9920	268.0202	396.5753	473.5615	478.8580	479.4335	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1037.3405	1005.3059	909.7014	759.4376	583.4652	390.1699	257.1685	270.0373	423.0082	643.3135	855.6488	1033.1682	(97)
Space heating kWh													
	402.4133	306.7759	250.8012	125.2568	44.6946	0.0000	0.0000	0.0000	0.0000	126.2955	271.2894	411.9786	(98a)
Space heating requirement - total per year (kWh/year)												1939.5053	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	402.4133	306.7759	250.8012	125.2568	44.6946	0.0000	0.0000	0.0000	0.0000	126.2955	271.2894	411.9786	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1939.5053	
Space heating per m2											(98c) / (4) =	24.2499	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	629.7941	495.7954	508.2782	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8937	0.9455	0.9265	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	562.8363	468.7781	470.9138	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	723.6551	693.8769	653.3695	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	115.7895	167.4735	135.7471	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	28.9474	41.8684	33.9368	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												104.7525	(107)
Energy for space heating												24.2499	(99)
Energy for space cooling												1.3097	(108)
Total												25.5596	(109)
Fabric Energy Efficiency (TFEE)												25.6	(109)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.60	**TER**	10.74
Environmental	99 A	**% DER < TER**			85.10
CO_2 Emissions (t/year)	0.1	**DFEE**	18.72	**TFEE**	25.56
Compliance Check	See BREL	**% DFEE < TFEE**			26.77
% DPER < TPER	62.38	**DPER**	21.39	**TPER**	56.87

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				4	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			15583.4798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.2856	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.6117	146.8201	132.6117	137.0321	132.6117	137.0321	132.6117	132.6117	137.0321	132.6117	137.0321	132.6117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	565.9813	580.0257	555.3786	537.2808	511.1311	494.4637	476.3107	477.3819	491.4645	506.5784	536.2944	554.9833	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	19.6403	0.6800	0.7000	0.7700	49.2381	(80)
Solar gains	49.2381	96.3201	158.6255	231.3459	283.5231	290.2363	276.3168	237.3520	184.4881	114.2919	61.3941	40.4910	(83)
Total gains	615.2193	676.3458	714.0042	768.6267	794.6541	784.7000	752.6275	714.7339	675.9526	620.8703	597.6885	595.4743	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9734	0.9526	0.9117	0.8056	0.6439	0.4599	0.3310	0.3642	0.5696	0.8357	0.9477	0.9777	(86)
MIT	20.3749	20.5178	20.6929	20.8804	20.9723	20.9968	20.9996	20.9994	20.9892	20.8732	20.6021	20.3348	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9680	0.9435	0.8958	0.7764	0.6029	0.4129	0.2810	0.3117	0.5177	0.8035	0.9363	0.9731	(89)
MIT 2	19.6107	19.7876	20.0002	20.2152	20.3100	20.3313	20.3331	20.3330	20.3258	20.2117	19.8941	19.5607	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.8264	19.9937	20.1957	20.4029	20.4969	20.5191	20.5212	20.5211	20.5130	20.3984	20.0939	19.7791	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8264	19.9937	20.1957	20.4029	20.4969	20.5191	20.5212	20.5211	20.5130	20.3984	20.0939	19.7791	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9631	0.9383	0.8922	0.7796	0.6132	0.4261	0.2951	0.3265	0.5319	0.8068	0.9316	0.9685	(94)
Useful gains	592.5008	634.5932	637.0264	599.2031	487.2474	334.3382	222.1168	233.3604	359.5340	500.9488	556.8060	576.7276	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	879.8541	855.3333	776.1130	651.8520	498.5043	335.4237	222.2095	233.5330	363.4131	555.2558	736.3423	882.8423	(97)
Space heating kWh	213.7908	148.3374	103.4804	37.9072	8.3751	0.0000	0.0000	0.0000	0.0000	40.4044	129.2662	227.7493	(98a)
Space heating requirement - total per year (kWh/year)												909.3108	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	213.7908	148.3374	103.4804	37.9072	8.3751	0.0000	0.0000	0.0000	0.0000	40.4044	129.2662	227.7493	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												909.3108	
Space heating per m2										(98c) / (4) =		11.3692	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	213.7908	148.3374	103.4804	37.9072	8.3751	0.0000	0.0000	0.0000	0.0000	40.4044	129.2662	227.7493 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	320.6862	222.5061	155.2206	56.8608	12.5627	0.0000	0.0000	0.0000	0.0000	60.6066	193.8992	341.6240
Space heating requirement												
	320.6862	222.5061	155.2206	56.8608	12.5627	0.0000	0.0000	0.0000	0.0000	60.6066	193.8992	341.6240 (307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement												
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948
Water heating fuel												
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679 (331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year	
Space heating fuel - community heating	1363.9662 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4037.1274 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	13.6397 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)	
mechanical ventilation fans (SFP = 0.0920)	21.9935 (330a)
Total electricity for the above, kWh/year	21.9935 (331)
Electricity for lighting (calculated in Appendix L)	206.9234 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-958.2209 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4671.7896 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1440.2916	0.1573	57.2312	(367)
Electrical energy for heat distribution (space & water)	13.6397	0.0000	7.8339	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			216.7374	(373)
Space and water heating			216.7374	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			128.2557	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6000	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1440.2916	1.5825	575.5913	(467)
Electrical energy for heat distribution (space & water)	13.6397	0.0000	82.9870	(472)
Overall CO2 factor for heat network			0.4251	(486)
Total CO2 associated with community systems			2295.9741	(473)
Space and water heating			2295.9741	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	1.4873	-726.6034	
PV Unit electricity exported	-469.6869	0.4449	-208.9838	
Total			-935.5872	(480)
Total Primary energy kWh/year			1711.0447	(483)
Dwelling Primary energy Rate (DPER)			21.3900	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type			7.6000	1.1450	8.7023			(27)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.1800	5.4450			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
500mm mineral wool	39.9900		39.9900	0.1100	4.3989			(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7164			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.7300	0.0500	0.3365
E3 Sill	5.8800	0.0500	0.2940
E4 Jamb	10.3200	0.0500	0.5160
E6 Intermediate floor within a dwelling	14.1900	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	11.4900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
E7 Party floor between dwellings (in blocks of flats)	14.1900	0.0700	0.9933
P4 Party wall - Roof (insulation at ceiling level)	11.4900	0.1200	1.3788
E10 Eaves (insulation at ceiling level)	8.7100	0.0600	0.5226
E12 Gable (insulation at ceiling level)	5.4100	0.0600	0.3246

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.6278	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	32.3442	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	68.8609	68.6984	68.5391	67.7910	67.6510	66.9994	66.9994	66.8787	67.2504	67.6510	67.9342	68.2302	(39)
Average = Sum(39)m / 12 =												67.7903	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8610	0.8589	0.8570	0.8476	0.8458	0.8377	0.8377	0.8362	0.8408	0.8458	0.8494	0.8531	(40)
HLP (average)												0.8476	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
									Total per year (kWh/year) = Sum(64)m =			2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.1468	142.9840	129.1468	133.4517	129.1468	133.4517	129.1468	129.1468	133.4517	129.1468	133.4517	129.1468	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													

	556.1810	569.8542	545.5784	527.3650	501.3308	481.5479	463.5104	464.5816	478.5488	496.7781	526.3787	545.1830 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	19.6403	0.6300	0.7000	0.7700	45.6176	(80)

Solar gains	45.6176	89.2378	146.9619	214.3352	262.6758	268.8954	255.9994	219.8997	170.9228	105.8881	56.8798	37.5137 (83)
Total gains	601.7986	659.0920	692.5403	741.7002	764.0066	750.4433	719.5098	684.4813	649.4715	602.6662	583.2585	582.6967 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.8622	63.0109	63.1573	63.8543	63.9864	64.6087	64.6087	64.7253	64.3676	63.9864	63.7197	63.4432	
alpha	5.1908	5.2007	5.2105	5.2570	5.2658	5.3072	5.3072	5.3150	5.2912	5.2658	5.2480	5.2295	
util living area	0.9832	0.9715	0.9484	0.8793	0.7492	0.5585	0.4076	0.4459	0.6753	0.8978	0.9679	0.9855	(86)
MIT	20.0319	20.1920	20.4150	20.7076	20.9012	20.9831	20.9973	20.9958	20.9557	20.7172	20.3397	20.0063	(87)
Th 2	20.2008	20.2025	20.2042	20.2123	20.2138	20.2208	20.2208	20.2221	20.2181	20.2138	20.2107	20.2076	(88)
util rest of house	0.9793	0.9652	0.9368	0.8539	0.7034	0.4953	0.3365	0.3722	0.6115	0.8706	0.9597	0.9822	(89)
MIT 2	19.0758	19.2784	19.5572	19.9141	20.1276	20.2098	20.2197	20.2202	20.1862	19.9331	19.4724	19.0486	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.3456	19.5362	19.7993	20.1381	20.3459	20.4280	20.4391	20.4390	20.4033	20.1544	19.7172	19.3189	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3456	19.5362	19.7993	20.1381	20.3459	20.4280	20.4391	20.4390	20.4033	20.1544	19.7172	19.3189	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9741	0.9587	0.9299	0.8512	0.7115	0.5124	0.3565	0.3929	0.6272	0.8683	0.9534	0.9774	(94)
Useful gains	586.2231	631.8626	643.9713	631.3458	543.5623	384.5337	256.5134	268.9541	407.3704	523.2921	556.0918	569.5320	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1036.0557	1005.4847	911.5210	761.8383	584.9046	390.4746	257.2179	270.1253	423.9001	646.3623	857.1371	1031.5631	(97)
Space heating kWh	334.6754	251.0741	199.0570	93.9545	30.7587	0.0000	0.0000	0.0000	0.0000	91.5642	216.7526	343.7511	(98a)
Space heating requirement - total per year (kWh/year)												1561.5877	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	334.6754	251.0741	199.0570	93.9545	30.7587	0.0000	0.0000	0.0000	0.0000	91.5642	216.7526	343.7511	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1561.5877	
Space heating per m2											(98c) / (4) =	19.5247	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	334.6754	251.0741	199.0570	93.9545	30.7587	0.0000	0.0000	0.0000	0.0000	91.5642	216.7526	343.7511	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	362.5953	272.0196	215.6630	101.7926	33.3247	0.0000	0.0000	0.0000	0.0000	99.2028	234.8349	372.4281	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9161	84.5503	83.8921	82.5772	80.9771	79.8000	79.8000	79.8000	79.8000	82.5040	84.2059	84.9983	(217)
Fuel for water heating, kWh/month	268.8716	238.7352	255.7420	229.1037	226.8522	207.8751	205.6450	213.6686	215.8200	232.2159	241.2047	265.7959	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	26.8342	21.5274	19.3830	14.2008	10.9691	8.9619	10.0064	13.0067	16.8944	22.1664	25.0369	27.5800	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3597	-31.5987	-47.6203	-56.2064	-62.9289	-59.5773	-58.8595	-54.4329	-47.0022	-37.3178	-24.0087	-18.2981	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9169	-17.0101	-34.4870	-52.8069	-70.8246	-71.5366	-70.6859	-59.3742	-42.9070	-24.6402	-10.6698	-6.2334	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1691.8610	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2801.5299	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	216.5670	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3807.6549	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1691.8610	0.2100	355.2908	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2801.5299	0.2100	588.3213	(264)
Space and water heating			943.6121	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	216.5670	0.1443	31.2573	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	0.1336	-69.3640	
PV Unit electricity exported	-469.0927	0.1253	-58.7938	
Total			-128.1578	(269)
Total CO2, kg/year			858.6409	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.7400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1691.8610	1.1300	1911.8029	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2801.5299	1.1300	3165.7288	(278)
Space and water heating			5077.5317	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	216.5670	1.5338	332.1777	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	1.4937	-775.5387	
PV Unit electricity exported	-469.0927	0.4600	-215.8009	
Total			-991.3396	(283)
Total Primary energy kWh/year			4548.4706	(286)
Target Primary Energy Rate (TPER)			56.8700	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.60	**TER**	10.74
Environmental	99 A	**% DER < TER**			85.10
CO_2 Emissions (t/year)	0.1	**DFEE**	18.72	**TFEE**	25.56
Compliance Check	See BREL	**% DFEE < TFEE**			26.77
% DPER < TPER	62.38	**DPER**	21.39	**TPER**	56.87

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			15583.4798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.2856	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	612.2735	609.9558	591.8328	558.1588	524.7912	494.7014	477.0149	480.2399	497.5865	528.2765	565.2104	597.3217	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	19.6403	0.6800	0.7000	0.7700	49.2381	(80)

Solar gains	49.2381	96.3201	158.6255	231.3459	283.5231	290.2363	276.3168	237.3520	184.4881	114.2919	61.3941	40.4910	(83)
Total gains	661.5116	706.2759	750.4584	789.5046	808.3143	784.9377	753.3317	717.5919	682.0745	642.5685	626.6045	637.8127	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area													
	0.9631	0.9433	0.8948	0.7920	0.6344	0.4598	0.3307	0.3628	0.5649	0.8193	0.9368	0.9695	(86)
MIT	20.4438	20.5573	20.7299	20.8913	20.9744	20.9968	20.9996	20.9994	20.9897	20.8869	20.6390	20.3998	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house													
	0.9560	0.9329	0.8770	0.7621	0.5937	0.4128	0.2807	0.3104	0.5133	0.7859	0.9236	0.9634	(89)
MIT 2	19.6960	19.8356	20.0431	20.2266	20.3118	20.3313	20.3332	20.3330	20.3261	20.2258	19.9382	19.6415	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.9070	20.0392	20.2369	20.4142	20.4988	20.5191	20.5212	20.5211	20.5134	20.4124	20.1360	19.8555	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9070	20.0392	20.2369	20.4142	20.4988	20.5191	20.5212	20.5211	20.5134	20.4124	20.1360	19.8555	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9508	0.9278	0.8742	0.7659	0.6040	0.4259	0.2948	0.3252	0.5274	0.7901	0.9192	0.9583	(94)
Useful gains	628.9398	655.2678	656.0766	604.6618	488.2081	334.3402	222.1173	233.3647	359.7257	507.6884	575.9619	611.2458	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	884.4213	857.9142	778.4476	652.4891	498.6111	335.4240	222.2095	233.5335	363.4342	556.0496	738.7267	887.1689	(97)
Space heating kWh													
	190.0782	136.1784	91.0440	34.4357	7.7398	0.0000	0.0000	0.0000	0.0000	35.9808	117.1907	205.2868	(98a)
Space heating requirement - total per year (kWh/year)												817.9344	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	190.0782	136.1784	91.0440	34.4357	7.7398	0.0000	0.0000	0.0000	0.0000	35.9808	117.1907	205.2868	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												817.9344	
Space heating per m2											(98c) / (4) =	10.2267	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	190.0782	136.1784	91.0440	34.4357	7.7398	0.0000	0.0000	0.0000	0.0000	35.9808	117.1907	205.2868	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	285.1173	204.2676	136.5660	51.6535	11.6098	0.0000	0.0000	0.0000	0.0000	53.9712	175.7860	307.9302	
Space heating requirement													
	285.1173	204.2676	136.5660	51.6535	11.6098	0.0000	0.0000	0.0000	0.0000	53.9712	175.7860	307.9302	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1226.9016	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												12.2690	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)
Total electricity for the above, kWh/year												21.9935	(331)
Electricity for lighting (calculated in Appendix L)												206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4534.7250	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1226.9016	4.4400	54.4744	(340a)
Space heating total			54.4744	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	206.9234	16.4900	34.1217	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	16.4900	-80.5593	
PV Unit electricity exported	-469.6869	5.5900	-26.2555	
Total			-106.8148	(352)
Total energy cost			256.6565	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7393 (357)
SAP value		88.0161
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1403.7411	0.1573	51.4792	(367)
Electrical energy for heat distribution (space & water)	12.2690	0.0000	7.6182	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			210.7697	(373)
Space and water heating			210.7697	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			122.2880	(383)
CO2 emissions per m2			1.5300	(384)
EI value			98.6889	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 79.9800						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate													
	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15583.4798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.2856	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539	(43)

Daily hot water use

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte 211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
								Total per year (kWh/year) = Sum(64)m =			2691.4183	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)

Heat gains from water heating, kWh/month

114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
327.4608 330.8588 322.2959 304.0665 281.0552 259.4278 244.9794 241.5813 250.1442 268.3736 291.3850 313.0124 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 (71)
Water heating gains (Table 5)
154.0336 151.5930 146.8914 136.5869 130.2751 123.6777 119.6256 122.9734 126.8986 134.2191 144.0972 152.7161 (72)
Total internal gains
612.2735 609.9558 591.8328 558.1588 524.7912 494.7014 477.0149 480.2399 497.5865 528.2765 565.2104 597.3217 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	23.7835	0.6800	0.7000	0.7700	59.6251	(80)

Solar gains 59.6251 103.6406 167.9167 247.1276 291.2895 319.6931 298.7175 261.9205 205.9597 129.6904 73.2361 49.3147 (83)
Total gains 671.8987 713.5964 759.7496 805.2864 816.0807 814.3945 775.7324 742.1603 703.5461 657.9669 638.4465 646.6364 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9573	0.9363	0.8769	0.7638	0.5989	0.4026	0.2848	0.3129	0.5262	0.7824	0.9239	0.9648	(86)
MIT	20.4854	20.5913	20.7713	20.9138	20.9821	20.9986	20.9999	20.9998	20.9932	20.9169	20.6850	20.4404	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9492	0.9248	0.8566	0.7319	0.5571	0.3568	0.2362	0.2621	0.4751	0.7450	0.9084	0.9579	(89)
MIT 2	19.7475	19.8771	20.0915	20.2505	20.3188	20.3325	20.3333	20.3332	20.3288	20.2571	19.9934	19.6921	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.9557	20.0787	20.2834	20.4377	20.5060	20.5205	20.5214	20.5213	20.5163	20.4433	20.1886	19.9032	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9557	20.0787	20.2834	20.4377	20.5060	20.5205	20.5214	20.5213	20.5163	20.4433	20.1886	19.9032	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9439	0.9198	0.8550	0.7371	0.5680	0.3697	0.2499	0.2764	0.4893	0.7515	0.9046	0.9527	(94)
Useful gains	634.1980	656.3948	649.5837	593.5428	463.5728	301.0551	193.8520	205.1543	344.2286	494.4496	577.5599	616.0490	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	870.1828	843.1482	752.7460	631.1540	470.6858	301.5014	193.8831	205.2132	346.5988	529.4663	719.0389	872.8755	(97)
Space heating kWh	175.5727	125.4983	76.7527	27.0801	5.2920	0.0000	0.0000	0.0000	0.0000	26.0524	101.8648	191.0789	(98a)
Space heating requirement - total per year (kWh/year)												729.1921	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	175.5727	125.4983	76.7527	27.0801	5.2920	0.0000	0.0000	0.0000	0.0000	26.0524	101.8648	191.0789	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												729.1921	
Space heating per m2										(98c) / (4) =		9.1172	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement
175.5727 125.4983 76.7527 27.0801 5.2920 0.0000 0.0000 0.0000 0.0000 26.0524 101.8648 191.0789 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50
307a 263.3590 188.2475 115.1291 40.6202 7.9380 0.0000 0.0000 0.0000 0.0000 39.0787 152.7973 286.6184
Space heating requirement
263.3590 188.2475 115.1291 40.6202 7.9380 0.0000 0.0000 0.0000 0.0000 39.0787 152.7973 286.6184 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)

Water heating
Annual water heating requirement
266.9446 236.1786 250.9634 220.5542 213.7828 192.6005 189.9534 197.4446 199.5749 222.6078 236.8171 263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50
310a 400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948
Water heating fuel
400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948 (310)
Cooling System Energy Efficiency Ratio 0.0000 (314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (315)
Pumps and Fa 1.8679 1.6872 1.8679 1.8077 1.8679 1.8077 1.8679 1.8679 1.8077 1.8679 1.8077 1.8679 (331)
Lighting 25.6392 20.5688 18.5199 13.5685 10.4807 8.5628 9.5608 12.4275 16.1421 21.1793 23.9220 26.3518 (332)
Electricity generated by PVs (Appendix M) (negative quantity)
(333a)m -17.9904 -26.9468 -45.2798 -58.5762 -66.5604 -66.2871 -64.3781 -58.6940 -48.0761 -34.8334 -20.6614 -14.9764 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(334a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (334a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)

Electricity generated by PVs (Appendix M) (negative quantity)

(333b)m	-6.0081	-13.0184	-31.9653	-58.9969	-82.6801	-94.8316	-90.1120	-72.5476	-46.2727	-22.1629	-8.3690	-4.5223	(333b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1093.7881	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	10.9379	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4305.0855	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1093.7881	6.5500	71.6431	(340a)
Space heating total			71.6431	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	206.9234	28.4300	58.8283	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	28.4300	-148.7628	
PV Unit electricity exported	-531.4870	5.8100	-30.8794	
Total			-179.6422	(352)
Total energy cost			325.5138	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1368.2441	0.1578	46.0331	(367)
Electrical energy for heat distribution (space & water)	10.9379	0.0000	7.4140	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			205.1194	(373)
Space and water heating			205.1194	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	0.1322	-69.1719	
PV Unit electricity exported	-531.4870	0.1213	-64.4804	
Total			-133.6523	(380)
Total CO2, kg/year			104.3833	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1368.2441	1.5842	462.0861	(467)
Electrical energy for heat distribution (space & water)	10.9379	0.0000	78.7306	(472)
Overall CO2 factor for heat network			0.4245	(486)
Total CO2 associated with community systems			2178.2125	(473)
Space and water heating			2178.2125	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	1.4884	-778.8342	
PV Unit electricity exported	-531.4870	0.4450	-236.5330	
Total			-1015.3671	(480)
Total Primary energy kWh/year			1513.5032	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Be Green

Current energy efficiency rating:	B 88
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£65	£65	£0
Community scheme	£440	£440	£0
Space heating	£182	£182	£0
Water heating	£264	£264	£0
Lighting	£59	£59	£0
Generated (PV)	-£180	-£180	£0
Total cost of fuels	£325	£325	£0
Total cost of uses	£325	£325	£0
Delivered energy	54 kWh/m²	54 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	19 kWh/m²	19 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15583.4798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		194.8422 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.2856 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4625 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
									Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)

Water heating gains (Table 5)

154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)

Total internal gains

612.2735	609.9558	591.8328	558.1588	524.7912	494.7014	477.0149	480.2399	497.5865	528.2765	565.2104	597.3217	(73)

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6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d				Gains W	
West				7.6000	19.6403	0.6800	0.7000	0.7700				49.2381	(80)
Solar gains	49.2381	96.3201	158.6255	231.3459	283.5231	290.2363	276.3168	237.3520	184.4881	114.2919	61.3941	40.4910	(83)
Total gains	661.5116	706.2759	750.4584	789.5046	808.3143	784.9377	753.3317	717.5919	682.0745	642.5685	626.6045	637.8127	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9631	0.9433	0.8948	0.7920	0.6344	0.4598	0.3307	0.3628	0.5649	0.8193	0.9368	0.9695	(86)
MIT	20.4438	20.5573	20.7299	20.8913	20.9744	20.9968	20.9996	20.9994	20.9897	20.8869	20.6390	20.3998	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9560	0.9329	0.8770	0.7621	0.5937	0.4128	0.2807	0.3104	0.5133	0.7859	0.9236	0.9634	(89)
MIT 2	19.6960	19.8356	20.0431	20.2266	20.3118	20.3313	20.3332	20.3330	20.3261	20.2258	19.9382	19.6415	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.9070	20.0392	20.2369	20.4142	20.4988	20.5191	20.5212	20.5211	20.5134	20.4124	20.1360	19.8555	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9070	20.0392	20.2369	20.4142	20.4988	20.5191	20.5212	20.5211	20.5134	20.4124	20.1360	19.8555	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9508	0.9278	0.8742	0.7659	0.6040	0.4259	0.2948	0.3252	0.5274	0.7901	0.9192	0.9583	(94)
Useful gains	628.9398	655.2678	656.0766	604.6618	488.2081	334.3402	222.1173	233.3647	359.7257	507.6884	575.9619	611.2458	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	884.4213	857.9142	778.4476	652.4891	498.6111	335.4240	222.2095	233.5335	363.4342	556.0496	738.7267	887.1689	(97)
Space heating kWh	190.0782	136.1784	91.0440	34.4357	7.7398	0.0000	0.0000	0.0000	0.0000	35.9808	117.1907	205.2868	(98a)
Space heating requirement - total per year (kWh/year)												817.9344	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	190.0782	136.1784	91.0440	34.4357	7.7398	0.0000	0.0000	0.0000	0.0000	35.9808	117.1907	205.2868	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												817.9344	
Space heating per m2											(98c) / (4) =	10.2267	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	190.0782	136.1784	91.0440	34.4357	7.7398	0.0000	0.0000	0.0000	0.0000	35.9808	117.1907	205.2868	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	285.1173	204.2676	136.5660	51.6535	11.6098	0.0000	0.0000	0.0000	0.0000	53.9712	175.7860	307.9302	
Space heating requirement													
	285.1173	204.2676	136.5660	51.6535	11.6098	0.0000	0.0000	0.0000	0.0000	53.9712	175.7860	307.9302	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1226.9016	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												12.2690	(313)
Space cooling fuel												0.0000	(321)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)

mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4534.7250	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1226.9016	4.4400	54.4744	(340a)
Space heating total			54.4744	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	206.9234	16.4900	34.1217	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	16.4900	-80.5593	
PV Unit electricity exported	-469.6869	5.5900	-26.2555	
Total			-106.8148	(352)
Total energy cost			256.6565	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7393	(357)
SAP value		88.0161	
SAP rating (Section 12)		88	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1403.7411	0.1573	51.4792	(367)
Electrical energy for heat distribution (space & water)	12.2690	0.0000	7.6182	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			210.7697	(373)
Space and water heating			210.7697	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			122.2880	(383)
CO2 emissions per m2			1.5300	(384)
EI value			98.6889	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)

Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15583.4798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		194.8422 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.2856 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4625 (42)

Hot water usage for mixer showers

65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)
Total storage loss	

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

											Total per year (kWh/year) = Sum(64)m =	2691.4183	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000		(64a)
Heat gains from water heating, kWh/month													
114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207		(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063		(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124		(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374		(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993		(71)
Water heating gains (Table 5)													
154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161		(72)
Total internal gains													
612.2735	609.9558	591.8328	558.1588	524.7912	494.7014	477.0149	480.2399	497.5865	528.2765	565.2104	597.3217		(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	23.7835	0.6800	0.7000	0.7700	59.6251	(80)

Solar gains	59.6251	103.6406	167.9167	247.1276	291.2895	319.6931	298.7175	261.9205	205.9597	129.6904	73.2361	49.3147	(83)
Total gains	671.8987	713.5964	759.7496	805.2864	816.0807	814.3945	775.7324	742.1603	703.5461	657.9669	638.4465	646.6364	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area													
0.9573	0.9363	0.8769	0.7638	0.5989	0.4026	0.2848	0.3129	0.5262	0.7824	0.9239	0.9648		(86)
MIT	20.4854	20.5913	20.7713	20.9138	20.9821	20.9986	20.9999	20.9998	20.9932	20.9169	20.6850	20.4404	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house													
0.9492	0.9248	0.8566	0.7319	0.5571	0.3568	0.2362	0.2621	0.4751	0.7450	0.9084	0.9579		(89)
MIT 2	19.7475	19.8771	20.0915	20.2505	20.3188	20.3325	20.3333	20.3332	20.3288	20.2571	19.9934	19.6921	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.9557	20.0787	20.2834	20.4377	20.5060	20.5205	20.5214	20.5213	20.5163	20.4433	20.1886	19.9032	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9557	20.0787	20.2834	20.4377	20.5060	20.5205	20.5214	20.5213	20.5163	20.4433	20.1886	19.9032	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9439	0.9198	0.8550	0.7371	0.5680	0.3697	0.2499	0.2764	0.4893	0.7515	0.9046	0.9527	(94)
Useful gains	634.1980	656.3948	649.5837	593.5428	463.5728	301.0551	193.8520	205.1543	344.2286	494.4496	577.5599	616.0490	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
870.1828	843.1482	752.7460	631.1540	470.6858	301.5014	193.8831	205.2132	346.5988	529.4663	719.0389	872.8755		(97)
Space heating kWh													
175.5727	125.4983	76.7527	27.0801	5.2920	0.0000	0.0000	0.0000	0.0000	26.0524	101.8648	191.0789		(98a)
Space heating requirement - total per year (kWh/year)												729.1921	
Solar heating kWh													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
175.5727	125.4983	76.7527	27.0801	5.2920	0.0000	0.0000	0.0000	0.0000	26.0524	101.8648	191.0789		(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												729.1921	
Space heating per m2											(98c) / (4) =	9.1172	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
175.5727	125.4983	76.7527	27.0801	5.2920	0.0000	0.0000	0.0000	0.0000	26.0524	101.8648	191.0789		(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	263.3590	188.2475	115.1291	40.6202	7.9380	0.0000	0.0000	0.0000	0.0000	39.0787	152.7973	286.6184	
Space heating requirement													
263.3590	188.2475	115.1291	40.6202	7.9380	0.0000	0.0000	0.0000	0.0000	39.0787	152.7973	286.6184		(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement												
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948
Water heating fuel												
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679 (331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-17.9904	-26.9468	-45.2798	-58.5762	-66.5604	-66.2871	-64.3781	-58.6940	-48.0761	-34.8334	-20.6614	-14.9764 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-6.0081	-13.0184	-31.9653	-58.9969	-82.6801	-94.8316	-90.1120	-72.5476	-46.2727	-22.1629	-8.3690	-4.5223 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year	
Space heating fuel - community heating	1093.7881 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4037.1274 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	10.9379 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)	
mechanical ventilation fans (SFP = 0.0920)	21.9935 (330a)
Total electricity for the above, kWh/year	21.9935 (331)
Electricity for lighting (calculated in Appendix L)	206.9234 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4305.0855 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1093.7881	6.5500	71.6431	(340a)
Space heating total			71.6431	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	206.9234	28.4300	58.8283	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	28.4300	-148.7628	
PV Unit electricity exported	-531.4870	5.8100	-30.8794	
Total			-179.6422	(352)
Total energy cost			325.5138	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1368.2441	0.1578	46.0331	(367)
Electrical energy for heat distribution (space & water)	10.9379	0.0000	7.4140	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			205.1194	(373)
Space and water heating			205.1194	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	0.1322	-69.1719	
PV Unit electricity exported	-531.4870	0.1213	-64.4804	
Total			-133.6523	(380)
Total CO2, kg/year			104.3833	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1368.2441	1.5842	462.0861	(467)
Electrical energy for heat distribution (space & water)	10.9379	0.0000	78.7306	(472)
Overall CO2 factor for heat network			0.4245	(486)
Total CO2 associated with community systems			2178.2125	(473)
Space and water heating			2178.2125	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)

Energy saving/generation technologies			
PV Unit electricity used in dwelling	-523.2600	1.4884	-778.8342
PV Unit electricity exported	-531.4870	0.4450	-236.5330
Total			-1015.3671 (480)
Total Primary energy kWh/year			1513.5032 (483)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	10.19	**TER**	11.17
Environmental	92 A	**% DER < TER**			8.77
CO_2 Emissions (t/year)	0.77	**DFEE**	18.72	**TFEE**	25.56
Compliance Check	See BREL	**% DFEE < TFEE**			26.77
% DPER < TPER	2.32	**DPER**	57.83	**TPER**	59.20

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			15583.4798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.2856	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2646	12.8723	14.2262	13.7137	14.1370	13.6467	14.0798	14.0978	13.6634	14.1582	13.7528	14.2575	(61)
Total heat required for water heating calculated for each month	225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(64)
										Total per year (kWh/year) = Sum(64)m =		2207.4483	(64)
12Total per year (kWh/year)												2207	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	73.9457	65.1466	68.6223	58.9761	56.2375	49.6647	48.2999	50.7952	51.9879	59.1771	64.3932	72.9637	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.6117	146.8201	132.6117	137.0321	132.6117	137.0321	132.6117	132.6117	137.0321	132.6117	137.0321	132.6117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	99.3893	96.9443	92.2343	81.9112	75.5880	68.9787	64.9192	68.2731	72.2054	79.5391	89.4350	98.0695	(72)
Total internal gains	514.3370	528.3771	503.7215	485.6051	459.4440	439.7647	421.6043	422.6816	436.7713	454.8984	484.6323	503.3367	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	19.6403	0.6800	0.7000	0.7700	49.2381	(80)

Solar gains	49.2381	96.3201	158.6255	231.3459	283.5231	290.2363	276.3168	237.3520	184.4881	114.2919	61.3941	40.4910	(83)
Total gains	563.5751	624.6972	662.3471	716.9510	742.9670	730.0010	697.9211	660.0336	621.2594	569.1903	546.0264	543.8277	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9824	0.9663	0.9334	0.8392	0.6815	0.4933	0.3568	0.3941	0.6150	0.8735	0.9644	0.9856	(86)

MIT	20.2936	20.4448	20.6341	20.8488	20.9627	20.9953	20.9995	20.9990	20.9839	20.8342	20.5304	20.2517	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house													
	0.9786	0.9595	0.9203	0.8120	0.6399	0.4433	0.3030	0.3374	0.5606	0.8451	0.9560	0.9825	(89)
MIT 2	19.5092	19.6982	19.9310	20.1816	20.3014	20.3303	20.3331	20.3328	20.3218	20.1705	19.8073	19.4564	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.7305	19.9089	20.1294	20.3699	20.4880	20.5180	20.5211	20.5208	20.5086	20.3578	20.0114	19.6808	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.5805	19.7589	19.9794	20.2199	20.3380	20.3680	20.3711	20.3708	20.3586	20.2078	19.8614	19.5308	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9732	0.9524	0.9124	0.8071	0.6402	0.4459	0.3060	0.3406	0.5627	0.8392	0.9488	0.9776	(94)
Useful gains	548.4842	594.9656	604.3153	578.6380	475.6422	325.5059	213.5933	224.8095	349.5689	477.6806	518.0685	531.6704	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	865.9224	842.0263	763.8534	641.4803	489.5027	326.8608	213.7029	225.0204	354.6668	544.4596	723.1656	868.7701	(97)
Space heating kWh													
	236.1740	166.0248	118.6964	45.2464	10.3122	0.0000	0.0000	0.0000	0.0000	49.6836	147.6699	250.8021	(98a)
Space heating requirement - total per year (kWh/year)												1024.6094	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	236.1740	166.0248	118.6964	45.2464	10.3122	0.0000	0.0000	0.0000	0.0000	49.6836	147.6699	250.8021	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1024.6094	
Space heating per m2											(98c) / (4) =	12.8108	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	89.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	236.1740	166.0248	118.6964	45.2464	10.3122	0.0000	0.0000	0.0000	0.0000	49.6836	147.6699	250.8021	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	265.3641	186.5447	133.3667	50.8387	11.5867	0.0000	0.0000	0.0000	0.0000	55.8242	165.9213	281.8002	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.1606	88.0648	87.9065	87.6351	87.3941	87.3000	87.3000	87.3000	87.3000	87.6599	88.0202	88.1917	(217)
Fuel for water heating, kWh/month													
	256.2735	226.1101	238.7909	206.2806	197.5454	174.9753	170.3968	178.9983	182.9836	207.0379	223.8989	252.8323	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	9.1721	8.2844	9.1721	8.8762	9.1721	8.8762	9.1721	9.1721	8.8762	9.1721	8.8762	9.1721	(231)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1151.2465 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	87.3000
Water heating fuel used	2516.1235 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)	
mechanical ventilation fans (SFP = 0.0920)	21.9935 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	107.9935 (231)
Electricity for lighting (calculated in Appendix L)	206.9234 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3982.2869 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1151.2465	0.2100	241.7618	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2516.1235	0.2100	528.3859	(264)
Space and water heating			770.1477	(265)
Pumps, fans and electric keep-hot	107.9935	0.1387	14.9800	(267)
Energy for lighting	206.9234	0.1443	29.8654	(268)
Total CO2, kg/year			814.9932	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.1900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1151.2465	1.1300	1300.9086	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2516.1235	1.1300	2843.2195	(278)
Space and water heating			4144.1281	(279)
Pumps, fans and electric keep-hot	107.9935	1.5128	163.3726	(281)
Energy for lighting	206.9234	1.5338	317.3860	(282)
Total Primary energy kWh/year			4624.8867	(286)
Dwelling Primary energy Rate (DPER)			57.8300	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type			7.6000	1.1450	8.7023			(27)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.1800	5.4450			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
500mm mineral wool	39.9900		39.9900	0.1100	4.3989			(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7164			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							194.8422	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.7300	0.0500	0.3365
E3 Sill	5.8800	0.0500	0.2940
E4 Jamb	10.3200	0.0500	0.5160
E6 Intermediate floor within a dwelling	14.1900	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	11.4900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
E7 Party floor between dwellings (in blocks of flats)	14.1900	0.0700	0.9933
P4 Party wall - Roof (insulation at ceiling level)	11.4900	0.1200	1.3788
E10 Eaves (insulation at ceiling level)	8.7100	0.0600	0.5226
E12 Gable (insulation at ceiling level)	5.4100	0.0600	0.3246

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.6278 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.3442 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	68.8609	68.6984	68.5391	67.7910	67.6510	66.9994	66.9994	66.8787	67.2504	67.6510	67.9342	68.2302	(39)
Average = Sum(39)m / 12 =												67.7903	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8610	0.8589	0.8570	0.8476	0.8458	0.8377	0.8377	0.8362	0.8408	0.8458	0.8494	0.8531	(40)
HLP (average)												0.8476	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	262.6267	232.2786	246.6455	216.3756	209.4649	188.4219	185.6355	193.1267	195.3963	218.2899	232.6384	259.6786	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	232.6794	205.7930	218.9113	193.4106	188.0624	170.1075	168.4687	174.8715	176.4476	195.9515	207.3317	230.2859	(64)
										Total per year (kWh/year) = Sum(64)m =		2362.3211	(64)
12Total per year (kWh/year)												2362	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	83.1193	73.4354	77.8055	67.8764	65.4430	58.5818	57.5197	60.0105	60.9008	68.3773	73.2838	82.1390	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.1468	142.9840	129.1468	133.4517	129.1468	133.4517	129.1468	129.1468	133.4517	129.1468	133.4517	129.1468	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	111.7194	109.2788	104.5773	94.2728	87.9610	81.3636	77.3114	80.6593	84.5844	91.9049	101.7830	110.4019	(72)
Total internal gains	523.2022	536.8754	512.5996	494.3863	468.3520	448.5691	430.5316	431.6028	445.5700	463.7993	493.3999	512.2042	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	19.6403	0.6300	0.7000	0.7700	45.6176	(80)

Solar gains	45.6176	89.2378	146.9619	214.3352	262.6758	268.8954	255.9994	219.8997	170.9228	105.8881	56.8798	37.5137	(83)

Total gains	568.8199	626.1132	659.5615	708.7214	731.0278	717.4645	686.5310	651.5025	616.4928	569.6874	550.2797	549.7180	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.8622	63.0109	63.1573	63.8543	63.9864	64.6087	64.6087	64.7253	64.3676	63.9864	63.7197	63.4432	
alpha	5.1908	5.2007	5.2105	5.2570	5.2658	5.3072	5.3072	5.3150	5.2912	5.2658	5.2480	5.2295	
util living area													
	0.9867	0.9768	0.9569	0.8948	0.7714	0.5814	0.4266	0.4675	0.7030	0.9146	0.9746	0.9887	(86)
MIT	19.9792	20.1422	20.3705	20.6762	20.8864	20.9796	20.9967	20.9947	20.9466	20.6824	20.2906	19.9529	(87)
Th 2	20.2008	20.2025	20.2042	20.2123	20.2138	20.2208	20.2208	20.2221	20.2181	20.2138	20.2107	20.2076	(88)
util rest of house													
	0.9837	0.9715	0.9469	0.8714	0.7265	0.5166	0.3524	0.3907	0.6390	0.8905	0.9679	0.9861	(89)
MIT 2	19.0095	19.2164	19.5033	19.8790	20.1135	20.2075	20.2194	20.2197	20.1790	19.8943	19.4118	18.9812	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.2831	19.4777	19.7480	20.1040	20.3316	20.4254	20.4387	20.4384	20.3956	20.1167	19.6598	19.2554	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2831	19.4777	19.7480	20.1040	20.3316	20.4254	20.4387	20.4384	20.3956	20.1167	19.6598	19.2554	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9791	0.9655	0.9400	0.8678	0.7336	0.5340	0.3733	0.4123	0.6542	0.8871	0.9620	0.9820	(94)
Useful gains	556.9185	604.5424	620.0098	615.0137	536.2795	383.1091	256.3126	268.6087	403.3370	505.3460	529.3774	539.8003	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1031.7506	1001.4634	908.0051	759.5278	583.9382	390.2958	257.1921	270.0813	423.3820	643.8119	853.2412	1027.2339	(97)
Space heating kWh													
	353.2751	266.7309	214.2685	104.0502	35.4581	0.0000	0.0000	0.0000	0.0000	103.0186	233.1819	362.6506	(98a)
Space heating requirement - total per year (kWh/year)												1672.6339	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	353.2751	266.7309	214.2685	104.0502	35.4581	0.0000	0.0000	0.0000	0.0000	103.0186	233.1819	362.6506	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1672.6339	
Space heating per m2											(98c) / (4) =	20.9132	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	353.2751	266.7309	214.2685	104.0502	35.4581	0.0000	0.0000	0.0000	0.0000	103.0186	233.1819	362.6506	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	382.3324	288.6698	231.8923	112.6084	38.3745	0.0000	0.0000	0.0000	0.0000	111.4920	252.3614	392.4790	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	232.6794	205.7930	218.9113	193.4106	188.0624	170.1075	168.4687	174.8715	176.4476	195.9515	207.3317	230.2859	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.2735	84.9382	84.3355	83.1124	81.5515	80.3000	80.3000	80.3000	80.3000	83.0690	84.6339	85.3499	(217)
Fuel for water heating, kWh/month													
	272.8626	242.2855	259.5719	232.7097	230.6057	211.8400	209.7992	217.7728	219.7355	235.8900	244.9748	269.8140	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	26.8342	21.5274	19.3830	14.2008	10.9691	8.9619	10.0064	13.0067	16.8944	22.1664	25.0369	27.5800	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3597	-31.5987	-47.6203	-56.2064	-62.9289	-59.5773	-58.8595	-54.4329	-47.0022	-37.3178	-24.0087	-18.2981	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9169	-17.0101	-34.4870	-52.8069	-70.8246	-71.5366	-70.6859	-59.3742	-42.9070	-24.6402	-10.6698	-6.2334	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1810.2099	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2847.8617	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												216.5670	(232)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3972.3356	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1810.2099	0.2100	380.1441	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2847.8617	0.2100	598.0510	(264)
Space and water heating			978.1950	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	216.5670	0.1443	31.2573	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	0.1336	-69.3640	
PV Unit electricity exported	-469.0927	0.1253	-58.7938	
Total			-128.1578	(269)
Total CO2, kg/year			893.2238	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.1700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1810.2099	1.1300	2045.5372	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2847.8617	1.1300	3218.0837	(278)
Space and water heating			5263.6209	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	216.5670	1.5338	332.1777	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	1.4937	-775.5387	
PV Unit electricity exported	-469.0927	0.4600	-215.8009	
Total			-991.3396	(283)
Total Primary energy kWh/year			4734.5598	(286)
Target Primary Energy Rate (TPER)			59.2000	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	10.19	**TER**	11.17
Environmental	92 A	**% DER < TER**			8.77
CO_2 Emissions (t/year)	0.77	**DFEE**	18.72	**TFEE**	25.56
Compliance Check	See BREL	**% DFEE < TFEE**			26.77
% DPER < TPER	2.32	**DPER**	57.83	**TPER**	59.20

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2122	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2705	0.2652	0.2599	0.2334	0.2281	0.2016	0.2016	0.1963	0.2122	0.2281	0.2387	0.2493	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5366	0.5352	0.5338	0.5272	0.5260	0.5203	0.5203	0.5193	0.5225	0.5260	0.5285	0.5311	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15583.4798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.2856	(36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.6979	34.6061	34.5160	34.0930	34.0139	33.6455	33.6455	33.5772	33.7874	34.0139	34.1740	34.3414	(38)
Heat transfer coeff	59.0343	58.9424	58.8524	58.4294	58.3502	57.9818	57.9818	57.9136	58.1237	58.3502	58.5103	58.6777	(39)
Average = Sum(39)m / 12 =												58.4290	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7381	0.7370	0.7358	0.7305	0.7296	0.7250	0.7250	0.7241	0.7267	0.7296	0.7316	0.7337	(40)
HLP (average)												0.7305	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.6117	146.8201	132.6117	137.0321	132.6117	137.0321	132.6117	132.6117	137.0321	132.6117	137.0321	132.6117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains	460.3995	475.6643	453.8350	442.5318	420.3791	407.9331	392.6658	391.8132	403.5720	413.9765	437.2071	450.3260	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	19.6403	0.6800	0.7000	0.7700	49.2381	(80)

Solar gains	49.2381	96.3201	158.6255	231.3459	283.5231	290.2363	276.3168	237.3520	184.4881	114.2919	61.3941	40.4910	(83)
Total gains	509.6376	571.9844	612.4605	673.8777	703.9021	698.1694	668.9826	629.1652	588.0600	528.2684	498.6012	490.8170	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.3259	73.4402	73.5526	74.0851	74.1855	74.6569	74.6569	74.7449	74.4746	74.1855	73.9825	73.7715	
alpha	5.8884	5.8960	5.9035	5.9390	5.9457	5.9771	5.9771	5.9830	5.9650	5.9457	5.9322	5.9181	
util living area	0.9900	0.9793	0.9557	0.8756	0.7259	0.5257	0.3806	0.4220	0.6582	0.9082	0.9780	0.9918	(86)
MIT	20.1404	20.3055	20.5211	20.7908	20.9433	20.9928	20.9991	20.9984	20.9750	20.7726	20.4176	20.1080	(87)

Th 2	20.3073	20.3083	20.3093	20.3139	20.3148	20.3188	20.3188	20.3196	20.3173	20.3148	20.3130	20.3112	(88)
util rest of house	0.9877	0.9747	0.9460	0.8514	0.6836	0.4720	0.3221	0.3603	0.6011	0.8844	0.9724	0.9900	(89)
MIT 2	19.5187	19.6819	19.8924	20.1472	20.2764	20.3152	20.3185	20.3190	20.3031	20.1364	19.7974	19.4898	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.6941	19.8579	20.0698	20.3288	20.4646	20.5064	20.5106	20.5107	20.4927	20.3160	19.9724	19.6643	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6941	19.8579	20.0698	20.3288	20.4646	20.5064	20.5106	20.5107	20.4927	20.3160	19.9724	19.6643	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9852	0.9711	0.9421	0.8520	0.6932	0.4870	0.3386	0.3777	0.6162	0.8844	0.9690	0.9877	(94)
Useful gains	502.0704	555.4803	576.9841	574.1225	487.9318	339.9763	226.5104	237.6249	362.3464	467.2173	483.1270	484.7967	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	908.7822	881.6531	798.6135	667.7803	511.4149	342.4638	226.7434	238.0670	371.5693	566.9289	753.1698	907.4073	(97)
Space heating kWh	302.5936	219.1881	164.8922	67.4336	17.4714	0.0000	0.0000	0.0000	0.0000	74.1854	194.4308	314.4223	(98a)
Space heating requirement - total per year (kWh/year)												1354.6174	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	302.5936	219.1881	164.8922	67.4336	17.4714	0.0000	0.0000	0.0000	0.0000	74.1854	194.4308	314.4223	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1354.6174	
Space heating per m2											(98c) / (4) =	16.9370	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	545.0293	429.0656	440.1434	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9543	0.9809	0.9715	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	520.1083	420.8815	427.5884	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	748.9021	717.9521	674.1942	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	164.7315	221.0206	183.4747	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	41.1829	55.2551	45.8687	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												142.3067	(107)
Energy for space heating												16.9370	(99)
Energy for space cooling												1.7793	(108)
Total												18.7162	(109)
Fabric Energy Efficiency (DFEE)												18.7	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type			7.6000	1.1450	8.7023			(27)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.1800	5.4450			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
500mm mineral wool	39.9900		39.9900	0.1100	4.3989			(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7164			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 194.8422 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.7300	0.0500	0.3365
E3 Sill	5.8800	0.0500	0.2940
E4 Jamb	10.3200	0.0500	0.5160
E6 Intermediate floor within a dwelling	14.1900	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	11.4900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
E7 Party floor between dwellings (in blocks of flats)	14.1900	0.0700	0.9933
P4 Party wall - Roof (insulation at ceiling level)	11.4900	0.1200	1.3788
E10 Eaves (insulation at ceiling level)	8.7100	0.0600	0.5226
E12 Gable (insulation at ceiling level)	5.4100	0.0600	0.3246

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.6278 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.3442 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	68.8609	68.6984	68.5391	67.7910	67.6510	66.9994	66.9994	66.8787	67.2504	67.6510	67.9342	68.2302	(39)
Average = Sum(39)m / 12 =												67.7903	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8610	0.8589	0.8570	0.8476	0.8458	0.8377	0.8377	0.8362	0.8408	0.8458	0.8494	0.8531	(40)
HLP (average)												0.8476	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	129.1468	142.9840	129.1468	133.4517	129.1468	133.4517	129.1468	129.1468	133.4517	129.1468	133.4517	129.1468	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains													
	456.9346	471.8282	450.3701	438.9514	416.9142	404.3527	389.2009	388.3482	399.9916	410.5116	433.6267	446.8611	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	19.6403	0.6300	0.7000	0.7700	45.6176	(80)

Solar gains	45.6176	89.2378	146.9619	214.3352	262.6758	268.8954	255.9994	219.8997	170.9228	105.8881	56.8798	37.5137	(83)
Total gains	502.5522	561.0659	597.3320	653.2866	679.5899	673.2481	645.2002	608.2479	570.9143	516.3997	490.5065	484.3748	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.8622	63.0109	63.1573	63.8543	63.9864	64.6087	64.6087	64.7253	64.3676	63.9864	63.7197	63.4432	
alpha	5.1908	5.2007	5.2105	5.2570	5.2658	5.3072	5.3072	5.3150	5.2912	5.2658	5.2480	5.2295	
util living area													
	0.9923	0.9853	0.9706	0.9190	0.8063	0.6145	0.4530	0.4990	0.7430	0.9390	0.9843	0.9936	(86)
MIT	19.8706	20.0403	20.2814	20.6174	20.8587	20.9737	20.9956	20.9928	20.9306	20.6195	20.1976	19.8447	(87)
Th 2	20.2008	20.2025	20.2042	20.2123	20.2138	20.2208	20.2208	20.2221	20.2181	20.2138	20.2107	20.2076	(88)
util rest of house													
	0.9904	0.9818	0.9634	0.8993	0.7637	0.5478	0.3747	0.4178	0.6799	0.9200	0.9799	0.9920	(89)
MIT 2	19.1652	19.3344	19.5728	19.9002	20.1147	20.2072	20.2193	20.2195	20.1775	19.9087	19.4978	19.1449	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.3643	19.5336	19.7727	20.1026	20.3246	20.4235	20.4384	20.4377	20.3901	20.1093	19.6953	19.3424	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3643	19.5336	19.7727	20.1026	20.3246	20.4235	20.4384	20.4377	20.3901	20.1093	19.6953	19.3424	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9879	0.9781	0.9586	0.8962	0.7702	0.5656	0.3968	0.4406	0.6946	0.9170	0.9763	0.9898	(94)
Useful gains	496.4624	548.7942	572.6030	585.4698	523.3918	380.8002	255.9920	268.0202	396.5753	473.5615	478.8580	479.4335	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1037.3405	1005.3059	909.7014	759.4376	583.4652	390.1699	257.1685	270.0373	423.0082	643.3135	855.6488	1033.1682	(97)
Space heating kWh													
	402.4133	306.7759	250.8012	125.2568	44.6946	0.0000	0.0000	0.0000	0.0000	126.2955	271.2894	411.9786	(98a)
Space heating requirement - total per year (kWh/year)												1939.5053	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	402.4133	306.7759	250.8012	125.2568	44.6946	0.0000	0.0000	0.0000	0.0000	126.2955	271.2894	411.9786	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1939.5053	
Space heating per m2											(98c) / (4) =	24.2499	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	629.7941	495.7954	508.2782	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8937	0.9455	0.9265	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	562.8363	468.7781	470.9138	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	723.6551	693.8769	653.3695	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	115.7895	167.4735	135.7471	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	28.9474	41.8684	33.9368	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												104.7525	(107)
Energy for space heating												24.2499	(99)
Energy for space cooling												1.3097	(108)
Total												25.5596	(109)
Fabric Energy Efficiency (TFEE)												25.6	(109)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	10.19	**TER**	11.17
Environmental	92 A	**% DER < TER**			8.77
CO_2 Emissions (t/year)	0.77	**DFEE**	18.72	**TFEE**	25.56
Compliance Check	See BREL	**% DFEE < TFEE**			26.77
% DPER < TPER	2.32	**DPER**	57.83	**TPER**	59.20

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			15583.4798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.2856	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2646	12.8723	14.2262	13.7137	14.1370	13.6467	14.0798	14.0978	13.6634	14.1582	13.7528	14.2575	(61)
Total heat required for water heating calculated for each month	225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(64)
										Total per year (kWh/year) = Sum(64)m =		2207.4483	(64)
12Total per year (kWh/year)												2207	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	73.9457	65.1466	68.6223	58.9761	56.2375	49.6647	48.2999	50.7952	51.9879	59.1771	64.3932	72.9637	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.6117	146.8201	132.6117	137.0321	132.6117	137.0321	132.6117	132.6117	137.0321	132.6117	137.0321	132.6117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	99.3893	96.9443	92.2343	81.9112	75.5880	68.9787	64.9192	68.2731	72.2054	79.5391	89.4350	98.0695	(72)
Total internal gains	514.3370	528.3771	503.7215	485.6051	459.4440	439.7647	421.6043	422.6816	436.7713	454.8984	484.6323	503.3367	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	19.6403	0.6800	0.7000	0.7700	49.2381	(80)

Solar gains	49.2381	96.3201	158.6255	231.3459	283.5231	290.2363	276.3168	237.3520	184.4881	114.2919	61.3941	40.4910	(83)
Total gains	563.5751	624.6972	662.3471	716.9510	742.9670	730.0010	697.9211	660.0336	621.2594	569.1903	546.0264	543.8277	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9824	0.9663	0.9334	0.8392	0.6815	0.4933	0.3568	0.3941	0.6150	0.8735	0.9644	0.9856	(86)

MIT	20.2936	20.4448	20.6341	20.8488	20.9627	20.9953	20.9995	20.9990	20.9839	20.8342	20.5304	20.2517	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house													
	0.9786	0.9595	0.9203	0.8120	0.6399	0.4433	0.3030	0.3374	0.5606	0.8451	0.9560	0.9825	(89)
MIT 2	19.5092	19.6982	19.9310	20.1816	20.3014	20.3303	20.3331	20.3328	20.3218	20.1705	19.8073	19.4564	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.7305	19.9089	20.1294	20.3699	20.4880	20.5180	20.5211	20.5208	20.5086	20.3578	20.0114	19.6808	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.5805	19.7589	19.9794	20.2199	20.3380	20.3680	20.3711	20.3708	20.3586	20.2078	19.8614	19.5308	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9732	0.9524	0.9124	0.8071	0.6402	0.4459	0.3060	0.3406	0.5627	0.8392	0.9488	0.9776	(94)
Useful gains	548.4842	594.9656	604.3153	578.6380	475.6422	325.5059	213.5933	224.8095	349.5689	477.6806	518.0685	531.6704	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	865.9224	842.0263	763.8534	641.4803	489.5027	326.8608	213.7029	225.0204	354.6668	544.4596	723.1656	868.7701	(97)
Space heating kWh													
	236.1740	166.0248	118.6964	45.2464	10.3122	0.0000	0.0000	0.0000	0.0000	49.6836	147.6699	250.8021	(98a)
Space heating requirement - total per year (kWh/year)												1024.6094	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	236.1740	166.0248	118.6964	45.2464	10.3122	0.0000	0.0000	0.0000	0.0000	49.6836	147.6699	250.8021	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1024.6094	
Space heating per m2											(98c) / (4) =	12.8108	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	89.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	236.1740	166.0248	118.6964	45.2464	10.3122	0.0000	0.0000	0.0000	0.0000	49.6836	147.6699	250.8021	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	265.3641	186.5447	133.3667	50.8387	11.5867	0.0000	0.0000	0.0000	0.0000	55.8242	165.9213	281.8002	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.1606	88.0648	87.9065	87.6351	87.3941	87.3000	87.3000	87.3000	87.3000	87.6599	88.0202	88.1917	(217)
Fuel for water heating, kWh/month													
	256.2735	226.1101	238.7909	206.2806	197.5454	174.9753	170.3968	178.9983	182.9836	207.0379	223.8989	252.8323	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	9.1721	8.2844	9.1721	8.8762	9.1721	8.8762	9.1721	9.1721	8.8762	9.1721	8.8762	9.1721	(231)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1151.2465 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	87.3000
Water heating fuel used	2516.1235 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)	
mechanical ventilation fans (SFP = 0.0920)	21.9935 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	107.9935 (231)
Electricity for lighting (calculated in Appendix L)	206.9234 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3982.2869 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1151.2465	0.2100	241.7618	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2516.1235	0.2100	528.3859	(264)
Space and water heating			770.1477	(265)
Pumps, fans and electric keep-hot	107.9935	0.1387	14.9800	(267)
Energy for lighting	206.9234	0.1443	29.8654	(268)
Total CO2, kg/year			814.9932	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.1900	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1151.2465	1.1300	1300.9086	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2516.1235	1.1300	2843.2195	(278)
Space and water heating			4144.1281	(279)
Pumps, fans and electric keep-hot	107.9935	1.5128	163.3726	(281)
Energy for lighting	206.9234	1.5338	317.3860	(282)
Total Primary energy kWh/year			4624.8867	(286)
Dwelling Primary energy Rate (DPER)			57.8300	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type			7.6000	1.1450	8.7023			(27)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.1800	5.4450			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
500mm mineral wool	39.9900		39.9900	0.1100	4.3989			(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7164			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							194.8422	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.7300	0.0500	0.3365
E3 Sill	5.8800	0.0500	0.2940
E4 Jamb	10.3200	0.0500	0.5160
E6 Intermediate floor within a dwelling	14.1900	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	11.4900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
E7 Party floor between dwellings (in blocks of flats)	14.1900	0.0700	0.9933
P4 Party wall - Roof (insulation at ceiling level)	11.4900	0.1200	1.3788
E10 Eaves (insulation at ceiling level)	8.7100	0.0600	0.5226
E12 Gable (insulation at ceiling level)	5.4100	0.0600	0.3246

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.6278 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.3442 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	68.8609	68.6984	68.5391	67.7910	67.6510	66.9994	66.9994	66.8787	67.2504	67.6510	67.9342	68.2302	(39)
Average = Sum(39)m / 12 =												67.7903	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8610	0.8589	0.8570	0.8476	0.8458	0.8377	0.8377	0.8362	0.8408	0.8458	0.8494	0.8531	(40)
HLP (average)												0.8476	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	262.6267	232.2786	246.6455	216.3756	209.4649	188.4219	185.6355	193.1267	195.3963	218.2899	232.6384	259.6786	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	232.6794	205.7930	218.9113	193.4106	188.0624	170.1075	168.4687	174.8715	176.4476	195.9515	207.3317	230.2859	(64)
										Total per year (kWh/year) = Sum(64)m =		2362.3211	(64)
12Total per year (kWh/year)												2362	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	83.1193	73.4354	77.8055	67.8764	65.4430	58.5818	57.5197	60.0105	60.9008	68.3773	73.2838	82.1390	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.1468	142.9840	129.1468	133.4517	129.1468	133.4517	129.1468	129.1468	133.4517	129.1468	133.4517	129.1468	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	111.7194	109.2788	104.5773	94.2728	87.9610	81.3636	77.3114	80.6593	84.5844	91.9049	101.7830	110.4019	(72)
Total internal gains	523.2022	536.8754	512.5996	494.3863	468.3520	448.5691	430.5316	431.6028	445.5700	463.7993	493.3999	512.2042	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	19.6403	0.6300	0.7000	0.7700	45.6176	(80)

Solar gains	45.6176	89.2378	146.9619	214.3352	262.6758	268.8954	255.9994	219.8997	170.9228	105.8881	56.8798	37.5137	(83)

Total gains	568.8199	626.1132	659.5615	708.7214	731.0278	717.4645	686.5310	651.5025	616.4928	569.6874	550.2797	549.7180	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.8622	63.0109	63.1573	63.8543	63.9864	64.6087	64.6087	64.7253	64.3676	63.9864	63.7197	63.4432	
alpha	5.1908	5.2007	5.2105	5.2570	5.2658	5.3072	5.3072	5.3150	5.2912	5.2658	5.2480	5.2295	
util living area													
	0.9867	0.9768	0.9569	0.8948	0.7714	0.5814	0.4266	0.4675	0.7030	0.9146	0.9746	0.9887	(86)
MIT	19.9792	20.1422	20.3705	20.6762	20.8864	20.9796	20.9967	20.9947	20.9466	20.6824	20.2906	19.9529	(87)
Th 2	20.2008	20.2025	20.2042	20.2123	20.2138	20.2208	20.2208	20.2221	20.2181	20.2138	20.2107	20.2076	(88)
util rest of house													
	0.9837	0.9715	0.9469	0.8714	0.7265	0.5166	0.3524	0.3907	0.6390	0.8905	0.9679	0.9861	(89)
MIT 2	19.0095	19.2164	19.5033	19.8790	20.1135	20.2075	20.2194	20.2197	20.1790	19.8943	19.4118	18.9812	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.2831	19.4777	19.7480	20.1040	20.3316	20.4254	20.4387	20.4384	20.3956	20.1167	19.6598	19.2554	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2831	19.4777	19.7480	20.1040	20.3316	20.4254	20.4387	20.4384	20.3956	20.1167	19.6598	19.2554	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9791	0.9655	0.9400	0.8678	0.7336	0.5340	0.3733	0.4123	0.6542	0.8871	0.9620	0.9820	(94)
Useful gains	556.9185	604.5424	620.0098	615.0137	536.2795	383.1091	256.3126	268.6087	403.3370	505.3460	529.3774	539.8003	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1031.7506	1001.4634	908.0051	759.5278	583.9382	390.2958	257.1921	270.0813	423.3820	643.8119	853.2412	1027.2339	(97)
Space heating kWh													
	353.2751	266.7309	214.2685	104.0502	35.4581	0.0000	0.0000	0.0000	0.0000	103.0186	233.1819	362.6506	(98a)
Space heating requirement - total per year (kWh/year)												1672.6339	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	353.2751	266.7309	214.2685	104.0502	35.4581	0.0000	0.0000	0.0000	0.0000	103.0186	233.1819	362.6506	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1672.6339	
Space heating per m2											(98c) / (4) =	20.9132	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	353.2751	266.7309	214.2685	104.0502	35.4581	0.0000	0.0000	0.0000	0.0000	103.0186	233.1819	362.6506	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	382.3324	288.6698	231.8923	112.6084	38.3745	0.0000	0.0000	0.0000	0.0000	111.4920	252.3614	392.4790	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	232.6794	205.7930	218.9113	193.4106	188.0624	170.1075	168.4687	174.8715	176.4476	195.9515	207.3317	230.2859	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.2735	84.9382	84.3355	83.1124	81.5515	80.3000	80.3000	80.3000	80.3000	83.0690	84.6339	85.3499	(217)
Fuel for water heating, kWh/month													
	272.8626	242.2855	259.5719	232.7097	230.6057	211.8400	209.7992	217.7728	219.7355	235.8900	244.9748	269.8140	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	26.8342	21.5274	19.3830	14.2008	10.9691	8.9619	10.0064	13.0067	16.8944	22.1664	25.0369	27.5800	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3597	-31.5987	-47.6203	-56.2064	-62.9289	-59.5773	-58.8595	-54.4329	-47.0022	-37.3178	-24.0087	-18.2981	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9169	-17.0101	-34.4870	-52.8069	-70.8246	-71.5366	-70.6859	-59.3742	-42.9070	-24.6402	-10.6698	-6.2334	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1810.2099	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2847.8617	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												216.5670	(232)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3972.3356	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1810.2099	0.2100	380.1441	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2847.8617	0.2100	598.0510	(264)
Space and water heating			978.1950	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	216.5670	0.1443	31.2573	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	0.1336	-69.3640	
PV Unit electricity exported	-469.0927	0.1253	-58.7938	
Total			-128.1578	(269)
Total CO2, kg/year			893.2238	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.1700	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1810.2099	1.1300	2045.5372	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2847.8617	1.1300	3218.0837	(278)
Space and water heating			5263.6209	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	216.5670	1.5338	332.1777	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	1.4937	-775.5387	
PV Unit electricity exported	-469.0927	0.4600	-215.8009	
Total			-991.3396	(283)
Total Primary energy kWh/year			4734.5598	(286)
Target Primary Energy Rate (TPER)			59.2000	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	10.19	**TER**	11.17
Environmental	92 A	**% DER < TER**			8.77
CO_2 Emissions (t/year)	0.77	**DFEE**	18.72	**TFEE**	25.56
Compliance Check	See BREL	**% DFEE < TFEE**			26.77
% DPER < TPER	2.32	**DPER**	57.83	**TPER**	59.20

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			15583.4798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.2856	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers													
	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths													
	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses													
	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2646	12.8723	14.2262	13.7137	14.1370	13.6467	14.0798	14.0978	13.6634	14.1582	13.7528	14.2575	(61)
Total heat required for water heating calculated for each month	225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(64)
										Total per year (kWh/year) = Sum(64)m =		2207.4483	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	73.9457	65.1466	68.6223	58.9761	56.2375	49.6647	48.2999	50.7952	51.9879	59.1771	64.3932	72.9637	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	99.3893	96.9443	92.2343	81.9112	75.5880	68.9787	64.9192	68.2731	72.2054	79.5391	89.4350	98.0695	(72)
Total internal gains	560.6293	558.3072	540.1757	506.4831	473.1041	440.0024	422.3086	425.5396	442.8933	476.5965	513.5482	545.6751	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	19.6403	0.6800	0.7000	0.7700	49.2381	(80)

Solar gains	49.2381	96.3201	158.6255	231.3459	283.5231	290.2363	276.3168	237.3520	184.4881	114.2919	61.3941	40.4910	(83)
Total gains	609.8674	654.6273	698.8013	737.8289	756.6272	730.2387	698.6254	662.8916	627.3813	590.8885	574.9423	586.1661	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9744	0.9587	0.9184	0.8257	0.6712	0.4931	0.3565	0.3924	0.6096	0.8579	0.9556	0.9793	(86)

MIT	20.3667	20.4878	20.6764	20.8624	20.9656	20.9953	20.9995	20.9990	20.9846	20.8517	20.5714	20.3201	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house													
	0.9692	0.9506	0.9033	0.7976	0.6298	0.4431	0.3027	0.3360	0.5555	0.8278	0.9455	0.9750	(89)
MIT 2	19.6005	19.7510	19.9809	20.1962	20.3040	20.3303	20.3331	20.3329	20.3224	20.1892	19.8571	19.5423	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.8167	19.9590	20.1772	20.3842	20.4907	20.5180	20.5211	20.5208	20.5092	20.3762	20.0587	19.7618	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.6667	19.8090	20.0272	20.2342	20.3407	20.3680	20.3711	20.3708	20.3592	20.2262	19.9087	19.6118	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9628	0.9431	0.8955	0.7932	0.6303	0.4458	0.3057	0.3391	0.5576	0.8225	0.9378	0.9692	(94)
Useful gains	587.1885	617.3740	625.7712	585.2138	476.8779	325.5086	213.5940	224.8154	349.8393	485.9909	539.2071	568.1186	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	870.8065	844.8647	766.5618	642.2902	489.6519	326.8612	213.7030	225.0213	354.7003	545.4976	725.8471	873.3601	(97)
Space heating kWh													
	211.0118	152.8737	104.7482	41.0950	9.5039	0.0000	0.0000	0.0000	0.0000	44.2730	134.3808	227.0997	(98a)
Space heating requirement - total per year (kWh/year)												924.9861	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	211.0118	152.8737	104.7482	41.0950	9.5039	0.0000	0.0000	0.0000	0.0000	44.2730	134.3808	227.0997	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												924.9861	
Space heating per m2											(98c) / (4) =	11.5652	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	211.0118	152.8737	104.7482	41.0950	9.5039	0.0000	0.0000	0.0000	0.0000	44.2730	134.3808	227.0997	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	237.0919	171.7682	117.6946	46.1742	10.6785	0.0000	0.0000	0.0000	0.0000	49.7450	150.9896	255.1682	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.1128	88.0303	87.8587	87.6100	87.3871	87.3000	87.3000	87.3000	87.3000	87.6282	87.9813	88.1496	(217)
Fuel for water heating, kWh/month													
	256.4126	226.1988	238.9210	206.3398	197.5612	174.9753	170.3968	178.9983	182.9836	207.1126	223.9977	252.9532	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	9.1721	8.2844	9.1721	8.8762	9.1721	8.8762	9.1721	9.1721	8.8762	9.1721	8.8762	9.1721	(231)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1039.3102	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2516.8509	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	107.9935	(231)
Electricity for lighting (calculated in Appendix L)	206.9234	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3871.0781	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1039.3102	3.6400	37.8309	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2516.8509	3.6400	91.6134	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	107.9935	16.4900	17.8081	(249)
Energy for lighting	206.9234	16.4900	34.1217	(250)
Additional standing charges			92.0000	(251)
Total energy cost			273.3741	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7874	(257)
SAP value		87.2355	
SAP rating (Section 12)		87	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1039.3102	0.2100	218.2551	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2516.8509	0.2100	528.5387	(264)
Space and water heating			746.7938	(265)
Pumps, fans and electric keep-hot	107.9935	0.1387	14.9800	(267)
Energy for lighting	206.9234	0.1443	29.8654	(268)
Total CO2, kg/year			791.6393	(272)
CO2 emissions per m2			9.9000	(273)
EI value			91.5123	
EI rating			92	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15583.4798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		194.8422 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.2856 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4625 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)		122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2646	12.8723	14.2262	13.7137	14.1370	13.6467	14.0798	14.0978	13.6634	14.1582	13.7528	14.2575	(61)
Total heat required for water heating calculated for each month	225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(64)
									Total per year (kWh/year) = Sum(64)m =			2207.4483	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	73.9457	65.1466	68.6223	58.9761	56.2375	49.6647	48.2999	50.7952	51.9879	59.1771	64.3932	72.9637	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	99.3893	96.9443	92.2343	81.9112	75.5880	68.9787	64.9192	68.2731	72.2054	79.5391	89.4350	98.0695	(72)
Total internal gains	560.6293	558.3072	540.1757	506.4831	473.1041	440.0024	422.3086	425.5396	442.8933	476.5965	513.5482	545.6751	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

				m2		Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c		factor Table 6d		W	
West				7.6000		23.7835	0.6800	0.7000		0.7700		59.6251	(80)
Solar gains	59.6251	103.6406	167.9167	247.1276	291.2895	319.6931	298.7175	261.9205	205.9597	129.6904	73.2361	49.3147	(83)
Total gains	620.2544	661.9477	708.0925	753.6106	764.3936	759.6955	721.0261	687.4601	648.8529	606.2869	586.7844	594.9898	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9700	0.9531	0.9029	0.7986	0.6347	0.4311	0.3064	0.3377	0.5677	0.8236	0.9454	0.9759	(86)
MIT	20.4105	20.5243	20.7229	20.8899	20.9757	20.9980	20.9998	20.9996	20.9899	20.8891	20.6218	20.3626	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9639	0.9440	0.8853	0.7679	0.5917	0.3822	0.2541	0.2829	0.5136	0.7887	0.9332	0.9708	(89)
MIT 2	19.6554	19.7962	20.0363	20.2260	20.3134	20.3321	20.3332	20.3332	20.3264	20.2293	19.9186	19.5957	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.8685	20.0017	20.2300	20.4133	20.5003	20.5200	20.5213	20.5212	20.5136	20.4155	20.1170	19.8121	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.7185	19.8517	20.0800	20.2633	20.3503	20.3700	20.3713	20.3712	20.3636	20.2655	19.9670	19.6621	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9571	0.9362	0.8779	0.7645	0.5928	0.3849	0.2571	0.2860	0.5161	0.7849	0.9253	0.9646	(94)
Useful gains	593.6348	619.7367	621.6093	576.1647	453.1281	292.4327	185.3456	196.6401	334.8761	475.8505	542.9547	573.9337	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	856.7390	830.2847	741.2233	621.2731	461.8631	292.9755	185.3807	196.7088	337.9496	519.3922	706.4863	859.2089	(97)
Space heating kWh	195.7496	141.4882	88.9928	32.4781	6.4989	0.0000	0.0000	0.0000	0.0000	32.3950	117.7427	212.2447	(98a)
Space heating requirement - total per year (kWh/year)												827.5900	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	195.7496	141.4882	88.9928	32.4781	6.4989	0.0000	0.0000	0.0000	0.0000	32.3950	117.7427	212.2447	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												827.5900	
Space heating per m2											(98c) / (4) =	10.3475	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	195.7496	141.4882	88.9928	32.4781	6.4989	0.0000	0.0000	0.0000	0.0000	32.3950	117.7427	212.2447	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	219.9433	158.9756	99.9919	36.4922	7.3021	0.0000	0.0000	0.0000	0.0000	36.3989	132.2952	238.4772	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0810	87.9982	87.7993	87.5547	87.3605	87.3000	87.3000	87.3000	87.3000	87.5533	87.9281	88.1208	(217)
Fuel for water heating, kWh/month	256.5051	226.2812	239.0825	206.4701	197.6213	174.9753	170.3968	178.9983	182.9836	207.2899	224.1332	253.0357	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	9.1721	8.2844	9.1721	8.8762	9.1721	8.8762	9.1721	9.1721	8.8762	9.1721	8.8762	9.1721	(231)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												929.8764	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.3000	

Water heating fuel used		2517.7729 (219)
Space cooling fuel		0.0000 (221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)		21.9935 (230a)
central heating pump		41.0000 (230c)
main heating flue fan		45.0000 (230e)
Total electricity for the above, kWh/year		107.9935 (231)
Electricity for lighting (calculated in Appendix L)		206.9234 (232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation		0.0000 (233)
Wind generation		0.0000 (234)
Hydro-electric generation (Appendix N)		0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)		0.0000 (235)
Appendix Q - special features		
Energy saved or generated		-0.0000 (236)
Energy used		0.0000 (237)
Total delivered energy for all uses		3762.5662 (238)

10a. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	929.8764	6.5500	60.9069	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2517.7729	6.5500	164.9141	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	107.9935	28.4300	30.7026	(249)
Energy for lighting	206.9234	28.4300	58.8283	(250)
Additional standing charges			104.0000	(251)
Total energy cost			419.3519	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	929.8764	0.2100	195.2740	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2517.7729	0.2100	528.7323	(264)
Space and water heating			724.0064	(265)
Pumps, fans and electric keep-hot	107.9935	0.1387	14.9800	(267)
Energy for lighting	206.9234	0.1443	29.8654	(268)
Total CO2, kg/year			768.8518	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	929.8764	1.1300	1050.7603	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2517.7729	1.1300	2845.0834	(278)
Space and water heating			3895.8437	(279)
Pumps, fans and electric keep-hot	107.9935	1.5128	163.3726	(281)
Energy for lighting	206.9234	1.5338	317.3860	(282)
Total Primary energy kWh/year			4376.6023	(286)

SAP 10 EPC IMPROVEMENTS

Rev C - Be Lean

Current energy efficiency rating: B 87
Current environmental impact rating: A 92

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 87
Potential environmental impact rating: A 92

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£90	£90	£0
Mains gas	£330	£330	£0
Space heating	£196	£196	£0
Water heating	£165	£165	£0
Lighting	£59	£59	£0
Total cost of fuels	£420	£420	£0

Total cost of uses	£420	£420	£0
Delivered energy	47 kWh/m²	47 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.8 tonnes	0.0 tonnes
CO2 emissions per m²	10 kg/m²	10 kg/m²	0 kg/m²
Primary energy	55 kWh/m²	55 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

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2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15583.4798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		194.8422 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.2856 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

Hot water usage for mixer showers

	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564 (42a)

Hot water usage for baths

	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979 (42b)

Hot water usage for other uses

	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483 (42c)

Average daily hot water use (litres/day) 122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2646	12.8723	14.2262	13.7137	14.1370	13.6467	14.0798	14.0978	13.6634	14.1582	13.7528	14.2575	(61)
Total heat required for water heating calculated for each month	225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(64)
										Total per year (kWh/year) = Sum(64)m =		2207.4483	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	73.9457	65.1466	68.6223	58.9761	56.2375	49.6647	48.2999	50.7952	51.9879	59.1771	64.3932	72.9637	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	99.3893	96.9443	92.2343	81.9112	75.5880	68.9787	64.9192	68.2731	72.2054	79.5391	89.4350	98.0695	(72)
Total internal gains	560.6293	558.3072	540.1757	506.4831	473.1041	440.0024	422.3086	425.5396	442.8933	476.5965	513.5482	545.6751	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	19.6403	0.6800	0.7000	0.7700	49.2381	(80)

Solar gains	49.2381	96.3201	158.6255	231.3459	283.5231	290.2363	276.3168	237.3520	184.4881	114.2919	61.3941	40.4910	(83)
Total gains	609.8674	654.6273	698.8013	737.8289	756.6272	730.2387	698.6254	662.8916	627.3813	590.8885	574.9423	586.1661	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9744	0.9587	0.9184	0.8257	0.6712	0.4931	0.3565	0.3924	0.6096	0.8579	0.9556	0.9793	(86)
MIT	20.3667	20.4878	20.6764	20.8624	20.9656	20.9953	20.9995	20.9990	20.9846	20.8517	20.5714	20.3201	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9692	0.9506	0.9033	0.7976	0.6298	0.4431	0.3027	0.3360	0.5555	0.8278	0.9455	0.9750	(89)
MIT 2	19.6005	19.7510	19.9809	20.1962	20.3040	20.3303	20.3331	20.3329	20.3224	20.1892	19.8571	19.5423	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.8167	19.9590	20.1772	20.3842	20.4907	20.5180	20.5211	20.5208	20.5092	20.3762	20.0587	19.7618	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.6667	19.8090	20.0272	20.2342	20.3407	20.3680	20.3711	20.3708	20.3592	20.2262	19.9087	19.6118	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Utilisation	0.9628	0.9431	0.8955	0.7932	0.6303	0.4458	0.3057	0.3391	0.5576	0.8225	0.9378	0.9692	(94)
Useful gains	587.1885	617.3740	625.7712	585.2138	476.8779	325.5086	213.5940	224.8154	349.8393	485.9909	539.2071	568.1186	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	870.8065	844.8647	766.5618	642.2902	489.6519	326.8612	213.7030	225.0213	354.7003	545.4976	725.8471	873.3601	(97)
Space heating kWh	211.0118	152.8737	104.7482	41.0950	9.5039	0.0000	0.0000	0.0000	0.0000	44.2730	134.3808	227.0997	(98a)
Space heating requirement - total per year (kWh/year)												924.9861	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	211.0118	152.8737	104.7482	41.0950	9.5039	0.0000	0.0000	0.0000	0.0000	44.2730	134.3808	227.0997	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												924.9861	
Space heating per m2											(98c) / (4) =	11.5652	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	211.0118	152.8737	104.7482	41.0950	9.5039	0.0000	0.0000	0.0000	0.0000	44.2730	134.3808	227.0997	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	237.0919	171.7682	117.6946	46.1742	10.6785	0.0000	0.0000	0.0000	0.0000	49.7450	150.9896	255.1682	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.1128	88.0303	87.8587	87.6100	87.3871	87.3000	87.3000	87.3000	87.3000	87.6282	87.9813	88.1496	(217)
Fuel for water heating, kWh/month	256.4126	226.1988	238.9210	206.3398	197.5612	174.9753	170.3968	178.9983	182.9836	207.1126	223.9977	252.9532	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	9.1721	8.2844	9.1721	8.8762	9.1721	8.8762	9.1721	9.1721	8.8762	9.1721	8.8762	9.1721	(231)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1039.3102	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2516.8509	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	107.9935	(231)
Electricity for lighting (calculated in Appendix L)	206.9234	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3871.0781	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1039.3102	3.6400	37.8309	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2516.8509	3.6400	91.6134	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	107.9935	16.4900	17.8081	(249)
Energy for lighting	206.9234	16.4900	34.1217	(250)
Additional standing charges			92.0000	(251)
Total energy cost			273.3741	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7874 (257)
SAP value		87.2355
SAP rating (Section 12)		87 (258)
SAP band		B

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1039.3102	0.2100	218.2551	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2516.8509	0.2100	528.5387	(264)
Space and water heating			746.7938	(265)
Pumps, fans and electric keep-hot	107.9935	0.1387	14.9800	(267)
Energy for lighting	206.9234	0.1443	29.8654	(268)
Total CO2, kg/year			791.6393	(272)
CO2 emissions per m2			9.9000	(273)
EI value			91.5123	
EI rating			92	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)

Timber partitions	151.9500	9.0000	1367.5500	(32c)
Internal Floor 1	39.9900	18.0000	719.8200	(32d)
Internal Ceiling 1	39.9900	9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15583.4798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.2856	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2646	12.8723	14.2262	13.7137	14.1370	13.6467	14.0798	14.0978	13.6634	14.1582	13.7528	14.2575	(61)
Total heat required for water heating calculated for each month	225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(64)
									Total per year (kWh/year) = Sum(64)m =			2207.4483	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	73.9457	65.1466	68.6223	58.9761	56.2375	49.6647	48.2999	50.7952	51.9879	59.1771	64.3932	72.9637	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	99.3893	96.9443	92.2343	81.9112	75.5880	68.9787	64.9192	68.2731	72.2054	79.5391	89.4350	98.0695	(72)
Total internal gains	560.6293	558.3072	540.1757	506.4831	473.1041	440.0024	422.3086	425.5396	442.8933	476.5965	513.5482	545.6751	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	23.7835	0.6800	0.7000	0.7700	59.6251	(80)

Solar gains	59.6251	103.6406	167.9167	247.1276	291.2895	319.6931	298.7175	261.9205	205.9597	129.6904	73.2361	49.3147	(83)
Total gains	620.2544	661.9477	708.0925	753.6106	764.3936	759.6955	721.0261	687.4601	648.8529	606.2869	586.7844	594.9898	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9700	0.9531	0.9029	0.7986	0.6347	0.4311	0.3064	0.3377	0.5677	0.8236	0.9454	0.9759	(86)
MIT	20.4105	20.5243	20.7229	20.8899	20.9757	20.9980	20.9998	20.9996	20.9899	20.8891	20.6218	20.3626	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9639	0.9440	0.8853	0.7679	0.5917	0.3822	0.2541	0.2829	0.5136	0.7887	0.9332	0.9708	(89)
MIT 2	19.6554	19.7962	20.0363	20.2260	20.3134	20.3321	20.3332	20.3332	20.3264	20.2293	19.9186	19.5957	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.8685	20.0017	20.2300	20.4133	20.5003	20.5200	20.5213	20.5212	20.5136	20.4155	20.1170	19.8121	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.7185	19.8517	20.0800	20.2633	20.3503	20.3700	20.3713	20.3712	20.3636	20.2655	19.9670	19.6621	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9571	0.9362	0.8779	0.7645	0.5928	0.3849	0.2571	0.2860	0.5161	0.7849	0.9253	0.9646	(94)
Useful gains	593.6348	619.7367	621.6093	576.1647	453.1281	292.4327	185.3456	196.6401	334.8761	475.8505	542.9547	573.9337	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	856.7390	830.2847	741.2233	621.2731	461.8631	292.9755	185.3807	196.7088	337.9496	519.3922	706.4863	859.2089	(97)
Space heating kWh	195.7496	141.4882	88.9928	32.4781	6.4989	0.0000	0.0000	0.0000	0.0000	32.3950	117.7427	212.2447	(98a)
Space heating requirement - total per year (kWh/year)												827.5900	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	195.7496	141.4882	88.9928	32.4781	6.4989	0.0000	0.0000	0.0000	0.0000	32.3950	117.7427	212.2447	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												827.5900	
Space heating per m2											(98c) / (4) =	10.3475	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	195.7496	141.4882	88.9928	32.4781	6.4989	0.0000	0.0000	0.0000	0.0000	32.3950	117.7427	212.2447	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	219.9433	158.9756	99.9919	36.4922	7.3021	0.0000	0.0000	0.0000	0.0000	36.3989	132.2952	238.4772	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	225.9323	199.1235	209.9128	180.7742	172.6430	152.7534	148.7564	156.2655	159.7447	181.4891	197.0762	222.9772	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.0810	87.9982	87.7993	87.5547	87.3605	87.3000	87.3000	87.3000	87.3000	87.5533	87.9281	88.1208	(217)
Fuel for water heating, kWh/month	256.5051	226.2812	239.0825	206.4701	197.6213	174.9753	170.3968	178.9983	182.9836	207.2899	224.1332	253.0357	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	9.1721	8.2844	9.1721	8.8762	9.1721	8.8762	9.1721	9.1721	8.8762	9.1721	8.8762	9.1721	(231)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	929.8764	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2517.7729	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	107.9935	(231)
Electricity for lighting (calculated in Appendix L)	206.9234	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		

Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3762.5662	(238)

10a. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	929.8764	6.5500	60.9069	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2517.7729	6.5500	164.9141	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	107.9935	28.4300	30.7026	(249)
Energy for lighting	206.9234	28.4300	58.8283	(250)
Additional standing charges			104.0000	(251)
Total energy cost			419.3519	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	929.8764	0.2100	195.2740	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2517.7729	0.2100	528.7323	(264)
Space and water heating			724.0064	(265)
Pumps, fans and electric keep-hot	107.9935	0.1387	14.9800	(267)
Energy for lighting	206.9234	0.1443	29.8654	(268)
Total CO2, kg/year			768.8518	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	929.8764	1.1300	1050.7603	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2517.7729	1.1300	2845.0834	(278)
Space and water heating			3895.8437	(279)
Pumps, fans and electric keep-hot	107.9935	1.5128	163.3726	(281)
Energy for lighting	206.9234	1.5338	317.3860	(282)
Total Primary energy kWh/year			4376.6023	(286)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.70	**TER**	11.14
Environmental	99 A	**% DER < TER**			84.74
CO_2 Emissions (t/year)	0.11	**DFEE**	20.17	**TFEE**	27.28
Compliance Check	See BREL	**% DFEE < TFEE**			26.07
% DPER < TPER	62.08	**DPER**	22.38	**TPER**	59.02

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			15583.4798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.2856	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.6117	146.8201	132.6117	137.0321	132.6117	137.0321	132.6117	132.6117	137.0321	132.6117	137.0321	132.6117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	565.9813	580.0257	555.3786	537.2808	511.1311	494.4637	476.3107	477.3819	491.4645	506.5784	536.2944	554.9833	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.6000	10.6334	0.6800	0.7000	0.7700	26.6579	(74)
Solar gains	26.6579	50.9446	86.5673	139.0493	187.3121	200.5231	187.2140	148.5304	104.0819	60.6429	32.8859	22.2233	(83)
Total gains	592.6391	630.9703	641.9459	676.3301	698.4431	694.9868	663.5246	625.9122	595.5465	567.2212	569.1804	577.2066	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9776	0.9648	0.9412	0.8648	0.7160	0.5171	0.3752	0.4153	0.6383	0.8749	0.9574	0.9808	(86)
MIT	20.3399	20.4540	20.6088	20.8187	20.9516	20.9940	20.9993	20.9987	20.9804	20.8326	20.5634	20.3059	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9730	0.9577	0.9292	0.8399	0.6744	0.4651	0.3186	0.3557	0.5829	0.8467	0.9477	0.9767	(89)
MIT 2	19.5671	19.7095	19.9008	20.1490	20.2913	20.3294	20.3330	20.3327	20.3192	20.1687	19.8475	19.5244	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.7852	19.9196	20.1006	20.3380	20.4776	20.5170	20.5210	20.5206	20.5058	20.3561	20.0495	19.7449	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7852	19.9196	20.1006	20.3380	20.4776	20.5170	20.5210	20.5206	20.5058	20.3561	20.0495	19.7449	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9683	0.9526	0.9245	0.8401	0.6837	0.4795	0.3346	0.3725	0.5975	0.8478	0.9429	0.9724	(94)
Useful gains	573.8748	601.0363	593.4814	568.1852	477.5194	333.2459	222.0087	233.1484	355.8474	480.8649	536.6538	561.2665	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	877.5196	851.1332	770.7219	648.1725	497.4128	335.3035	222.1971	233.5090	363.0049	552.8600	733.8258	880.9055	(97)
Space heating kWh	225.9117	168.0651	131.8670	57.5909	14.8007	0.0000	0.0000	0.0000	0.0000	53.5643	141.9638	237.8114	(98a)
Space heating requirement - total per year (kWh/year)												1031.5749	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	225.9117	168.0651	131.8670	57.5909	14.8007	0.0000	0.0000	0.0000	0.0000	53.5643	141.9638	237.8114	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1031.5749	
Space heating per m2										(98c) / (4) =		12.8979	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

225.9117	168.0651	131.8670	57.5909	14.8007	0.0000	0.0000	0.0000	0.0000	53.5643	141.9638	237.8114	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a 338.8676	252.0977	197.8005	86.3863	22.2010	0.0000	0.0000	0.0000	0.0000	80.3465	212.9457	356.7172	
Space heating requirement												
338.8676	252.0977	197.8005	86.3863	22.2010	0.0000	0.0000	0.0000	0.0000	80.3465	212.9457	356.7172	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a 400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel												
400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio											0.0000	(314)
Space coolin 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa 1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting 25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m -15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m -4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1547.3624	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	15.4736	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4855.1858	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1489.1973	0.1566	64.6254	(367)
Electrical energy for heat distribution (space & water)	15.4736	0.0000	8.1112	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			224.4088	(373)
Space and water heating			224.4088	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			135.9272	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.7000	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1489.1973	1.5798	651.8873	(467)
Electrical energy for heat distribution (space & water)	15.4736	0.0000	85.8481	(472)
Overall CO2 factor for heat network			0.4253	(486)
Total CO2 associated with community systems			2375.1312	(473)
Space and water heating			2375.1312	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	1.4873	-726.6034	
PV Unit electricity exported	-469.6869	0.4449	-208.9838	
Total			-935.5872	(480)
Total Primary energy kWh/year			1790.2018	(483)
Dwelling Primary energy Rate (DPER)			22.3800	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type			7.6000	1.1450	8.7023			(27)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.1800	5.4450			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
500mm mineral wool	39.9900		39.9900	0.1100	4.3989			(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7164			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.7300	0.0500	0.3365
E3 Sill	5.8800	0.0500	0.2940
E4 Jamb	10.3200	0.0500	0.5160
E6 Intermediate floor within a dwelling	14.1900	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	11.4900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
E7 Party floor between dwellings (in blocks of flats)	14.1900	0.0700	0.9933
P4 Party wall - Roof (insulation at ceiling level)	11.4900	0.1200	1.3788
E10 Eaves (insulation at ceiling level)	8.7100	0.0600	0.5226
E12 Gable (insulation at ceiling level)	5.4100	0.0600	0.3246

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.6278	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	32.3442	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	68.8609	68.6984	68.5391	67.7910	67.6510	66.9994	66.9994	66.8787	67.2504	67.6510	67.9342	68.2302	(39)
Average = Sum(39)m / 12 =												67.7903	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8610	0.8589	0.8570	0.8476	0.8458	0.8377	0.8377	0.8362	0.8408	0.8458	0.8494	0.8531	(40)
HLP (average)												0.8476	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
									Total per year (kWh/year) = Sum(64)m =			2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.1468	142.9840	129.1468	133.4517	129.1468	133.4517	129.1468	129.1468	133.4517	129.1468	133.4517	129.1468	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													

	556.1810	569.8542	545.5784	527.3650	501.3308	481.5479	463.5104	464.5816	478.5488	496.7781	526.3787	545.1830 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.6000	10.6334	0.6300	0.7000	0.7700	24.6977	(74)

Solar gains	24.6977	47.1986	80.2020	128.8250	173.5391	185.7788	173.4482	137.6090	96.4288	56.1838	30.4678	20.5893 (83)
Total gains	580.8787	617.0528	625.7804	656.1901	674.8699	667.3267	636.9586	602.1906	574.9776	552.9619	556.8465	565.7723 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.8622	63.0109	63.1573	63.8543	63.9864	64.6087	64.6087	64.7253	64.3676	63.9864	63.7197	63.4432	
alpha	5.1908	5.2007	5.2105	5.2570	5.2658	5.3072	5.3072	5.3150	5.2912	5.2658	5.2480	5.2295	
util living area	0.9855	0.9782	0.9648	0.9178	0.8095	0.6192	0.4586	0.5037	0.7394	0.9227	0.9733	0.9872	(86)
MIT	19.9986	20.1283	20.3229	20.6207	20.8559	20.9728	20.9953	20.9925	20.9322	20.6635	20.3005	19.9790	(87)
Th 2	20.2008	20.2025	20.2042	20.2123	20.2138	20.2208	20.2208	20.2221	20.2181	20.2138	20.2107	20.2076	(88)
util rest of house	0.9822	0.9732	0.9563	0.8979	0.7672	0.5522	0.3794	0.4219	0.6761	0.9001	0.9663	0.9843	(89)
MIT 2	19.0339	19.1991	19.4451	19.8157	20.0838	20.2027	20.2188	20.2186	20.1674	19.8729	19.4241	19.0142	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.3061	19.4613	19.6928	20.0428	20.3017	20.4200	20.4379	20.4370	20.3832	20.0960	19.6714	19.2865	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3061	19.4613	19.6928	20.0428	20.3017	20.4200	20.4379	20.4370	20.3832	20.0960	19.6714	19.2865	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9773	0.9673	0.9496	0.8930	0.7723	0.5698	0.4017	0.4448	0.6903	0.8962	0.9604	0.9798	(94)
Useful gains	567.7155	596.8814	594.2640	585.9839	521.1921	380.2475	255.8896	267.8796	396.9034	495.5746	534.7847	554.3569	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1033.3357	1000.3365	904.2227	755.3840	581.9113	389.9354	257.1378	269.9886	422.5484	642.4155	854.0296	1029.3522	(97)
Space heating kWh	346.4215	271.1218	230.6093	121.9681	45.1751	0.0000	0.0000	0.0000	0.0000	109.2496	229.8563	353.3965	(98a)
Space heating requirement - total per year (kWh/year)												1707.7981	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	346.4215	271.1218	230.6093	121.9681	45.1751	0.0000	0.0000	0.0000	0.0000	109.2496	229.8563	353.3965	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1707.7981	
Space heating per m2											(98c) / (4) =	21.3528	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	346.4215	271.1218	230.6093	121.9681	45.1751	0.0000	0.0000	0.0000	0.0000	109.2496	229.8563	353.3965	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	375.3212	293.7398	249.8475	132.1431	48.9438	0.0000	0.0000	0.0000	0.0000	118.3636	249.0317	382.8782	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9921	84.7221	84.2220	83.1015	81.4290	79.8000	79.8000	79.8000	79.8000	82.8493	84.3379	85.0589	(217)
Fuel for water heating, kWh/month	268.6313	238.2509	254.7401	227.6582	225.5934	207.8751	205.6450	213.6686	215.8200	231.2480	240.8270	265.6065	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	26.8342	21.5274	19.3830	14.2008	10.9691	8.9619	10.0064	13.0067	16.8944	22.1664	25.0369	27.5800	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3597	-31.5987	-47.6203	-56.2064	-62.9289	-59.5773	-58.8595	-54.4329	-47.0022	-37.3178	-24.0087	-18.2981	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9169	-17.0101	-34.4870	-52.8069	-70.8246	-71.5366	-70.6859	-59.3742	-42.9070	-24.6402	-10.6698	-6.2334	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1850.2688	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2795.5642	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	216.5670	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3960.0970	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1850.2688	0.2100	388.5565	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2795.5642	0.2100	587.0685	(264)
Space and water heating			975.6249	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	216.5670	0.1443	31.2573	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	0.1336	-69.3640	
PV Unit electricity exported	-469.0927	0.1253	-58.7938	
Total			-128.1578	(269)
Total CO2, kg/year			890.6537	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.1400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1850.2688	1.1300	2090.8038	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2795.5642	1.1300	3158.9875	(278)
Space and water heating			5249.7913	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	216.5670	1.5338	332.1777	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	1.4937	-775.5387	
PV Unit electricity exported	-469.0927	0.4600	-215.8009	
Total			-991.3396	(283)
Total Primary energy kWh/year			4720.7302	(286)
Target Primary Energy Rate (TPER)			59.0200	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.70	**TER**	11.14
Environmental	99 A	**% DER < TER**			84.74
CO_2 Emissions (t/year)	0.11	**DFEE**	20.17	**TFEE**	27.28
Compliance Check	See BREL	**% DFEE < TFEE**			26.07
% DPER < TPER	62.08	**DPER**	22.38	**TPER**	59.02

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2122	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2705	0.2652	0.2599	0.2334	0.2281	0.2016	0.2016	0.1963	0.2122	0.2281	0.2387	0.2493	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5366	0.5352	0.5338	0.5272	0.5260	0.5203	0.5203	0.5193	0.5225	0.5260	0.5285	0.5311	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15583.4798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							3.2856	(36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.6979	34.6061	34.5160	34.0930	34.0139	33.6455	33.6455	33.5772	33.7874	34.0139	34.1740	34.3414	(38)
Heat transfer coeff	59.0343	58.9424	58.8524	58.4294	58.3502	57.9818	57.9818	57.9136	58.1237	58.3502	58.5103	58.6777	(39)
Average = Sum(39)m / 12 =												58.4290	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7381	0.7370	0.7358	0.7305	0.7296	0.7250	0.7250	0.7241	0.7267	0.7296	0.7316	0.7337	(40)
HLP (average)												0.7305	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
								Total per year (kWh/year) = Sum(64)m =			881.7040	(64)
12Total per year (kWh/year)											882	(64)

Electric shower(s)

52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
				Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							596.7355	(64a)

Heat gains from water heating, kWh/month

36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.6117	146.8201	132.6117	137.0321	132.6117	137.0321	132.6117	132.6117	137.0321	132.6117	137.0321	132.6117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains	460.3995	475.6643	453.8350	442.5318	420.3791	407.9331	392.6658	391.8132	403.5720	413.9765	437.2071	450.3260	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.6000	10.6334	0.6800	0.7000	0.7700	26.6579	(74)

Solar gains	26.6579	50.9446	86.5673	139.0493	187.3121	200.5231	187.2140	148.5304	104.0819	60.6429	32.8859	22.2233	(83)
Total gains	487.0574	526.6089	540.4023	581.5811	607.6911	608.4562	579.8797	540.3435	507.6539	474.6193	470.0930	472.5493	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.3259	73.4402	73.5526	74.0851	74.1855	74.6569	74.6569	74.7449	74.4746	74.1855	73.9825	73.7715	
alpha	5.8884	5.8960	5.9035	5.9390	5.9457	5.9771	5.9771	5.9830	5.9650	5.9457	5.9322	5.9181	
util living area	0.9920	0.9859	0.9742	0.9250	0.8034	0.5971	0.4381	0.4894	0.7396	0.9383	0.9833	0.9932	(86)
MIT	20.1023	20.2323	20.4159	20.6976	20.9026	20.9861	20.9981	20.9965	20.9542	20.7110	20.3721	20.0768	(87)

Th 2	20.3073	20.3083	20.3093	20.3139	20.3148	20.3188	20.3188	20.3196	20.3173	20.3148	20.3130	20.3112	(88)
util rest of house	0.9901	0.9827	0.9680	0.9075	0.7640	0.5383	0.3712	0.4187	0.6820	0.9201	0.9788	0.9917	(89)
MIT 2	19.4810	19.6104	19.7918	20.0650	20.2461	20.3116	20.3182	20.3183	20.2902	20.0819	19.7533	19.4589	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.6563	19.7859	19.9679	20.2435	20.4314	20.5019	20.5101	20.5097	20.4776	20.2594	19.9279	19.6333	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6563	19.7859	19.9679	20.2435	20.4314	20.5019	20.5101	20.5097	20.4776	20.2594	19.9279	19.6333	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9879	0.9797	0.9643	0.9055	0.7711	0.5544	0.3901	0.4386	0.6962	0.9185	0.9758	0.9897	(94)
Useful gains	481.1660	515.9146	521.1090	526.5942	468.5906	337.3131	226.2076	237.0155	353.4284	435.9155	458.7029	467.6838	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	906.5484	877.4119	792.6196	662.7954	509.4767	342.2029	226.7122	238.0049	370.6876	563.6295	750.5662	905.5902	(97)
Space heating kWh	316.4845	242.9262	202.0039	98.0649	30.4193	0.0000	0.0000	0.0000	0.0000	95.0192	210.1415	325.8023	(98a)
Space heating requirement - total per year (kWh/year)												1520.8618	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	316.4845	242.9262	202.0039	98.0649	30.4193	0.0000	0.0000	0.0000	0.0000	95.0192	210.1415	325.8023	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1520.8618	
Space heating per m2											(98c) / (4) =	19.0155	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	545.0293	429.0656	440.1434	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9176	0.9614	0.9421	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	500.1218	412.5143	414.6587	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	644.0426	613.8060	570.3767	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	103.6230	149.7610	115.8542	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction											fC = cooled area / (4) =	1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	25.9057	37.4402	28.9635	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												92.3095	(107)
Energy for space heating												19.0155	(99)
Energy for space cooling												1.1542	(108)
Total												20.1697	(109)
Fabric Energy Efficiency (DFEE)												20.2	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type			7.6000	1.1450	8.7023			(27)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.1800	5.4450			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
500mm mineral wool	39.9900		39.9900	0.1100	4.3989			(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7164			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 194.8422 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.7300	0.0500	0.3365
E3 Sill	5.8800	0.0500	0.2940
E4 Jamb	10.3200	0.0500	0.5160
E6 Intermediate floor within a dwelling	14.1900	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	11.4900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
E7 Party floor between dwellings (in blocks of flats)	14.1900	0.0700	0.9933
P4 Party wall - Roof (insulation at ceiling level)	11.4900	0.1200	1.3788
E10 Eaves (insulation at ceiling level)	8.7100	0.0600	0.5226
E12 Gable (insulation at ceiling level)	5.4100	0.0600	0.3246

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.6278 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.3442 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	68.8609	68.6984	68.5391	67.7910	67.6510	66.9994	66.9994	66.8787	67.2504	67.6510	67.9342	68.2302	(39)
Average = Sum(39)m / 12 =												67.7903	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8610	0.8589	0.8570	0.8476	0.8458	0.8377	0.8377	0.8362	0.8408	0.8458	0.8494	0.8531	(40)
HLP (average)												0.8476	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	129.1468	142.9840	129.1468	133.4517	129.1468	133.4517	129.1468	129.1468	133.4517	129.1468	133.4517	129.1468 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993 (71)

Water heating gains (Table 5)

	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587 (72)

Total internal gains

	456.9346	471.8282	450.3701	438.9514	416.9142	404.3527	389.2009	388.3482	399.9916	410.5116	433.6267	446.8611 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.6000	10.6334	0.6300	0.7000	0.7700	24.6977	(74)

Solar gains	24.6977	47.1986	80.2020	128.8250	173.5391	185.7788	173.4482	137.6090	96.4288	56.1838	30.4678	20.5893 (83)
Total gains	481.6323	519.0268	530.5721	567.7764	590.4533	590.1314	562.6491	525.9573	496.4204	466.6954	464.0945	467.4503 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.8622	63.0109	63.1573	63.8543	63.9864	64.6087	64.6087	64.7253	64.3676	63.9864	63.7197	63.4432	
alpha	5.1908	5.2007	5.2105	5.2570	5.2658	5.3072	5.3072	5.3150	5.2912	5.2658	5.2480	5.2295	
util living area	0.9936	0.9895	0.9819	0.9506	0.8658	0.6845	0.5157	0.5704	0.8114	0.9580	0.9876	0.9945	(86)
MIT	19.8358	19.9722	20.1793	20.5119	20.7948	20.9567	20.9919	20.9867	20.8933	20.5537	20.1551	19.8163	(87)
Th 2	20.2008	20.2025	20.2042	20.2123	20.2138	20.2208	20.2208	20.2221	20.2181	20.2138	20.2107	20.2076	(88)
util rest of house	0.9921	0.9869	0.9772	0.9369	0.8298	0.6155	0.4283	0.4805	0.7530	0.9438	0.9841	0.9932	(89)
MIT 2	19.1307	19.2674	19.4738	19.8036	20.0641	20.1975	20.2180	20.2171	20.1525	19.8485	19.4562	19.1167	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.3296	19.4663	19.6729	20.0035	20.2703	20.4117	20.4364	20.4342	20.3616	20.0475	19.6534	19.3141	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3296	19.4663	19.6729	20.0035	20.2703	20.4117	20.4364	20.4342	20.3616	20.0475	19.6534	19.3141	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9898	0.9839	0.9732	0.9327	0.8326	0.6332	0.4529	0.5057	0.7647	0.9401	0.9809	0.9912	(94)
Useful gains	476.7325	510.6641	516.3383	529.5423	491.6380	373.6620	254.8370	265.9662	379.6137	438.7562	455.2138	463.3422	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1034.9545	1000.6820	902.8594	752.7184	579.7882	389.3833	257.0364	269.8054	421.0920	639.1307	852.8045	1031.2390	(97)
Space heating kWh	415.3172	329.2920	287.5717	160.6868	65.5837	0.0000	0.0000	0.0000	0.0000	149.0786	286.2653	422.5152	(98a)
Space heating requirement - total per year (kWh/year)												2116.3106	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	415.3172	329.2920	287.5717	160.6868	65.5837	0.0000	0.0000	0.0000	0.0000	149.0786	286.2653	422.5152	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2116.3106	
Space heating per m2										(98c) / (4) =		26.4605	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	629.7941	495.7954	508.2782	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8392	0.9085	0.8776	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	528.5494	450.4495	446.0803	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	626.5058	597.3886	557.1856	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	70.5286	109.3226	82.6623	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	17.6322	27.3307	20.6656	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												65.6284	(107)
Energy for space heating												26.4605	(99)
Energy for space cooling												0.8206	(108)
Total												27.2811	(109)
Fabric Energy Efficiency (TFEE)												27.3	(109)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.70	**TER**	11.14
Environmental	99 A	**% DER < TER**			84.74
CO_2 Emissions (t/year)	0.11	**DFEE**	20.17	**TFEE**	27.28
Compliance Check	See BREL	**% DFEE < TFEE**			26.07
% DPER < TPER	62.08	**DPER**	22.38	**TPER**	59.02

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			15583.4798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.2856	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.6117	146.8201	132.6117	137.0321	132.6117	137.0321	132.6117	132.6117	137.0321	132.6117	137.0321	132.6117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	565.9813	580.0257	555.3786	537.2808	511.1311	494.4637	476.3107	477.3819	491.4645	506.5784	536.2944	554.9833	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.6000	10.6334	0.6800	0.7000	0.7700	26.6579	(74)
Solar gains	26.6579	50.9446	86.5673	139.0493	187.3121	200.5231	187.2140	148.5304	104.0819	60.6429	32.8859	22.2233	(83)
Total gains	592.6391	630.9703	641.9459	676.3301	698.4431	694.9868	663.5246	625.9122	595.5465	567.2212	569.1804	577.2066	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9776	0.9648	0.9412	0.8648	0.7160	0.5171	0.3752	0.4153	0.6383	0.8749	0.9574	0.9808	(86)
MIT	20.3399	20.4540	20.6088	20.8187	20.9516	20.9940	20.9993	20.9987	20.9804	20.8326	20.5634	20.3059	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9730	0.9577	0.9292	0.8399	0.6744	0.4651	0.3186	0.3557	0.5829	0.8467	0.9477	0.9767	(89)
MIT 2	19.5671	19.7095	19.9008	20.1490	20.2913	20.3294	20.3330	20.3327	20.3192	20.1687	19.8475	19.5244	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.7852	19.9196	20.1006	20.3380	20.4776	20.5170	20.5210	20.5206	20.5058	20.3561	20.0495	19.7449	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7852	19.9196	20.1006	20.3380	20.4776	20.5170	20.5210	20.5206	20.5058	20.3561	20.0495	19.7449	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9683	0.9526	0.9245	0.8401	0.6837	0.4795	0.3346	0.3725	0.5975	0.8478	0.9429	0.9724	(94)
Useful gains	573.8748	601.0363	593.4814	568.1852	477.5194	333.2459	222.0087	233.1484	355.8474	480.8649	536.6538	561.2665	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	877.5196	851.1332	770.7219	648.1725	497.4128	335.3035	222.1971	233.5090	363.0049	552.8600	733.8258	880.9055	(97)
Space heating kWh	225.9117	168.0651	131.8670	57.5909	14.8007	0.0000	0.0000	0.0000	0.0000	53.5643	141.9638	237.8114	(98a)
Space heating requirement - total per year (kWh/year)												1031.5749	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	225.9117	168.0651	131.8670	57.5909	14.8007	0.0000	0.0000	0.0000	0.0000	53.5643	141.9638	237.8114	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1031.5749	
Space heating per m2										(98c) / (4) =		12.8979	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

225.9117	168.0651	131.8670	57.5909	14.8007	0.0000	0.0000	0.0000	0.0000	53.5643	141.9638	237.8114	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a 338.8676	252.0977	197.8005	86.3863	22.2010	0.0000	0.0000	0.0000	0.0000	80.3465	212.9457	356.7172	
Space heating requirement												
338.8676	252.0977	197.8005	86.3863	22.2010	0.0000	0.0000	0.0000	0.0000	80.3465	212.9457	356.7172	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a 400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel												
400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio											0.0000	(314)
Space coolin 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa 1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting 25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m -15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m -4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1547.3624	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	15.4736	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4855.1858	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1489.1973	0.1566	64.6254	(367)
Electrical energy for heat distribution (space & water)	15.4736	0.0000	8.1112	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			224.4088	(373)
Space and water heating			224.4088	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			135.9272	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.7000	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1489.1973	1.5798	651.8873	(467)
Electrical energy for heat distribution (space & water)	15.4736	0.0000	85.8481	(472)
Overall CO2 factor for heat network			0.4253	(486)
Total CO2 associated with community systems			2375.1312	(473)
Space and water heating			2375.1312	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	1.4873	-726.6034	
PV Unit electricity exported	-469.6869	0.4449	-208.9838	
Total			-935.5872	(480)
Total Primary energy kWh/year			1790.2018	(483)
Dwelling Primary energy Rate (DPER)			22.3800	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type			7.6000	1.1450	8.7023			(27)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.1800	5.4450			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
500mm mineral wool	39.9900		39.9900	0.1100	4.3989			(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7164			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.7300	0.0500	0.3365
E3 Sill	5.8800	0.0500	0.2940
E4 Jamb	10.3200	0.0500	0.5160
E6 Intermediate floor within a dwelling	14.1900	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	11.4900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
E7 Party floor between dwellings (in blocks of flats)	14.1900	0.0700	0.9933
P4 Party wall - Roof (insulation at ceiling level)	11.4900	0.1200	1.3788
E10 Eaves (insulation at ceiling level)	8.7100	0.0600	0.5226
E12 Gable (insulation at ceiling level)	5.4100	0.0600	0.3246

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.6278	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	32.3442	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	68.8609	68.6984	68.5391	67.7910	67.6510	66.9994	66.9994	66.8787	67.2504	67.6510	67.9342	68.2302	(39)
Average = Sum(39)m / 12 =												67.7903	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8610	0.8589	0.8570	0.8476	0.8458	0.8377	0.8377	0.8362	0.8408	0.8458	0.8494	0.8531	(40)
HLP (average)												0.8476	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
									Total per year (kWh/year) = Sum(64)m =			2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.1468	142.9840	129.1468	133.4517	129.1468	133.4517	129.1468	129.1468	133.4517	129.1468	133.4517	129.1468	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													

	556.1810	569.8542	545.5784	527.3650	501.3308	481.5479	463.5104	464.5816	478.5488	496.7781	526.3787	545.1830 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.6000	10.6334	0.6300	0.7000	0.7700	24.6977	(74)

Solar gains	24.6977	47.1986	80.2020	128.8250	173.5391	185.7788	173.4482	137.6090	96.4288	56.1838	30.4678	20.5893 (83)
Total gains	580.8787	617.0528	625.7804	656.1901	674.8699	667.3267	636.9586	602.1906	574.9776	552.9619	556.8465	565.7723 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.8622	63.0109	63.1573	63.8543	63.9864	64.6087	64.6087	64.7253	64.3676	63.9864	63.7197	63.4432	
alpha	5.1908	5.2007	5.2105	5.2570	5.2658	5.3072	5.3072	5.3150	5.2912	5.2658	5.2480	5.2295	
util living area	0.9855	0.9782	0.9648	0.9178	0.8095	0.6192	0.4586	0.5037	0.7394	0.9227	0.9733	0.9872	(86)
MIT	19.9986	20.1283	20.3229	20.6207	20.8559	20.9728	20.9953	20.9925	20.9322	20.6635	20.3005	19.9790	(87)
Th 2	20.2008	20.2025	20.2042	20.2123	20.2138	20.2208	20.2208	20.2221	20.2181	20.2138	20.2107	20.2076	(88)
util rest of house	0.9822	0.9732	0.9563	0.8979	0.7672	0.5522	0.3794	0.4219	0.6761	0.9001	0.9663	0.9843	(89)
MIT 2	19.0339	19.1991	19.4451	19.8157	20.0838	20.2027	20.2188	20.2186	20.1674	19.8729	19.4241	19.0142	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.3061	19.4613	19.6928	20.0428	20.3017	20.4200	20.4379	20.4370	20.3832	20.0960	19.6714	19.2865	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3061	19.4613	19.6928	20.0428	20.3017	20.4200	20.4379	20.4370	20.3832	20.0960	19.6714	19.2865	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9773	0.9673	0.9496	0.8930	0.7723	0.5698	0.4017	0.4448	0.6903	0.8962	0.9604	0.9798	(94)
Useful gains	567.7155	596.8814	594.2640	585.9839	521.1921	380.2475	255.8896	267.8796	396.9034	495.5746	534.7847	554.3569	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1033.3357	1000.3365	904.2227	755.3840	581.9113	389.9354	257.1378	269.9886	422.5484	642.4155	854.0296	1029.3522	(97)
Space heating kWh	346.4215	271.1218	230.6093	121.9681	45.1751	0.0000	0.0000	0.0000	0.0000	109.2496	229.8563	353.3965	(98a)
Space heating requirement - total per year (kWh/year)												1707.7981	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	346.4215	271.1218	230.6093	121.9681	45.1751	0.0000	0.0000	0.0000	0.0000	109.2496	229.8563	353.3965	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1707.7981	
Space heating per m2											(98c) / (4) =	21.3528	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	346.4215	271.1218	230.6093	121.9681	45.1751	0.0000	0.0000	0.0000	0.0000	109.2496	229.8563	353.3965	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	375.3212	293.7398	249.8475	132.1431	48.9438	0.0000	0.0000	0.0000	0.0000	118.3636	249.0317	382.8782	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9921	84.7221	84.2220	83.1015	81.4290	79.8000	79.8000	79.8000	79.8000	82.8493	84.3379	85.0589	(217)
Fuel for water heating, kWh/month	268.6313	238.2509	254.7401	227.6582	225.5934	207.8751	205.6450	213.6686	215.8200	231.2480	240.8270	265.6065	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	26.8342	21.5274	19.3830	14.2008	10.9691	8.9619	10.0064	13.0067	16.8944	22.1664	25.0369	27.5800	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3597	-31.5987	-47.6203	-56.2064	-62.9289	-59.5773	-58.8595	-54.4329	-47.0022	-37.3178	-24.0087	-18.2981	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9169	-17.0101	-34.4870	-52.8069	-70.8246	-71.5366	-70.6859	-59.3742	-42.9070	-24.6402	-10.6698	-6.2334	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1850.2688	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2795.5642	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	216.5670	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3960.0970	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1850.2688	0.2100	388.5565	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2795.5642	0.2100	587.0685	(264)
Space and water heating			975.6249	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	216.5670	0.1443	31.2573	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	0.1336	-69.3640	
PV Unit electricity exported	-469.0927	0.1253	-58.7938	
Total			-128.1578	(269)
Total CO2, kg/year			890.6537	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.1400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1850.2688	1.1300	2090.8038	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2795.5642	1.1300	3158.9875	(278)
Space and water heating			5249.7913	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	216.5670	1.5338	332.1777	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	1.4937	-775.5387	
PV Unit electricity exported	-469.0927	0.4600	-215.8009	
Total			-991.3396	(283)
Total Primary energy kWh/year			4720.7302	(286)
Target Primary Energy Rate (TPER)			59.0200	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.70	**TER**	11.14
Environmental	99 A	**% DER < TER**			84.74
CO_2 Emissions (t/year)	0.11	**DFEE**	20.17	**TFEE**	27.28
Compliance Check	See BREL	**% DFEE < TFEE**			26.07
% DPER < TPER	62.08	**DPER**	22.38	**TPER**	59.02

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised	
If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			15583.4798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.2856	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	612.2735	609.9558	591.8328	558.1588	524.7912	494.7014	477.0149	480.2399	497.5865	528.2765	565.2104	597.3217	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.6000	10.6334	0.6800	0.7000	0.7700	26.6579	(74)

Solar gains	26.6579	50.9446	86.5673	139.0493	187.3121	200.5231	187.2140	148.5304	104.0819	60.6429	32.8859	22.2233	(83)
Total gains	638.9314	660.9004	678.4001	697.2080	712.1033	695.2245	664.2288	628.7702	601.6684	588.9194	598.0963	619.5450	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9684	0.9570	0.9270	0.8517	0.7052	0.5169	0.3748	0.4134	0.6326	0.8593	0.9476	0.9732	(86)
MIT	20.4107	20.4966	20.6532	20.8348	20.9553	20.9940	20.9993	20.9987	20.9813	20.8502	20.6026	20.3722	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9621	0.9486	0.9130	0.8256	0.6635	0.4649	0.3183	0.3541	0.5774	0.8294	0.9361	0.9679	(89)
MIT 2	19.6551	19.7618	19.9536	20.1665	20.2947	20.3294	20.3330	20.3327	20.3199	20.1876	19.8948	19.6072	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.8684	19.9691	20.1510	20.3551	20.4811	20.5170	20.5210	20.5206	20.5065	20.3746	20.0945	19.8230	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8684	19.9691	20.1510	20.3551	20.4811	20.5170	20.5210	20.5206	20.5065	20.3746	20.0945	19.8230	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9570	0.9434	0.9087	0.8266	0.6731	0.4793	0.3342	0.3708	0.5921	0.8314	0.9314	0.9629	(94)
Useful gains	611.4697	623.4644	616.4950	576.2808	479.2870	333.2500	222.0099	233.1584	356.2251	489.6087	557.0852	596.5865	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	882.2319	853.9416	773.5791	649.1417	497.6124	335.3039	222.1973	233.5101	363.0468	553.9082	736.3771	885.3313	(97)
Space heating kWh	201.4471	154.8806	116.8706	52.4599	13.6341	0.0000	0.0000	0.0000	0.0000	47.8388	129.0902	214.8261	(98a)
Space heating requirement - total per year (kWh/year)												931.0474	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	201.4471	154.8806	116.8706	52.4599	13.6341	0.0000	0.0000	0.0000	0.0000	47.8388	129.0902	214.8261	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												931.0474	
Space heating per m2											(98c) / (4) =	11.6410	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	201.4471	154.8806	116.8706	52.4599	13.6341	0.0000	0.0000	0.0000	0.0000	47.8388	129.0902	214.8261	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	302.1706	232.3210	175.3059	78.6898	20.4512	0.0000	0.0000	0.0000	0.0000	71.7582	193.6353	322.2392	
Space heating requirement													
	302.1706	232.3210	175.3059	78.6898	20.4512	0.0000	0.0000	0.0000	0.0000	71.7582	193.6353	322.2392	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1396.5711	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												13.9657	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)
Total electricity for the above, kWh/year												21.9935	(331)
Electricity for lighting (calculated in Appendix L)												206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4704.3945	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1396.5711	4.4400	62.0078	(340a)
Space heating total			62.0078	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	206.9234	16.4900	34.1217	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	16.4900	-80.5593	
PV Unit electricity exported	-469.6869	5.5900	-26.2555	
Total			-106.8148	(352)
Total energy cost			264.1899	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7610 (357)
SAP value		87.6644
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1448.9863	0.1566	58.3259	(367)
Electrical energy for heat distribution (space & water)	13.9657	0.0000	7.8749	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			217.8732	(373)
Space and water heating			217.8732	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			129.3915	(383)
CO2 emissions per m2			1.6200	(384)
EI value			98.6127	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 79.9800						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate													
	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15583.4798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.2856	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539	(43)

Daily hot water use

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte 211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
								Total per year (kWh/year) = Sum(64)m =			2691.4183	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)

Heat gains from water heating, kWh/month

114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993 (71)
Water heating gains (Table 5)												
	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161 (72)
Total internal gains												
	612.2735	609.9558	591.8328	558.1588	524.7912	494.7014	477.0149	480.2399	497.5865	528.2765	565.2104	597.3217 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.6000	12.7500	0.6800	0.7000	0.7700	31.9642	(74)

Solar gains	31.9642	54.8336	92.8939	151.7588	196.7429	225.5506	206.8014	167.6006	118.2774	69.2036	38.9546	26.7280 (83)
Total gains	644.2377	664.7894	684.7267	709.9176	721.5341	720.2520	683.8163	647.8404	615.8638	597.4801	604.1650	624.0497 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area													
	0.9644	0.9522	0.9139	0.8280	0.6669	0.4542	0.3230	0.3582	0.5955	0.8306	0.9386	0.9700	(86)
MIT	20.4460	20.5282	20.6985	20.8648	20.9685	20.9973	20.9997	20.9995	20.9870	20.8835	20.6439	20.4070	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house													
	0.9574	0.9430	0.8976	0.7991	0.6231	0.4029	0.2679	0.3002	0.5397	0.7962	0.9252	0.9639	(89)
MIT 2	19.6992	19.8009	20.0079	20.1996	20.3072	20.3317	20.3332	20.3331	20.3244	20.2237	19.9450	19.6508	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.9099	20.0061	20.2028	20.3873	20.4938	20.5195	20.5213	20.5211	20.5113	20.4099	20.1422	19.8642	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9099	20.0061	20.2028	20.3873	20.4938	20.5195	20.5213	20.5211	20.5113	20.4099	20.1422	19.8642	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9522	0.9378	0.8941	0.8016	0.6339	0.4173	0.2834	0.3166	0.5548	0.8004	0.9209	0.9589	(94)
Useful gains	613.4606	623.4232	612.2022	569.0656	457.3621	300.5776	193.8145	205.0769	341.6974	478.2406	556.3775	598.3926	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	867.5859	839.0373	748.1815	628.2986	469.9957	301.4486	193.8788	205.2043	346.3194	527.5741	716.4137	870.6626	(97)
Space heating kWh													
	189.0692	144.8927	101.1686	42.6478	9.3994	0.0000	0.0000	0.0000	0.0000	36.7041	115.2261	202.5688	(98a)
Space heating requirement - total per year (kWh/year)												841.6767	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	189.0692	144.8927	101.1686	42.6478	9.3994	0.0000	0.0000	0.0000	0.0000	36.7041	115.2261	202.5688	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												841.6767	
Space heating per m2										(98c) / (4) =		10.5236	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												1.5000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement												
	189.0692	144.8927	101.1686	42.6478	9.3994	0.0000	0.0000	0.0000	0.0000	36.7041	115.2261	202.5688 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	283.6037	217.3390	151.7529	63.9717	14.0991	0.0000	0.0000	0.0000	0.0000	55.0562	172.8392	303.8533
Space heating requirement												
	283.6037	217.3390	151.7529	63.9717	14.0991	0.0000	0.0000	0.0000	0.0000	55.0562	172.8392	303.8533 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement												
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948
Water heating fuel												
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679 (331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-17.9904	-26.9468	-45.2798	-58.5762	-66.5604	-66.2871	-64.3781	-58.6940	-48.0761	-34.8334	-20.6614	-14.9764 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.0081	-13.0184	-31.9653	-58.9969	-82.6801	-94.8316	-90.1120	-72.5476	-46.2727	-22.1629	-8.3690	-4.5223	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1262.5151	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	12.6252	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4473.8124	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1262.5151	6.5500	82.6947	(340a)
Space heating total			82.6947	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	206.9234	28.4300	58.8283	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	28.4300	-148.7628	
PV Unit electricity exported	-531.4870	5.8100	-30.8794	
Total			-179.6422	(352)
Total energy cost			336.5654	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1413.2380	0.1571	52.8916	(367)
Electrical energy for heat distribution (space & water)	12.6252	0.0000	7.6711	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			212.2350	(373)
Space and water heating			212.2350	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	0.1322	-69.1719	
PV Unit electricity exported	-531.4870	0.1213	-64.4804	
Total			-133.6523	(380)
Total CO2, kg/year			111.4989	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1413.2380	1.5816	532.4836	(467)
Electrical energy for heat distribution (space & water)	12.6252	0.0000	81.3705	(472)
Overall CO2 factor for heat network			0.4248	(486)
Total CO2 associated with community systems			2251.2499	(473)
Space and water heating			2251.2499	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	1.4884	-778.8342	
PV Unit electricity exported	-531.4870	0.4450	-236.5330	
Total			-1015.3671	(480)
Total Primary energy kWh/year			1586.5406	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - East

Current energy efficiency rating:	B 88
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£65	£65	£0
Community scheme	£451	£451	£0
Space heating	£193	£193	£0
Water heating	£264	£264	£0
Lighting	£59	£59	£0
Generated (PV)	-£180	-£180	£0
Total cost of fuels	£336	£336	£0
Total cost of uses	£336	£336	£0
Delivered energy	56 kWh/m²	56 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	20 kWh/m²	20 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =		0.7000	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =		0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15583.4798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		194.8422 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.2856 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4625 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
									Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)

Water heating gains (Table 5)

154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)

Total internal gains

612.2735	609.9558	591.8328	558.1588	524.7912	494.7014	477.0149	480.2399	497.5865	528.2765	565.2104	597.3217	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.6000	10.6334	0.6800	0.7000	0.7700	26.6579	(74)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	26.6579	50.9446	86.5673	139.0493	187.3121	200.5231	187.2140	148.5304	104.0819	60.6429	32.8859	22.2233	(83)
Total gains	638.9314	660.9004	678.4001	697.2080	712.1033	695.2245	664.2288	628.7702	601.6684	588.9194	598.0963	619.5450	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9684	0.9570	0.9270	0.8517	0.7052	0.5169	0.3748	0.4134	0.6326	0.8593	0.9476	0.9732	(86)
MIT	20.4107	20.4966	20.6532	20.8348	20.9553	20.9940	20.9993	20.9987	20.9813	20.8502	20.6026	20.3722	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9621	0.9486	0.9130	0.8256	0.6635	0.4649	0.3183	0.3541	0.5774	0.8294	0.9361	0.9679	(89)
MIT 2	19.6551	19.7618	19.9536	20.1665	20.2947	20.3294	20.3330	20.3327	20.3199	20.1876	19.8948	19.6072	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.8684	19.9691	20.1510	20.3551	20.4811	20.5170	20.5210	20.5206	20.5065	20.3746	20.0945	19.8230	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8684	19.9691	20.1510	20.3551	20.4811	20.5170	20.5210	20.5206	20.5065	20.3746	20.0945	19.8230	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9570	0.9434	0.9087	0.8266	0.6731	0.4793	0.3342	0.3708	0.5921	0.8314	0.9314	0.9629	(94)
Useful gains	611.4697	623.4644	616.4950	576.2808	479.2870	333.2500	222.0099	233.1584	356.2251	489.6087	557.0852	596.5865	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	882.2319	853.9416	773.5791	649.1417	497.6124	335.3039	222.1973	233.5101	363.0468	553.9082	736.3771	885.3313	(97)
Space heating kWh	201.4471	154.8806	116.8706	52.4599	13.6341	0.0000	0.0000	0.0000	0.0000	47.8388	129.0902	214.8261	(98a)
Space heating requirement - total per year (kWh/year)												931.0474	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	201.4471	154.8806	116.8706	52.4599	13.6341	0.0000	0.0000	0.0000	0.0000	47.8388	129.0902	214.8261	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												931.0474	
Space heating per m2											(98c) / (4) =	11.6410	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	201.4471	154.8806	116.8706	52.4599	13.6341	0.0000	0.0000	0.0000	0.0000	47.8388	129.0902	214.8261	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	302.1706	232.3210	175.3059	78.6898	20.4512	0.0000	0.0000	0.0000	0.0000	71.7582	193.6353	322.2392	
Space heating requirement	302.1706	232.3210	175.3059	78.6898	20.4512	0.0000	0.0000	0.0000	0.0000	71.7582	193.6353	322.2392	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1396.5711	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												13.9657	(313)
Space cooling fuel												0.0000	(321)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)

mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4704.3945	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1396.5711	4.4400	62.0078	(340a)
Space heating total			62.0078	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	206.9234	16.4900	34.1217	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	16.4900	-80.5593	
PV Unit electricity exported	-469.6869	5.5900	-26.2555	
Total			-106.8148	(352)
Total energy cost			264.1899	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7610	(357)
SAP value		87.6644	
SAP rating (Section 12)		88	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1448.9863	0.1566	58.3259	(367)
Electrical energy for heat distribution (space & water)	13.9657	0.0000	7.8749	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			217.8732	(373)
Space and water heating			217.8732	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			129.3915	(383)
CO2 emissions per m2			1.6200	(384)
EI value			98.6127	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)

Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15583.4798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		194.8422 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.2856 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4625 (42)

Hot water usage for mixer showers

65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)
Total storage loss	

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

											Total per year (kWh/year) = Sum(64)m =	2691.4183	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000		(64a)
Heat gains from water heating, kWh/month													
114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207		(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains													
	612.2735	609.9558	591.8328	558.1588	524.7912	494.7014	477.0149	480.2399	497.5865	528.2765	565.2104	597.3217	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.6000	12.7500	0.6800	0.7000	0.7700	31.9642	(74)

Solar gains	31.9642	54.8336	92.8939	151.7588	196.7429	225.5506	206.8014	167.6006	118.2774	69.2036	38.9546	26.7280	(83)
Total gains	644.2377	664.7894	684.7267	709.9176	721.5341	720.2520	683.8163	647.8404	615.8638	597.4801	604.1650	624.0497	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area													
	0.9644	0.9522	0.9139	0.8280	0.6669	0.4542	0.3230	0.3582	0.5955	0.8306	0.9386	0.9700	(86)
MIT	20.4460	20.5282	20.6985	20.8648	20.9685	20.9973	20.9997	20.9995	20.9870	20.8835	20.6439	20.4070	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house													
	0.9574	0.9430	0.8976	0.7991	0.6231	0.4029	0.2679	0.3002	0.5397	0.7962	0.9252	0.9639	(89)
MIT 2	19.6992	19.8009	20.0079	20.1996	20.3072	20.3317	20.3332	20.3331	20.3244	20.2237	19.9450	19.6508	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.9099	20.0061	20.2028	20.3873	20.4938	20.5195	20.5213	20.5211	20.5113	20.4099	20.1422	19.8642	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9099	20.0061	20.2028	20.3873	20.4938	20.5195	20.5213	20.5211	20.5113	20.4099	20.1422	19.8642	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9522	0.9378	0.8941	0.8016	0.6339	0.4173	0.2834	0.3166	0.5548	0.8004	0.9209	0.9589	(94)
Useful gains	613.4606	623.4232	612.2022	569.0656	457.3621	300.5776	193.8145	205.0769	341.6974	478.2406	556.3775	598.3926	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	867.5859	839.0373	748.1815	628.2986	469.9957	301.4486	193.8788	205.2043	346.3194	527.5741	716.4137	870.6626	(97)
Space heating kWh													
	189.0692	144.8927	101.1686	42.6478	9.3994	0.0000	0.0000	0.0000	0.0000	36.7041	115.2261	202.5688	(98a)
Space heating requirement - total per year (kWh/year)												841.6767	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	189.0692	144.8927	101.1686	42.6478	9.3994	0.0000	0.0000	0.0000	0.0000	36.7041	115.2261	202.5688	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												841.6767	
Space heating per m2											(98c) / (4) =	10.5236	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	189.0692	144.8927	101.1686	42.6478	9.3994	0.0000	0.0000	0.0000	0.0000	36.7041	115.2261	202.5688	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	283.6037	217.3390	151.7529	63.9717	14.0991	0.0000	0.0000	0.0000	0.0000	55.0562	172.8392	303.8533	
Space heating requirement													
	283.6037	217.3390	151.7529	63.9717	14.0991	0.0000	0.0000	0.0000	0.0000	55.0562	172.8392	303.8533	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.9904	-26.9468	-45.2798	-58.5762	-66.5604	-66.2871	-64.3781	-58.6940	-48.0761	-34.8334	-20.6614	-14.9764	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.0081	-13.0184	-31.9653	-58.9969	-82.6801	-94.8316	-90.1120	-72.5476	-46.2727	-22.1629	-8.3690	-4.5223	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1262.5151	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												12.6252	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)
Total electricity for the above, kWh/year												21.9935	(331)
Electricity for lighting (calculated in Appendix L)												206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1054.7470	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4473.8124	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1262.5151	6.5500	82.6947	(340a)
Space heating total			82.6947	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	206.9234	28.4300	58.8283	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	28.4300	-148.7628	
PV Unit electricity exported	-531.4870	5.8100	-30.8794	
Total			-179.6422	(352)
Total energy cost			336.5654	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1413.2380	0.1571	52.8916	(367)
Electrical energy for heat distribution (space & water)	12.6252	0.0000	7.6711	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			212.2350	(373)
Space and water heating			212.2350	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	0.1322	-69.1719	
PV Unit electricity exported	-531.4870	0.1213	-64.4804	
Total			-133.6523	(380)
Total CO2, kg/year			111.4989	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1413.2380	1.5816	532.4836	(467)
Electrical energy for heat distribution (space & water)	12.6252	0.0000	81.3705	(472)
Overall CO2 factor for heat network			0.4248	(486)
Total CO2 associated with community systems			2251.2499	(473)
Space and water heating			2251.2499	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)

Energy saving/generation technologies			
PV Unit electricity used in dwelling	-523.2600	1.4884	-778.8342
PV Unit electricity exported	-531.4870	0.4450	-236.5330
Total			-1015.3671 (480)
Total Primary energy kWh/year			1586.5406 (483)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.60	**TER**	10.74
Environmental	99 A	**% DER < TER**			85.10
CO_2 Emissions (t/year)	0.1	**DFEE**	18.72	**TFEE**	25.56
Compliance Check	See BREL	**% DFEE < TFEE**			26.77
% DPER < TPER	62.38	**DPER**	21.39	**TPER**	56.87

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation		0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			15583.4798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.2856	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.6117	146.8201	132.6117	137.0321	132.6117	137.0321	132.6117	132.6117	137.0321	132.6117	137.0321	132.6117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	565.9813	580.0257	555.3786	537.2808	511.1311	494.4637	476.3107	477.3819	491.4645	506.5784	536.2944	554.9833	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	19.6403	0.6800	0.7000	0.7700	49.2381	(80)
Solar gains	49.2381	96.3201	158.6255	231.3459	283.5231	290.2363	276.3168	237.3520	184.4881	114.2919	61.3941	40.4910	(83)
Total gains	615.2193	676.3458	714.0042	768.6267	794.6541	784.7000	752.6275	714.7339	675.9526	620.8703	597.6885	595.4743	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9734	0.9526	0.9117	0.8056	0.6439	0.4599	0.3310	0.3642	0.5696	0.8357	0.9477	0.9777	(86)
MIT	20.3749	20.5178	20.6929	20.8804	20.9723	20.9968	20.9996	20.9994	20.9892	20.8732	20.6021	20.3348	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9680	0.9435	0.8958	0.7764	0.6029	0.4129	0.2810	0.3117	0.5177	0.8035	0.9363	0.9731	(89)
MIT 2	19.6107	19.7876	20.0002	20.2152	20.3100	20.3313	20.3331	20.3330	20.3258	20.2117	19.8941	19.5607	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.8264	19.9937	20.1957	20.4029	20.4969	20.5191	20.5212	20.5211	20.5130	20.3984	20.0939	19.7791	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8264	19.9937	20.1957	20.4029	20.4969	20.5191	20.5212	20.5211	20.5130	20.3984	20.0939	19.7791	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9631	0.9383	0.8922	0.7796	0.6132	0.4261	0.2951	0.3265	0.5319	0.8068	0.9316	0.9685	(94)
Useful gains	592.5008	634.5932	637.0264	599.2031	487.2474	334.3382	222.1168	233.3604	359.5340	500.9488	556.8060	576.7276	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	879.8541	855.3333	776.1130	651.8520	498.5043	335.4237	222.2095	233.5330	363.4131	555.2558	736.3423	882.8423	(97)
Space heating kWh	213.7908	148.3374	103.4804	37.9072	8.3751	0.0000	0.0000	0.0000	0.0000	40.4044	129.2662	227.7493	(98a)
Space heating requirement - total per year (kWh/year)												909.3108	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	213.7908	148.3374	103.4804	37.9072	8.3751	0.0000	0.0000	0.0000	0.0000	40.4044	129.2662	227.7493	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												909.3108	
Space heating per m2										(98c) / (4) =		11.3692	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	213.7908	148.3374	103.4804	37.9072	8.3751	0.0000	0.0000	0.0000	0.0000	40.4044	129.2662	227.7493 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	320.6862	222.5061	155.2206	56.8608	12.5627	0.0000	0.0000	0.0000	0.0000	60.6066	193.8992	341.6240
Space heating requirement												
	320.6862	222.5061	155.2206	56.8608	12.5627	0.0000	0.0000	0.0000	0.0000	60.6066	193.8992	341.6240 (307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement												
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948
Water heating fuel												
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679 (331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year	
Space heating fuel - community heating	1363.9662 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4037.1274 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	13.6397 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)	
mechanical ventilation fans (SFP = 0.0920)	21.9935 (330a)
Total electricity for the above, kWh/year	21.9935 (331)
Electricity for lighting (calculated in Appendix L)	206.9234 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-958.2209 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4671.7896 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1440.2916	0.1573	57.2312	(367)
Electrical energy for heat distribution (space & water)	13.6397	0.0000	7.8339	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			216.7374	(373)
Space and water heating			216.7374	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			128.2557	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6000	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1440.2916	1.5825	575.5913	(467)
Electrical energy for heat distribution (space & water)	13.6397	0.0000	82.9870	(472)
Overall CO2 factor for heat network			0.4251	(486)
Total CO2 associated with community systems			2295.9741	(473)
Space and water heating			2295.9741	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	1.4873	-726.6034	
PV Unit electricity exported	-469.6869	0.4449	-208.9838	
Total			-935.5872	(480)
Total Primary energy kWh/year			1711.0447	(483)
Dwelling Primary energy Rate (DPER)			21.3900	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type			7.6000	1.1450	8.7023			(27)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.1800	5.4450			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
500mm mineral wool	39.9900		39.9900	0.1100	4.3989			(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7164			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.7300	0.0500	0.3365
E3 Sill	5.8800	0.0500	0.2940
E4 Jamb	10.3200	0.0500	0.5160
E6 Intermediate floor within a dwelling	14.1900	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	11.4900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
E7 Party floor between dwellings (in blocks of flats)	14.1900	0.0700	0.9933
P4 Party wall - Roof (insulation at ceiling level)	11.4900	0.1200	1.3788
E10 Eaves (insulation at ceiling level)	8.7100	0.0600	0.5226
E12 Gable (insulation at ceiling level)	5.4100	0.0600	0.3246

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.6278	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	32.3442	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	68.8609	68.6984	68.5391	67.7910	67.6510	66.9994	66.9994	66.8787	67.2504	67.6510	67.9342	68.2302	(39)
Average = Sum(39)m / 12 =												67.7903	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8610	0.8589	0.8570	0.8476	0.8458	0.8377	0.8377	0.8362	0.8408	0.8458	0.8494	0.8531	(40)
HLP (average)												0.8476	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
									Total per year (kWh/year) = Sum(64)m =			2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.1468	142.9840	129.1468	133.4517	129.1468	133.4517	129.1468	129.1468	133.4517	129.1468	133.4517	129.1468	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													

	556.1810	569.8542	545.5784	527.3650	501.3308	481.5479	463.5104	464.5816	478.5488	496.7781	526.3787	545.1830 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	19.6403	0.6300	0.7000	0.7700	45.6176	(80)

Solar gains	45.6176	89.2378	146.9619	214.3352	262.6758	268.8954	255.9994	219.8997	170.9228	105.8881	56.8798	37.5137 (83)
Total gains	601.7986	659.0920	692.5403	741.7002	764.0066	750.4433	719.5098	684.4813	649.4715	602.6662	583.2585	582.6967 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.8622	63.0109	63.1573	63.8543	63.9864	64.6087	64.6087	64.7253	64.3676	63.9864	63.7197	63.4432	
alpha	5.1908	5.2007	5.2105	5.2570	5.2658	5.3072	5.3072	5.3150	5.2912	5.2658	5.2480	5.2295	
util living area	0.9832	0.9715	0.9484	0.8793	0.7492	0.5585	0.4076	0.4459	0.6753	0.8978	0.9679	0.9855	(86)
MIT	20.0319	20.1920	20.4150	20.7076	20.9012	20.9831	20.9973	20.9958	20.9557	20.7172	20.3397	20.0063	(87)
Th 2	20.2008	20.2025	20.2042	20.2123	20.2138	20.2208	20.2208	20.2221	20.2181	20.2138	20.2107	20.2076	(88)
util rest of house	0.9793	0.9652	0.9368	0.8539	0.7034	0.4953	0.3365	0.3722	0.6115	0.8706	0.9597	0.9822	(89)
MIT 2	19.0758	19.2784	19.5572	19.9141	20.1276	20.2098	20.2197	20.2202	20.1862	19.9331	19.4724	19.0486	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.3456	19.5362	19.7993	20.1381	20.3459	20.4280	20.4391	20.4390	20.4033	20.1544	19.7172	19.3189	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3456	19.5362	19.7993	20.1381	20.3459	20.4280	20.4391	20.4390	20.4033	20.1544	19.7172	19.3189	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9741	0.9587	0.9299	0.8512	0.7115	0.5124	0.3565	0.3929	0.6272	0.8683	0.9534	0.9774	(94)
Useful gains	586.2231	631.8626	643.9713	631.3458	543.5623	384.5337	256.5134	268.9541	407.3704	523.2921	556.0918	569.5320	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1036.0557	1005.4847	911.5210	761.8383	584.9046	390.4746	257.2179	270.1253	423.9001	646.3623	857.1371	1031.5631	(97)
Space heating kWh	334.6754	251.0741	199.0570	93.9545	30.7587	0.0000	0.0000	0.0000	0.0000	91.5642	216.7526	343.7511	(98a)
Space heating requirement - total per year (kWh/year)												1561.5877	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	334.6754	251.0741	199.0570	93.9545	30.7587	0.0000	0.0000	0.0000	0.0000	91.5642	216.7526	343.7511	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1561.5877	
Space heating per m2											(98c) / (4) =	19.5247	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	334.6754	251.0741	199.0570	93.9545	30.7587	0.0000	0.0000	0.0000	0.0000	91.5642	216.7526	343.7511	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	362.5953	272.0196	215.6630	101.7926	33.3247	0.0000	0.0000	0.0000	0.0000	99.2028	234.8349	372.4281	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9161	84.5503	83.8921	82.5772	80.9771	79.8000	79.8000	79.8000	79.8000	82.5040	84.2059	84.9983	(217)
Fuel for water heating, kWh/month	268.8716	238.7352	255.7420	229.1037	226.8522	207.8751	205.6450	213.6686	215.8200	232.2159	241.2047	265.7959	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	26.8342	21.5274	19.3830	14.2008	10.9691	8.9619	10.0064	13.0067	16.8944	22.1664	25.0369	27.5800	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3597	-31.5987	-47.6203	-56.2064	-62.9289	-59.5773	-58.8595	-54.4329	-47.0022	-37.3178	-24.0087	-18.2981	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9169	-17.0101	-34.4870	-52.8069	-70.8246	-71.5366	-70.6859	-59.3742	-42.9070	-24.6402	-10.6698	-6.2334	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1691.8610	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2801.5299	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	216.5670	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3807.6549	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1691.8610	0.2100	355.2908	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2801.5299	0.2100	588.3213	(264)
Space and water heating			943.6121	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	216.5670	0.1443	31.2573	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	0.1336	-69.3640	
PV Unit electricity exported	-469.0927	0.1253	-58.7938	
Total			-128.1578	(269)
Total CO2, kg/year			858.6409	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.7400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1691.8610	1.1300	1911.8029	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2801.5299	1.1300	3165.7288	(278)
Space and water heating			5077.5317	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	216.5670	1.5338	332.1777	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	1.4937	-775.5387	
PV Unit electricity exported	-469.0927	0.4600	-215.8009	
Total			-991.3396	(283)
Total Primary energy kWh/year			4548.4706	(286)
Target Primary Energy Rate (TPER)			56.8700	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.60	**TER**	10.74
Environmental	99 A	**% DER < TER**			85.10
CO_2 Emissions (t/year)	0.1	**DFEE**	18.72	**TFEE**	25.56
Compliance Check	See BREL	**% DFEE < TFEE**			26.77
% DPER < TPER	62.38	**DPER**	21.39	**TPER**	56.87

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2122	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2705	0.2652	0.2599	0.2334	0.2281	0.2016	0.2016	0.1963	0.2122	0.2281	0.2387	0.2493	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5366	0.5352	0.5338	0.5272	0.5260	0.5203	0.5203	0.5193	0.5225	0.5260	0.5285	0.5311	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15583.4798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.2856	(36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.6979	34.6061	34.5160	34.0930	34.0139	33.6455	33.6455	33.5772	33.7874	34.0139	34.1740	34.3414	(38)
Heat transfer coeff	59.0343	58.9424	58.8524	58.4294	58.3502	57.9818	57.9818	57.9136	58.1237	58.3502	58.5103	58.6777	(39)
Average = Sum(39)m / 12 =												58.4290	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7381	0.7370	0.7358	0.7305	0.7296	0.7250	0.7250	0.7241	0.7267	0.7296	0.7316	0.7337	(40)
HLP (average)												0.7305	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.6117	146.8201	132.6117	137.0321	132.6117	137.0321	132.6117	132.6117	137.0321	132.6117	137.0321	132.6117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains	460.3995	475.6643	453.8350	442.5318	420.3791	407.9331	392.6658	391.8132	403.5720	413.9765	437.2071	450.3260	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	19.6403	0.6800	0.7000	0.7700	49.2381	(80)

Solar gains	49.2381	96.3201	158.6255	231.3459	283.5231	290.2363	276.3168	237.3520	184.4881	114.2919	61.3941	40.4910	(83)
Total gains	509.6376	571.9844	612.4605	673.8777	703.9021	698.1694	668.9826	629.1652	588.0600	528.2684	498.6012	490.8170	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.3259	73.4402	73.5526	74.0851	74.1855	74.6569	74.6569	74.7449	74.4746	74.1855	73.9825	73.7715	
alpha	5.8884	5.8960	5.9035	5.9390	5.9457	5.9771	5.9771	5.9830	5.9650	5.9457	5.9322	5.9181	
util living area	0.9900	0.9793	0.9557	0.8756	0.7259	0.5257	0.3806	0.4220	0.6582	0.9082	0.9780	0.9918	(86)
MIT	20.1404	20.3055	20.5211	20.7908	20.9433	20.9928	20.9991	20.9984	20.9750	20.7726	20.4176	20.1080	(87)

Th 2	20.3073	20.3083	20.3093	20.3139	20.3148	20.3188	20.3188	20.3196	20.3173	20.3148	20.3130	20.3112	(88)
util rest of house	0.9877	0.9747	0.9460	0.8514	0.6836	0.4720	0.3221	0.3603	0.6011	0.8844	0.9724	0.9900	(89)
MIT 2	19.5187	19.6819	19.8924	20.1472	20.2764	20.3152	20.3185	20.3190	20.3031	20.1364	19.7974	19.4898	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.6941	19.8579	20.0698	20.3288	20.4646	20.5064	20.5106	20.5107	20.4927	20.3160	19.9724	19.6643	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6941	19.8579	20.0698	20.3288	20.4646	20.5064	20.5106	20.5107	20.4927	20.3160	19.9724	19.6643	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9852	0.9711	0.9421	0.8520	0.6932	0.4870	0.3386	0.3777	0.6162	0.8844	0.9690	0.9877	(94)
Useful gains	502.0704	555.4803	576.9841	574.1225	487.9318	339.9763	226.5104	237.6249	362.3464	467.2173	483.1270	484.7967	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	908.7822	881.6531	798.6135	667.7803	511.4149	342.4638	226.7434	238.0670	371.5693	566.9289	753.1698	907.4073	(97)
Space heating kWh	302.5936	219.1881	164.8922	67.4336	17.4714	0.0000	0.0000	0.0000	0.0000	74.1854	194.4308	314.4223	(98a)
Space heating requirement - total per year (kWh/year)												1354.6174	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	302.5936	219.1881	164.8922	67.4336	17.4714	0.0000	0.0000	0.0000	0.0000	74.1854	194.4308	314.4223	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1354.6174	
Space heating per m2											(98c) / (4) =	16.9370	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	545.0293	429.0656	440.1434	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9543	0.9809	0.9715	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	520.1083	420.8815	427.5884	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	748.9021	717.9521	674.1942	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	164.7315	221.0206	183.4747	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	41.1829	55.2551	45.8687	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												142.3067	(107)
Energy for space heating												16.9370	(99)
Energy for space cooling												1.7793	(108)
Total												18.7162	(109)
Fabric Energy Efficiency (DFEE)												18.7	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type			7.6000	1.1450	8.7023			(27)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.1800	5.4450			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
500mm mineral wool	39.9900		39.9900	0.1100	4.3989			(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7164			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 194.8422 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.7300	0.0500	0.3365
E3 Sill	5.8800	0.0500	0.2940
E4 Jamb	10.3200	0.0500	0.5160
E6 Intermediate floor within a dwelling	14.1900	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	11.4900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
E7 Party floor between dwellings (in blocks of flats)	14.1900	0.0700	0.9933
P4 Party wall - Roof (insulation at ceiling level)	11.4900	0.1200	1.3788
E10 Eaves (insulation at ceiling level)	8.7100	0.0600	0.5226
E12 Gable (insulation at ceiling level)	5.4100	0.0600	0.3246

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.6278 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.3442 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	68.8609	68.6984	68.5391	67.7910	67.6510	66.9994	66.9994	66.8787	67.2504	67.6510	67.9342	68.2302	(39)
Average = Sum(39)m / 12 =												67.7903	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8610	0.8589	0.8570	0.8476	0.8458	0.8377	0.8377	0.8362	0.8408	0.8458	0.8494	0.8531	(40)
HLP (average)												0.8476	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	129.1468	142.9840	129.1468	133.4517	129.1468	133.4517	129.1468	129.1468	133.4517	129.1468	133.4517	129.1468	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains													
	456.9346	471.8282	450.3701	438.9514	416.9142	404.3527	389.2009	388.3482	399.9916	410.5116	433.6267	446.8611	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	19.6403	0.6300	0.7000	0.7700	45.6176	(80)

Solar gains	45.6176	89.2378	146.9619	214.3352	262.6758	268.8954	255.9994	219.8997	170.9228	105.8881	56.8798	37.5137	(83)
Total gains	502.5522	561.0659	597.3320	653.2866	679.5899	673.2481	645.2002	608.2479	570.9143	516.3997	490.5065	484.3748	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.8622	63.0109	63.1573	63.8543	63.9864	64.6087	64.6087	64.7253	64.3676	63.9864	63.7197	63.4432	
alpha	5.1908	5.2007	5.2105	5.2570	5.2658	5.3072	5.3072	5.3150	5.2912	5.2658	5.2480	5.2295	
util living area													
	0.9923	0.9853	0.9706	0.9190	0.8063	0.6145	0.4530	0.4990	0.7430	0.9390	0.9843	0.9936	(86)
MIT	19.8706	20.0403	20.2814	20.6174	20.8587	20.9737	20.9956	20.9928	20.9306	20.6195	20.1976	19.8447	(87)
Th 2	20.2008	20.2025	20.2042	20.2123	20.2138	20.2208	20.2208	20.2221	20.2181	20.2138	20.2107	20.2076	(88)
util rest of house													
	0.9904	0.9818	0.9634	0.8993	0.7637	0.5478	0.3747	0.4178	0.6799	0.9200	0.9799	0.9920	(89)
MIT 2	19.1652	19.3344	19.5728	19.9002	20.1147	20.2072	20.2193	20.2195	20.1775	19.9087	19.4978	19.1449	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.3643	19.5336	19.7727	20.1026	20.3246	20.4235	20.4384	20.4377	20.3901	20.1093	19.6953	19.3424	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3643	19.5336	19.7727	20.1026	20.3246	20.4235	20.4384	20.4377	20.3901	20.1093	19.6953	19.3424	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9879	0.9781	0.9586	0.8962	0.7702	0.5656	0.3968	0.4406	0.6946	0.9170	0.9763	0.9898	(94)
Useful gains	496.4624	548.7942	572.6030	585.4698	523.3918	380.8002	255.9920	268.0202	396.5753	473.5615	478.8580	479.4335	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1037.3405	1005.3059	909.7014	759.4376	583.4652	390.1699	257.1685	270.0373	423.0082	643.3135	855.6488	1033.1682	(97)
Space heating kWh													
	402.4133	306.7759	250.8012	125.2568	44.6946	0.0000	0.0000	0.0000	0.0000	126.2955	271.2894	411.9786	(98a)
Space heating requirement - total per year (kWh/year)												1939.5053	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	402.4133	306.7759	250.8012	125.2568	44.6946	0.0000	0.0000	0.0000	0.0000	126.2955	271.2894	411.9786	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1939.5053	
Space heating per m2											(98c) / (4) =	24.2499	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	629.7941	495.7954	508.2782	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8937	0.9455	0.9265	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	562.8363	468.7781	470.9138	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	723.6551	693.8769	653.3695	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	115.7895	167.4735	135.7471	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	28.9474	41.8684	33.9368	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												104.7525	(107)
Energy for space heating												24.2499	(99)
Energy for space cooling												1.3097	(108)
Total												25.5596	(109)
Fabric Energy Efficiency (TFEE)												25.6	(109)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.60	**TER**	10.74
Environmental	99 A	**% DER < TER**			85.10
CO_2 Emissions (t/year)	0.1	**DFEE**	18.72	**TFEE**	25.56
Compliance Check	See BREL	**% DFEE < TFEE**			26.77
% DPER < TPER	62.38	**DPER**	21.39	**TPER**	56.87

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation		0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			15583.4798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.2856	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.6117	146.8201	132.6117	137.0321	132.6117	137.0321	132.6117	132.6117	137.0321	132.6117	137.0321	132.6117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	565.9813	580.0257	555.3786	537.2808	511.1311	494.4637	476.3107	477.3819	491.4645	506.5784	536.2944	554.9833	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	19.6403	0.6800	0.7000	0.7700	49.2381	(80)
Solar gains	49.2381	96.3201	158.6255	231.3459	283.5231	290.2363	276.3168	237.3520	184.4881	114.2919	61.3941	40.4910	(83)
Total gains	615.2193	676.3458	714.0042	768.6267	794.6541	784.7000	752.6275	714.7339	675.9526	620.8703	597.6885	595.4743	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9734	0.9526	0.9117	0.8056	0.6439	0.4599	0.3310	0.3642	0.5696	0.8357	0.9477	0.9777	(86)
MIT	20.3749	20.5178	20.6929	20.8804	20.9723	20.9968	20.9996	20.9994	20.9892	20.8732	20.6021	20.3348	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9680	0.9435	0.8958	0.7764	0.6029	0.4129	0.2810	0.3117	0.5177	0.8035	0.9363	0.9731	(89)
MIT 2	19.6107	19.7876	20.0002	20.2152	20.3100	20.3313	20.3331	20.3330	20.3258	20.2117	19.8941	19.5607	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.8264	19.9937	20.1957	20.4029	20.4969	20.5191	20.5212	20.5211	20.5130	20.3984	20.0939	19.7791	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8264	19.9937	20.1957	20.4029	20.4969	20.5191	20.5212	20.5211	20.5130	20.3984	20.0939	19.7791	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9631	0.9383	0.8922	0.7796	0.6132	0.4261	0.2951	0.3265	0.5319	0.8068	0.9316	0.9685	(94)
Useful gains	592.5008	634.5932	637.0264	599.2031	487.2474	334.3382	222.1168	233.3604	359.5340	500.9488	556.8060	576.7276	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	879.8541	855.3333	776.1130	651.8520	498.5043	335.4237	222.2095	233.5330	363.4131	555.2558	736.3423	882.8423	(97)
Space heating kWh	213.7908	148.3374	103.4804	37.9072	8.3751	0.0000	0.0000	0.0000	0.0000	40.4044	129.2662	227.7493	(98a)
Space heating requirement - total per year (kWh/year)												909.3108	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	213.7908	148.3374	103.4804	37.9072	8.3751	0.0000	0.0000	0.0000	0.0000	40.4044	129.2662	227.7493	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												909.3108	
Space heating per m2										(98c) / (4) =		11.3692	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	213.7908	148.3374	103.4804	37.9072	8.3751	0.0000	0.0000	0.0000	0.0000	40.4044	129.2662	227.7493 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	320.6862	222.5061	155.2206	56.8608	12.5627	0.0000	0.0000	0.0000	0.0000	60.6066	193.8992	341.6240
Space heating requirement												
	320.6862	222.5061	155.2206	56.8608	12.5627	0.0000	0.0000	0.0000	0.0000	60.6066	193.8992	341.6240 (307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement												
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948
Water heating fuel												
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679 (331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year	
Space heating fuel - community heating	1363.9662 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4037.1274 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	13.6397 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)	
mechanical ventilation fans (SFP = 0.0920)	21.9935 (330a)
Total electricity for the above, kWh/year	21.9935 (331)
Electricity for lighting (calculated in Appendix L)	206.9234 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-958.2209 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4671.7896 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1440.2916	0.1573	57.2312	(367)
Electrical energy for heat distribution (space & water)	13.6397	0.0000	7.8339	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			216.7374	(373)
Space and water heating			216.7374	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			128.2557	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6000	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1440.2916	1.5825	575.5913	(467)
Electrical energy for heat distribution (space & water)	13.6397	0.0000	82.9870	(472)
Overall CO2 factor for heat network			0.4251	(486)
Total CO2 associated with community systems			2295.9741	(473)
Space and water heating			2295.9741	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	1.4873	-726.6034	
PV Unit electricity exported	-469.6869	0.4449	-208.9838	
Total			-935.5872	(480)
Total Primary energy kWh/year			1711.0447	(483)
Dwelling Primary energy Rate (DPER)			21.3900	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type			7.6000	1.1450	8.7023			(27)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.1800	5.4450			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
500mm mineral wool	39.9900		39.9900	0.1100	4.3989			(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7164			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.7300	0.0500	0.3365
E3 Sill	5.8800	0.0500	0.2940
E4 Jamb	10.3200	0.0500	0.5160
E6 Intermediate floor within a dwelling	14.1900	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	11.4900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
E7 Party floor between dwellings (in blocks of flats)	14.1900	0.0700	0.9933
P4 Party wall - Roof (insulation at ceiling level)	11.4900	0.1200	1.3788
E10 Eaves (insulation at ceiling level)	8.7100	0.0600	0.5226
E12 Gable (insulation at ceiling level)	5.4100	0.0600	0.3246

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.6278	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	32.3442	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	68.8609	68.6984	68.5391	67.7910	67.6510	66.9994	66.9994	66.8787	67.2504	67.6510	67.9342	68.2302	(39)
Average = Sum(39)m / 12 =												67.7903	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8610	0.8589	0.8570	0.8476	0.8458	0.8377	0.8377	0.8362	0.8408	0.8458	0.8494	0.8531	(40)
HLP (average)												0.8476	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
									Total per year (kWh/year) = Sum(64)m =			2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.1468	142.9840	129.1468	133.4517	129.1468	133.4517	129.1468	129.1468	133.4517	129.1468	133.4517	129.1468	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													

	556.1810	569.8542	545.5784	527.3650	501.3308	481.5479	463.5104	464.5816	478.5488	496.7781	526.3787	545.1830 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	19.6403	0.6300	0.7000	0.7700	45.6176	(80)

Solar gains	45.6176	89.2378	146.9619	214.3352	262.6758	268.8954	255.9994	219.8997	170.9228	105.8881	56.8798	37.5137 (83)
Total gains	601.7986	659.0920	692.5403	741.7002	764.0066	750.4433	719.5098	684.4813	649.4715	602.6662	583.2585	582.6967 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.8622	63.0109	63.1573	63.8543	63.9864	64.6087	64.6087	64.7253	64.3676	63.9864	63.7197	63.4432	
alpha	5.1908	5.2007	5.2105	5.2570	5.2658	5.3072	5.3072	5.3150	5.2912	5.2658	5.2480	5.2295	
util living area	0.9832	0.9715	0.9484	0.8793	0.7492	0.5585	0.4076	0.4459	0.6753	0.8978	0.9679	0.9855	(86)
MIT	20.0319	20.1920	20.4150	20.7076	20.9012	20.9831	20.9973	20.9958	20.9557	20.7172	20.3397	20.0063	(87)
Th 2	20.2008	20.2025	20.2042	20.2123	20.2138	20.2208	20.2208	20.2221	20.2181	20.2138	20.2107	20.2076	(88)
util rest of house	0.9793	0.9652	0.9368	0.8539	0.7034	0.4953	0.3365	0.3722	0.6115	0.8706	0.9597	0.9822	(89)
MIT 2	19.0758	19.2784	19.5572	19.9141	20.1276	20.2098	20.2197	20.2202	20.1862	19.9331	19.4724	19.0486	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.3456	19.5362	19.7993	20.1381	20.3459	20.4280	20.4391	20.4390	20.4033	20.1544	19.7172	19.3189	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3456	19.5362	19.7993	20.1381	20.3459	20.4280	20.4391	20.4390	20.4033	20.1544	19.7172	19.3189	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9741	0.9587	0.9299	0.8512	0.7115	0.5124	0.3565	0.3929	0.6272	0.8683	0.9534	0.9774	(94)
Useful gains	586.2231	631.8626	643.9713	631.3458	543.5623	384.5337	256.5134	268.9541	407.3704	523.2921	556.0918	569.5320	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1036.0557	1005.4847	911.5210	761.8383	584.9046	390.4746	257.2179	270.1253	423.9001	646.3623	857.1371	1031.5631	(97)
Space heating kWh	334.6754	251.0741	199.0570	93.9545	30.7587	0.0000	0.0000	0.0000	0.0000	91.5642	216.7526	343.7511	(98a)
Space heating requirement - total per year (kWh/year)												1561.5877	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	334.6754	251.0741	199.0570	93.9545	30.7587	0.0000	0.0000	0.0000	0.0000	91.5642	216.7526	343.7511	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1561.5877	
Space heating per m2											(98c) / (4) =	19.5247	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	334.6754	251.0741	199.0570	93.9545	30.7587	0.0000	0.0000	0.0000	0.0000	91.5642	216.7526	343.7511	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	362.5953	272.0196	215.6630	101.7926	33.3247	0.0000	0.0000	0.0000	0.0000	99.2028	234.8349	372.4281	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9161	84.5503	83.8921	82.5772	80.9771	79.8000	79.8000	79.8000	79.8000	82.5040	84.2059	84.9983	(217)
Fuel for water heating, kWh/month	268.8716	238.7352	255.7420	229.1037	226.8522	207.8751	205.6450	213.6686	215.8200	232.2159	241.2047	265.7959	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	26.8342	21.5274	19.3830	14.2008	10.9691	8.9619	10.0064	13.0067	16.8944	22.1664	25.0369	27.5800	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3597	-31.5987	-47.6203	-56.2064	-62.9289	-59.5773	-58.8595	-54.4329	-47.0022	-37.3178	-24.0087	-18.2981	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9169	-17.0101	-34.4870	-52.8069	-70.8246	-71.5366	-70.6859	-59.3742	-42.9070	-24.6402	-10.6698	-6.2334	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1691.8610	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2801.5299	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	216.5670	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3807.6549	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1691.8610	0.2100	355.2908	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2801.5299	0.2100	588.3213	(264)
Space and water heating			943.6121	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	216.5670	0.1443	31.2573	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	0.1336	-69.3640	
PV Unit electricity exported	-469.0927	0.1253	-58.7938	
Total			-128.1578	(269)
Total CO2, kg/year			858.6409	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.7400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1691.8610	1.1300	1911.8029	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2801.5299	1.1300	3165.7288	(278)
Space and water heating			5077.5317	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	216.5670	1.5338	332.1777	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	1.4937	-775.5387	
PV Unit electricity exported	-469.0927	0.4600	-215.8009	
Total			-991.3396	(283)
Total Primary energy kWh/year			4548.4706	(286)
Target Primary Energy Rate (TPER)			56.8700	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.60	**TER**	10.74
Environmental	99 A	**% DER < TER**			85.10
CO_2 Emissions (t/year)	0.1	**DFEE**	18.72	**TFEE**	25.56
Compliance Check	See BREL	**% DFEE < TFEE**			26.77
% DPER < TPER	62.38	**DPER**	21.39	**TPER**	56.87

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			15583.4798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.2856	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	612.2735	609.9558	591.8328	558.1588	524.7912	494.7014	477.0149	480.2399	497.5865	528.2765	565.2104	597.3217	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	19.6403	0.6800	0.7000	0.7700	49.2381	(80)

Solar gains	49.2381	96.3201	158.6255	231.3459	283.5231	290.2363	276.3168	237.3520	184.4881	114.2919	61.3941	40.4910	(83)
Total gains	661.5116	706.2759	750.4584	789.5046	808.3143	784.9377	753.3317	717.5919	682.0745	642.5685	626.6045	637.8127	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area													
	0.9631	0.9433	0.8948	0.7920	0.6344	0.4598	0.3307	0.3628	0.5649	0.8193	0.9368	0.9695	(86)
MIT	20.4438	20.5573	20.7299	20.8913	20.9744	20.9968	20.9996	20.9994	20.9897	20.8869	20.6390	20.3998	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house													
	0.9560	0.9329	0.8770	0.7621	0.5937	0.4128	0.2807	0.3104	0.5133	0.7859	0.9236	0.9634	(89)
MIT 2	19.6960	19.8356	20.0431	20.2266	20.3118	20.3313	20.3332	20.3330	20.3261	20.2258	19.9382	19.6415	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.9070	20.0392	20.2369	20.4142	20.4988	20.5191	20.5212	20.5211	20.5134	20.4124	20.1360	19.8555	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9070	20.0392	20.2369	20.4142	20.4988	20.5191	20.5212	20.5211	20.5134	20.4124	20.1360	19.8555	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9508	0.9278	0.8742	0.7659	0.6040	0.4259	0.2948	0.3252	0.5274	0.7901	0.9192	0.9583	(94)
Useful gains	628.9398	655.2678	656.0766	604.6618	488.2081	334.3402	222.1173	233.3647	359.7257	507.6884	575.9619	611.2458	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	884.4213	857.9142	778.4476	652.4891	498.6111	335.4240	222.2095	233.5335	363.4342	556.0496	738.7267	887.1689	(97)
Space heating kWh													
	190.0782	136.1784	91.0440	34.4357	7.7398	0.0000	0.0000	0.0000	0.0000	35.9808	117.1907	205.2868	(98a)
Space heating requirement - total per year (kWh/year)												817.9344	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	190.0782	136.1784	91.0440	34.4357	7.7398	0.0000	0.0000	0.0000	0.0000	35.9808	117.1907	205.2868	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												817.9344	
Space heating per m2											(98c) / (4) =	10.2267	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	190.0782	136.1784	91.0440	34.4357	7.7398	0.0000	0.0000	0.0000	0.0000	35.9808	117.1907	205.2868	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	285.1173	204.2676	136.5660	51.6535	11.6098	0.0000	0.0000	0.0000	0.0000	53.9712	175.7860	307.9302	
Space heating requirement													
	285.1173	204.2676	136.5660	51.6535	11.6098	0.0000	0.0000	0.0000	0.0000	53.9712	175.7860	307.9302	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1226.9016	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												12.2690	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)
Total electricity for the above, kWh/year												21.9935	(331)
Electricity for lighting (calculated in Appendix L)												206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4534.7250	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1226.9016	4.4400	54.4744	(340a)
Space heating total			54.4744	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	206.9234	16.4900	34.1217	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	16.4900	-80.5593	
PV Unit electricity exported	-469.6869	5.5900	-26.2555	
Total			-106.8148	(352)
Total energy cost			256.6565	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7393 (357)
SAP value		88.0161
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1403.7411	0.1573	51.4792	(367)
Electrical energy for heat distribution (space & water)	12.2690	0.0000	7.6182	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			210.7697	(373)
Space and water heating			210.7697	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			122.2880	(383)
CO2 emissions per m2			1.5300	(384)
EI value			98.6889	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 79.9800						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate													
	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15583.4798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.2856	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539	(43)

Daily hot water use

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte 211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
								Total per year (kWh/year) = Sum(64)m =			2691.4183	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)

Heat gains from water heating, kWh/month

114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
327.4608 330.8588 322.2959 304.0665 281.0552 259.4278 244.9794 241.5813 250.1442 268.3736 291.3850 313.0124 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 (71)
Water heating gains (Table 5)
154.0336 151.5930 146.8914 136.5869 130.2751 123.6777 119.6256 122.9734 126.8986 134.2191 144.0972 152.7161 (72)
Total internal gains
612.2735 609.9558 591.8328 558.1588 524.7912 494.7014 477.0149 480.2399 497.5865 528.2765 565.2104 597.3217 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	23.7835	0.6800	0.7000	0.7700	59.6251	(80)

Solar gains 59.6251 103.6406 167.9167 247.1276 291.2895 319.6931 298.7175 261.9205 205.9597 129.6904 73.2361 49.3147 (83)
Total gains 671.8987 713.5964 759.7496 805.2864 816.0807 814.3945 775.7324 742.1603 703.5461 657.9669 638.4465 646.6364 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9573	0.9363	0.8769	0.7638	0.5989	0.4026	0.2848	0.3129	0.5262	0.7824	0.9239	0.9648	(86)
MIT	20.4854	20.5913	20.7713	20.9138	20.9821	20.9986	20.9999	20.9998	20.9932	20.9169	20.6850	20.4404	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9492	0.9248	0.8566	0.7319	0.5571	0.3568	0.2362	0.2621	0.4751	0.7450	0.9084	0.9579	(89)
MIT 2	19.7475	19.8771	20.0915	20.2505	20.3188	20.3325	20.3333	20.3332	20.3288	20.2571	19.9934	19.6921	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.9557	20.0787	20.2834	20.4377	20.5060	20.5205	20.5214	20.5213	20.5163	20.4433	20.1886	19.9032	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9557	20.0787	20.2834	20.4377	20.5060	20.5205	20.5214	20.5213	20.5163	20.4433	20.1886	19.9032	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9439	0.9198	0.8550	0.7371	0.5680	0.3697	0.2499	0.2764	0.4893	0.7515	0.9046	0.9527	(94)
Useful gains	634.1980	656.3948	649.5837	593.5428	463.5728	301.0551	193.8520	205.1543	344.2286	494.4496	577.5599	616.0490	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	870.1828	843.1482	752.7460	631.1540	470.6858	301.5014	193.8831	205.2132	346.5988	529.4663	719.0389	872.8755	(97)
Space heating kWh	175.5727	125.4983	76.7527	27.0801	5.2920	0.0000	0.0000	0.0000	0.0000	26.0524	101.8648	191.0789	(98a)
Space heating requirement - total per year (kWh/year)												729.1921	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	175.5727	125.4983	76.7527	27.0801	5.2920	0.0000	0.0000	0.0000	0.0000	26.0524	101.8648	191.0789	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												729.1921	
Space heating per m2										(98c) / (4) =		9.1172	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement
175.5727 125.4983 76.7527 27.0801 5.2920 0.0000 0.0000 0.0000 0.0000 26.0524 101.8648 191.0789 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50
307a 263.3590 188.2475 115.1291 40.6202 7.9380 0.0000 0.0000 0.0000 0.0000 39.0787 152.7973 286.6184
Space heating requirement
263.3590 188.2475 115.1291 40.6202 7.9380 0.0000 0.0000 0.0000 0.0000 39.0787 152.7973 286.6184 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)

Water heating
Annual water heating requirement
266.9446 236.1786 250.9634 220.5542 213.7828 192.6005 189.9534 197.4446 199.5749 222.6078 236.8171 263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50
310a 400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948
Water heating fuel
400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948 (310)
Cooling System Energy Efficiency Ratio 0.0000 (314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (315)
Pumps and Fa 1.8679 1.6872 1.8679 1.8077 1.8679 1.8077 1.8679 1.8679 1.8077 1.8679 1.8077 1.8679 (331)
Lighting 25.6392 20.5688 18.5199 13.5685 10.4807 8.5628 9.5608 12.4275 16.1421 21.1793 23.9220 26.3518 (332)
Electricity generated by PVs (Appendix M) (negative quantity)
(333a)m -17.9904 -26.9468 -45.2798 -58.5762 -66.5604 -66.2871 -64.3781 -58.6940 -48.0761 -34.8334 -20.6614 -14.9764 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(334a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (334a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.0081	-13.0184	-31.9653	-58.9969	-82.6801	-94.8316	-90.1120	-72.5476	-46.2727	-22.1629	-8.3690	-4.5223	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1093.7881	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	10.9379	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4305.0855	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1093.7881	6.5500	71.6431	(340a)
Space heating total			71.6431	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	206.9234	28.4300	58.8283	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	28.4300	-148.7628	
PV Unit electricity exported	-531.4870	5.8100	-30.8794	
Total			-179.6422	(352)
Total energy cost			325.5138	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1368.2441	0.1578	46.0331	(367)
Electrical energy for heat distribution (space & water)	10.9379	0.0000	7.4140	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			205.1194	(373)
Space and water heating			205.1194	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	0.1322	-69.1719	
PV Unit electricity exported	-531.4870	0.1213	-64.4804	
Total			-133.6523	(380)
Total CO2, kg/year			104.3833	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1368.2441	1.5842	462.0861	(467)
Electrical energy for heat distribution (space & water)	10.9379	0.0000	78.7306	(472)
Overall CO2 factor for heat network			0.4245	(486)
Total CO2 associated with community systems			2178.2125	(473)
Space and water heating			2178.2125	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	1.4884	-778.8342	
PV Unit electricity exported	-531.4870	0.4450	-236.5330	
Total			-1015.3671	(480)
Total Primary energy kWh/year			1513.5032	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - North

Current energy efficiency rating:	B 88
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£65	£65	£0
Community scheme	£440	£440	£0
Space heating	£182	£182	£0
Water heating	£264	£264	£0
Lighting	£59	£59	£0
Generated (PV)	-£180	-£180	£0
Total cost of fuels	£325	£325	£0
Total cost of uses	£325	£325	£0
Delivered energy	54 kWh/m²	54 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	19 kWh/m²	19 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15583.4798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		194.8422 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.2856 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4625 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
									Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)

Water heating gains (Table 5)

154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)

Total internal gains

612.2735	609.9558	591.8328	558.1588	524.7912	494.7014	477.0149	480.2399	497.5865	528.2765	565.2104	597.3217	(73)

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6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d				Gains W	
West				7.6000	19.6403	0.6800	0.7000	0.7700				49.2381	(80)
Solar gains	49.2381	96.3201	158.6255	231.3459	283.5231	290.2363	276.3168	237.3520	184.4881	114.2919	61.3941	40.4910	(83)
Total gains	661.5116	706.2759	750.4584	789.5046	808.3143	784.9377	753.3317	717.5919	682.0745	642.5685	626.6045	637.8127	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9631	0.9433	0.8948	0.7920	0.6344	0.4598	0.3307	0.3628	0.5649	0.8193	0.9368	0.9695	(86)
MIT	20.4438	20.5573	20.7299	20.8913	20.9744	20.9968	20.9996	20.9994	20.9897	20.8869	20.6390	20.3998	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9560	0.9329	0.8770	0.7621	0.5937	0.4128	0.2807	0.3104	0.5133	0.7859	0.9236	0.9634	(89)
MIT 2	19.6960	19.8356	20.0431	20.2266	20.3118	20.3313	20.3332	20.3330	20.3261	20.2258	19.9382	19.6415	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.9070	20.0392	20.2369	20.4142	20.4988	20.5191	20.5212	20.5211	20.5134	20.4124	20.1360	19.8555	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9070	20.0392	20.2369	20.4142	20.4988	20.5191	20.5212	20.5211	20.5134	20.4124	20.1360	19.8555	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9508	0.9278	0.8742	0.7659	0.6040	0.4259	0.2948	0.3252	0.5274	0.7901	0.9192	0.9583	(94)
Useful gains	628.9398	655.2678	656.0766	604.6618	488.2081	334.3402	222.1173	233.3647	359.7257	507.6884	575.9619	611.2458	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	884.4213	857.9142	778.4476	652.4891	498.6111	335.4240	222.2095	233.5335	363.4342	556.0496	738.7267	887.1689	(97)
Space heating kWh	190.0782	136.1784	91.0440	34.4357	7.7398	0.0000	0.0000	0.0000	0.0000	35.9808	117.1907	205.2868	(98a)
Space heating requirement - total per year (kWh/year)												817.9344	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	190.0782	136.1784	91.0440	34.4357	7.7398	0.0000	0.0000	0.0000	0.0000	35.9808	117.1907	205.2868	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												817.9344	
Space heating per m2											(98c) / (4) =	10.2267	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	190.0782	136.1784	91.0440	34.4357	7.7398	0.0000	0.0000	0.0000	0.0000	35.9808	117.1907	205.2868	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	285.1173	204.2676	136.5660	51.6535	11.6098	0.0000	0.0000	0.0000	0.0000	53.9712	175.7860	307.9302	
Space heating requirement													
	285.1173	204.2676	136.5660	51.6535	11.6098	0.0000	0.0000	0.0000	0.0000	53.9712	175.7860	307.9302	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1226.9016	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												12.2690	(313)
Space cooling fuel												0.0000	(321)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)

mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4534.7250	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1226.9016	4.4400	54.4744	(340a)
Space heating total			54.4744	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	206.9234	16.4900	34.1217	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	16.4900	-80.5593	
PV Unit electricity exported	-469.6869	5.5900	-26.2555	
Total			-106.8148	(352)
Total energy cost			256.6565	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7393	(357)
SAP value		88.0161	
SAP rating (Section 12)		88	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1403.7411	0.1573	51.4792	(367)
Electrical energy for heat distribution (space & water)	12.2690	0.0000	7.6182	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			210.7697	(373)
Space and water heating			210.7697	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			122.2880	(383)
CO2 emissions per m2			1.5300	(384)
EI value			98.6889	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)

Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15583.4798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		194.8422 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.2856 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4625 (42)

Hot water usage for mixer showers

65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)
Total storage loss	

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

											Total per year (kWh/year) = Sum(64)m =	2691.4183	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000		(64a)
Heat gains from water heating, kWh/month													
114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207		(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063		(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124		(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374		(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993		(71)
Water heating gains (Table 5)													
154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161		(72)
Total internal gains													
612.2735	609.9558	591.8328	558.1588	524.7912	494.7014	477.0149	480.2399	497.5865	528.2765	565.2104	597.3217		(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.6000	23.7835	0.6800	0.7000	0.7700	59.6251	(80)

Solar gains	59.6251	103.6406	167.9167	247.1276	291.2895	319.6931	298.7175	261.9205	205.9597	129.6904	73.2361	49.3147	(83)
Total gains	671.8987	713.5964	759.7496	805.2864	816.0807	814.3945	775.7324	742.1603	703.5461	657.9669	638.4465	646.6364	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area													
0.9573	0.9363	0.8769	0.7638	0.5989	0.4026	0.2848	0.3129	0.5262	0.7824	0.9239	0.9648		(86)
MIT	20.4854	20.5913	20.7713	20.9138	20.9821	20.9986	20.9999	20.9998	20.9932	20.9169	20.6850	20.4404	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house													
0.9492	0.9248	0.8566	0.7319	0.5571	0.3568	0.2362	0.2621	0.4751	0.7450	0.9084	0.9579		(89)
MIT 2	19.7475	19.8771	20.0915	20.2505	20.3188	20.3325	20.3333	20.3332	20.3288	20.2571	19.9934	19.6921	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.9557	20.0787	20.2834	20.4377	20.5060	20.5205	20.5214	20.5213	20.5163	20.4433	20.1886	19.9032	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9557	20.0787	20.2834	20.4377	20.5060	20.5205	20.5214	20.5213	20.5163	20.4433	20.1886	19.9032	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9439	0.9198	0.8550	0.7371	0.5680	0.3697	0.2499	0.2764	0.4893	0.7515	0.9046	0.9527	(94)
Useful gains	634.1980	656.3948	649.5837	593.5428	463.5728	301.0551	193.8520	205.1543	344.2286	494.4496	577.5599	616.0490	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
870.1828	843.1482	752.7460	631.1540	470.6858	301.5014	193.8831	205.2132	346.5988	529.4663	719.0389	872.8755		(97)
Space heating kWh													
175.5727	125.4983	76.7527	27.0801	5.2920	0.0000	0.0000	0.0000	0.0000	26.0524	101.8648	191.0789		(98a)
Space heating requirement - total per year (kWh/year)												729.1921	
Solar heating kWh													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
175.5727	125.4983	76.7527	27.0801	5.2920	0.0000	0.0000	0.0000	0.0000	26.0524	101.8648	191.0789		(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												729.1921	
Space heating per m2											(98c) / (4) =	9.1172	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
175.5727	125.4983	76.7527	27.0801	5.2920	0.0000	0.0000	0.0000	0.0000	26.0524	101.8648	191.0789		(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	263.3590	188.2475	115.1291	40.6202	7.9380	0.0000	0.0000	0.0000	0.0000	39.0787	152.7973	286.6184	
Space heating requirement													
263.3590	188.2475	115.1291	40.6202	7.9380	0.0000	0.0000	0.0000	0.0000	39.0787	152.7973	286.6184		(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement												
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948
Water heating fuel												
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679 (331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-17.9904	-26.9468	-45.2798	-58.5762	-66.5604	-66.2871	-64.3781	-58.6940	-48.0761	-34.8334	-20.6614	-14.9764 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-6.0081	-13.0184	-31.9653	-58.9969	-82.6801	-94.8316	-90.1120	-72.5476	-46.2727	-22.1629	-8.3690	-4.5223 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year	
Space heating fuel - community heating	1093.7881 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4037.1274 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	10.9379 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)	
mechanical ventilation fans (SFP = 0.0920)	21.9935 (330a)
Total electricity for the above, kWh/year	21.9935 (331)
Electricity for lighting (calculated in Appendix L)	206.9234 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4305.0855 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1093.7881	6.5500	71.6431	(340a)
Space heating total			71.6431	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	206.9234	28.4300	58.8283	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	28.4300	-148.7628	
PV Unit electricity exported	-531.4870	5.8100	-30.8794	
Total			-179.6422	(352)
Total energy cost			325.5138	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1368.2441	0.1578	46.0331	(367)
Electrical energy for heat distribution (space & water)	10.9379	0.0000	7.4140	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			205.1194	(373)
Space and water heating			205.1194	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	0.1322	-69.1719	
PV Unit electricity exported	-531.4870	0.1213	-64.4804	
Total			-133.6523	(380)
Total CO2, kg/year			104.3833	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1368.2441	1.5842	462.0861	(467)
Electrical energy for heat distribution (space & water)	10.9379	0.0000	78.7306	(472)
Overall CO2 factor for heat network			0.4245	(486)
Total CO2 associated with community systems			2178.2125	(473)
Space and water heating			2178.2125	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)

Energy saving/generation technologies			
PV Unit electricity used in dwelling	-523.2600	1.4884	-778.8342
PV Unit electricity exported	-531.4870	0.4450	-236.5330
Total			-1015.3671 (480)
Total Primary energy kWh/year			1513.5032 (483)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.68	**TER**	11.04
Environmental	99 A	**% DER < TER**			84.78
CO_2 Emissions (t/year)	0.11	**DFEE**	19.96	**TFEE**	26.96
Compliance Check	See BREL	**% DFEE < TFEE**			25.94
% DPER < TPER	62.12	**DPER**	22.17	**TPER**	58.53

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation		0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			15583.4798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.2856	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.6117	146.8201	132.6117	137.0321	132.6117	137.0321	132.6117	132.6117	137.0321	132.6117	137.0321	132.6117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	565.9813	580.0257	555.3786	537.2808	511.1311	494.4637	476.3107	477.3819	491.4645	506.5784	536.2944	554.9833	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.6000	11.2829	0.6800	0.7000	0.7700	28.2863	(81)

Solar gains	28.2863	57.5776	103.7365	170.3651	229.0041	244.1426	228.3904	182.0755	126.4045	70.3644	35.5915	23.1000	(83)
Total gains	594.2676	637.6033	659.1151	707.6459	740.1352	738.6063	704.7011	659.4573	617.8691	576.9427	571.8859	578.0833	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9773	0.9632	0.9347	0.8451	0.6836	0.4877	0.3534	0.3944	0.6180	0.8680	0.9566	0.9806	(86)
MIT	20.3425	20.4636	20.6302	20.8424	20.9621	20.9956	20.9995	20.9990	20.9835	20.8407	20.5672	20.3073	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9726	0.9558	0.9218	0.8185	0.6420	0.4382	0.3001	0.3377	0.5634	0.8390	0.9467	0.9766	(89)
MIT 2	19.5703	19.7213	19.9263	20.1747	20.3009	20.3305	20.3331	20.3328	20.3215	20.1774	19.8520	19.5262	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.7882	19.9308	20.1249	20.3631	20.4875	20.5182	20.5211	20.5208	20.5083	20.3646	20.0538	19.7466	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7882	19.9308	20.1249	20.3631	20.4875	20.5182	20.5211	20.5208	20.5083	20.3646	20.0538	19.7466	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9680	0.9506	0.9172	0.8197	0.6519	0.4520	0.3151	0.3537	0.5780	0.8404	0.9418	0.9722	(94)
Useful gains	575.2357	606.1030	604.5711	580.0781	482.4683	333.8757	222.0696	233.2502	357.1337	484.8912	538.6193	562.0159	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	877.6902	851.7679	772.1007	649.5943	497.9703	335.3728	222.2041	233.5205	363.1476	553.3436	734.0715	880.9994	(97)
Space heating kWh	225.0261	165.0868	124.6420	50.0517	11.5334	0.0000	0.0000	0.0000	0.0000	50.9286	140.7256	237.3237	(98a)
Space heating requirement - total per year (kWh/year)												1005.3180	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	225.0261	165.0868	124.6420	50.0517	11.5334	0.0000	0.0000	0.0000	0.0000	50.9286	140.7256	237.3237	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1005.3180	
Space heating per m2											(98c) / (4) =	12.5696	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	225.0261	165.0868	124.6420	50.0517	11.5334	0.0000	0.0000	0.0000	0.0000	50.9286	140.7256	237.3237 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	337.5392	247.6303	186.9630	75.0776	17.3002	0.0000	0.0000	0.0000	0.0000	76.3929	211.0884	355.9856
Space heating requirement												
	337.5392	247.6303	186.9630	75.0776	17.3002	0.0000	0.0000	0.0000	0.0000	76.3929	211.0884	355.9856 (307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement												
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948
Water heating fuel												
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679 (331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year		
Space heating fuel - community heating	1507.9770	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	15.0798	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4815.8004	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1478.6945	0.1569	63.0811	(367)
Electrical energy for heat distribution (space & water)	15.0798	0.0000	8.0533	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			222.8067	(373)
Space and water heating			222.8067	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			134.3251	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6800	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1478.6945	1.5808	635.6630	(467)
Electrical energy for heat distribution (space & water)	15.0798	0.0000	85.2397	(472)
Overall CO2 factor for heat network			0.4253	(486)
Total CO2 associated with community systems			2358.2985	(473)
Space and water heating			2358.2985	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	1.4873	-726.6034	
PV Unit electricity exported	-469.6869	0.4449	-208.9838	
Total			-935.5872	(480)
Total Primary energy kWh/year			1773.3691	(483)
Dwelling Primary energy Rate (DPER)			22.1700	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type			7.6000	1.1450	8.7023			(27)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.1800	5.4450			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
500mm mineral wool	39.9900		39.9900	0.1100	4.3989			(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7164			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.7300	0.0500	0.3365
E3 Sill	5.8800	0.0500	0.2940
E4 Jamb	10.3200	0.0500	0.5160
E6 Intermediate floor within a dwelling	14.1900	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	11.4900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
E7 Party floor between dwellings (in blocks of flats)	14.1900	0.0700	0.9933
P4 Party wall - Roof (insulation at ceiling level)	11.4900	0.1200	1.3788
E10 Eaves (insulation at ceiling level)	8.7100	0.0600	0.5226
E12 Gable (insulation at ceiling level)	5.4100	0.0600	0.3246

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.6278	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	32.3442	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	68.8609	68.6984	68.5391	67.7910	67.6510	66.9994	66.9994	66.8787	67.2504	67.6510	67.9342	68.2302	(39)
Average = Sum(39)m / 12 =												67.7903	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8610	0.8589	0.8570	0.8476	0.8458	0.8377	0.8377	0.8362	0.8408	0.8458	0.8494	0.8531	(40)
HLP (average)												0.8476	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
									Total per year (kWh/year) = Sum(64)m =			2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.1468	142.9840	129.1468	133.4517	129.1468	133.4517	129.1468	129.1468	133.4517	129.1468	133.4517	129.1468	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													

	556.1810	569.8542	545.5784	527.3650	501.3308	481.5479	463.5104	464.5816	478.5488	496.7781	526.3787	545.1830	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.6000	11.2829	0.6300	0.7000	0.7700	26.2064	(81)

Solar gains	26.2064	53.3439	96.1088	157.8383	212.1656	226.1910	211.5970	168.6876	117.1101	65.1905	32.9745	21.4015	(83)
Total gains	582.3874	623.1981	641.6872	685.2033	713.4964	707.7389	675.1074	633.2692	595.6588	561.9686	559.3531	566.5845	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.8622	63.0109	63.1573	63.8543	63.9864	64.6087	64.6087	64.7253	64.3676	63.9864	63.7197	63.4432	
alpha	5.1908	5.2007	5.2105	5.2570	5.2658	5.3072	5.3072	5.3150	5.2912	5.2658	5.2480	5.2295	
util living area													
	0.9853	0.9773	0.9612	0.9053	0.7832	0.5884	0.4336	0.4804	0.7210	0.9184	0.9729	0.9871	(86)
MIT	20.0010	20.1377	20.3456	20.6522	20.8776	20.9785	20.9964	20.9940	20.9398	20.6738	20.3043	19.9803	(87)
Th 2	20.2008	20.2025	20.2042	20.2123	20.2138	20.2208	20.2208	20.2221	20.2181	20.2138	20.2107	20.2076	(88)
util rest of house													
	0.9820	0.9721	0.9520	0.8835	0.7390	0.5232	0.3583	0.4017	0.6573	0.8950	0.9657	0.9842	(89)
MIT 2	19.0370	19.2109	19.4728	19.8518	20.1051	20.2067	20.2193	20.2193	20.1736	19.8846	19.4288	19.0159	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.3090	19.4724	19.7191	20.0777	20.3231	20.4245	20.4386	20.4379	20.3898	20.1073	19.6758	19.2880	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3090	19.4724	19.7191	20.0777	20.3231	20.4245	20.4386	20.4379	20.3898	20.1073	19.6758	19.2880	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9771	0.9661	0.9452	0.8793	0.7456	0.5406	0.3795	0.4238	0.6721	0.8913	0.9597	0.9797	(94)
Useful gains	569.0598	602.0847	606.5356	602.4822	531.9559	382.6264	256.2298	268.3737	400.3189	500.8930	536.8375	555.0892	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1033.5332	1001.1018	906.0259	757.7443	583.3607	390.2352	257.1815	270.0514	422.9920	643.1761	854.3289	1029.4589	(97)
Space heating kWh	345.5682	268.1395	222.8208	111.7887	38.2452	0.0000	0.0000	0.0000	0.0000	105.8587	228.5938	352.9310	(98a)
Space heating requirement - total per year (kWh/year)												1673.9459	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	345.5682	268.1395	222.8208	111.7887	38.2452	0.0000	0.0000	0.0000	0.0000	105.8587	228.5938	352.9310	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1673.9459	
Space heating per m2											(98c) / (4) =	20.9296	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	345.5682	268.1395	222.8208	111.7887	38.2452	0.0000	0.0000	0.0000	0.0000	105.8587	228.5938	352.9310	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	374.3967	290.5087	241.4093	121.1146	41.4357	0.0000	0.0000	0.0000	0.0000	114.6898	247.6639	382.3738	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9867	84.6975	84.1448	82.9215	81.2185	79.8000	79.8000	79.8000	79.8000	82.7861	84.3255	85.0560	(217)
Fuel for water heating, kWh/month	268.6484	238.3203	254.9740	228.1523	226.1781	207.8751	205.6450	213.6686	215.8200	231.4247	240.8624	265.6155	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	26.8342	21.5274	19.3830	14.2008	10.9691	8.9619	10.0064	13.0067	16.8944	22.1664	25.0369	27.5800	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3597	-31.5987	-47.6203	-56.2064	-62.9289	-59.5773	-58.8595	-54.4329	-47.0022	-37.3178	-24.0087	-18.2981	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9169	-17.0101	-34.4870	-52.8069	-70.8246	-71.5366	-70.6859	-59.3742	-42.9070	-24.6402	-10.6698	-6.2334	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1813.5926	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2797.1844	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	216.5670	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3925.0410	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1813.5926	0.2100	380.8544	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2797.1844	0.2100	587.4087	(264)
Space and water heating			968.2632	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	216.5670	0.1443	31.2573	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	0.1336	-69.3640	
PV Unit electricity exported	-469.0927	0.1253	-58.7938	
Total			-128.1578	(269)
Total CO2, kg/year			883.2920	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.0400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1813.5926	1.1300	2049.3596	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2797.1844	1.1300	3160.8184	(278)
Space and water heating			5210.1780	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	216.5670	1.5338	332.1777	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	1.4937	-775.5387	
PV Unit electricity exported	-469.0927	0.4600	-215.8009	
Total			-991.3396	(283)
Total Primary energy kWh/year			4681.1169	(286)
Target Primary Energy Rate (TPER)			58.5300	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.68	**TER**	11.04
Environmental	99 A	**% DER < TER**			84.78
CO_2 Emissions (t/year)	0.11	**DFEE**	19.96	**TFEE**	26.96
Compliance Check	See BREL	**% DFEE < TFEE**			25.94
% DPER < TPER	62.12	**DPER**	22.17	**TPER**	58.53

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2122	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2705	0.2652	0.2599	0.2334	0.2281	0.2016	0.2016	0.1963	0.2122	0.2281	0.2387	0.2493	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5366	0.5352	0.5338	0.5272	0.5260	0.5203	0.5203	0.5193	0.5225	0.5260	0.5285	0.5311	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15583.4798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422 (35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.2856 (36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.6979	34.6061	34.5160	34.0930	34.0139	33.6455	33.6455	33.5772	33.7874	34.0139	34.1740	34.3414	(38)
Heat transfer coeff	59.0343	58.9424	58.8524	58.4294	58.3502	57.9818	57.9818	57.9136	58.1237	58.3502	58.5103	58.6777	(39)
Average = Sum(39)m / 12 =												58.4290	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7381	0.7370	0.7358	0.7305	0.7296	0.7250	0.7250	0.7241	0.7267	0.7296	0.7316	0.7337	(40)
HLP (average)												0.7305	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.6117	146.8201	132.6117	137.0321	132.6117	137.0321	132.6117	132.6117	137.0321	132.6117	137.0321	132.6117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains	460.3995	475.6643	453.8350	442.5318	420.3791	407.9331	392.6658	391.8132	403.5720	413.9765	437.2071	450.3260	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.6000	11.2829	0.6800	0.7000	0.7700	28.2863	(81)

Solar gains	28.2863	57.5776	103.7365	170.3651	229.0041	244.1426	228.3904	182.0755	126.4045	70.3644	35.5915	23.1000	(83)
Total gains	488.6858	533.2419	557.5715	612.8969	649.3832	652.0757	621.0562	573.8887	529.9765	484.3408	472.7986	473.4260	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.3259	73.4402	73.5526	74.0851	74.1855	74.6569	74.6569	74.7449	74.4746	74.1855	73.9825	73.7715	
alpha	5.8884	5.8960	5.9035	5.9390	5.9457	5.9771	5.9771	5.9830	5.9650	5.9457	5.9322	5.9181	
util living area	0.9918	0.9851	0.9703	0.9094	0.7694	0.5605	0.4096	0.4617	0.7160	0.9332	0.9828	0.9932	(86)
MIT	20.1050	20.2432	20.4420	20.7323	20.9230	20.9899	20.9987	20.9974	20.9613	20.7229	20.3765	20.0783	(87)

Th 2	20.3073	20.3083	20.3093	20.3139	20.3148	20.3188	20.3188	20.3196	20.3173	20.3148	20.3130	20.3112	(88)
util rest of house	0.9900	0.9817	0.9633	0.8894	0.7282	0.5041	0.3468	0.3946	0.6581	0.9141	0.9783	0.9916	(89)
MIT 2	19.4837	19.6211	19.8169	20.0960	20.2615	20.3137	20.3184	20.3186	20.2947	20.0926	19.7576	19.4604	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.6590	19.7966	19.9933	20.2756	20.4481	20.5045	20.5104	20.5102	20.4829	20.2705	19.9322	19.6348	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6590	19.7966	19.9933	20.2756	20.4481	20.5045	20.5104	20.5102	20.4829	20.2705	19.9322	19.6348	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9877	0.9786	0.9596	0.8882	0.7366	0.5197	0.3645	0.4135	0.6727	0.9126	0.9752	0.9896	(94)
Useful gains	482.6840	521.8101	535.0183	544.3613	478.3162	338.8591	226.3810	237.3137	356.5283	442.0298	461.0590	468.5093	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	906.7105	878.0432	794.1118	664.6685	510.4561	342.3544	226.7301	238.0352	370.9952	564.2763	750.8171	905.6778	(97)
Space heating kWh	315.4757	239.3887	192.7656	86.6211	23.9121	0.0000	0.0000	0.0000	0.0000	90.9514	208.6259	325.2533	(98a)
Space heating requirement - total per year (kWh/year)												1482.9937	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	315.4757	239.3887	192.7656	86.6211	23.9121	0.0000	0.0000	0.0000	0.0000	90.9514	208.6259	325.2533	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1482.9937	
Space heating per m2											(98c) / (4) =	18.5421	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	545.0293	429.0656	440.1434	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9382	0.9723	0.9559	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	511.3466	417.1806	420.7125	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	695.0264	661.9343	609.5852	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	132.2495	182.0967	140.5213	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	33.0624	45.5242	35.1303	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												113.7169	(107)
Energy for space heating												18.5421	(99)
Energy for space cooling												1.4218	(108)
Total												19.9639	(109)
Fabric Energy Efficiency (DFEE)												20.0	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type			7.6000	1.1450	8.7023			(27)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.1800	5.4450			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
500mm mineral wool	39.9900		39.9900	0.1100	4.3989			(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7164			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 194.8422 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.7300	0.0500	0.3365
E3 Sill	5.8800	0.0500	0.2940
E4 Jamb	10.3200	0.0500	0.5160
E6 Intermediate floor within a dwelling	14.1900	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	11.4900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
E7 Party floor between dwellings (in blocks of flats)	14.1900	0.0700	0.9933
P4 Party wall - Roof (insulation at ceiling level)	11.4900	0.1200	1.3788
E10 Eaves (insulation at ceiling level)	8.7100	0.0600	0.5226
E12 Gable (insulation at ceiling level)	5.4100	0.0600	0.3246

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.6278 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.3442 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	68.8609	68.6984	68.5391	67.7910	67.6510	66.9994	66.9994	66.8787	67.2504	67.6510	67.9342	68.2302	(39)
Average = Sum(39)m / 12 =												67.7903	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8610	0.8589	0.8570	0.8476	0.8458	0.8377	0.8377	0.8362	0.8408	0.8458	0.8494	0.8531	(40)
HLP (average)												0.8476	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

129.1468	142.9840	129.1468	133.4517	129.1468	133.4517	129.1468	129.1468	133.4517	129.1468	133.4517	129.1468 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124 (69)

Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993 (71)

Water heating gains (Table 5)

48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587 (72)

Total internal gains

456.9346	471.8282	450.3701	438.9514	416.9142	404.3527	389.2009	388.3482	399.9916	410.5116	433.6267	446.8611 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.6000	11.2829	0.6300	0.7000	0.7700	26.2064	(81)

Solar gains	26.2064	53.3439	96.1088	157.8383	212.1656	226.1910	211.5970	168.6876	117.1101	65.1905	32.9745	21.4015 (83)
Total gains	483.1410	525.1721	546.4789	596.7897	629.0798	630.5436	600.7979	557.0358	517.1016	475.7021	466.6012	468.2626 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.8622	63.0109	63.1573	63.8543	63.9864	64.6087	64.6087	64.7253	64.3676	63.9864	63.7197	63.4432	
alpha	5.1908	5.2007	5.2105	5.2570	5.2658	5.3072	5.3072	5.3150	5.2912	5.2658	5.2480	5.2295	
util living area	0.9935	0.9890	0.9795	0.9407	0.8405	0.6492	0.4849	0.5415	0.7923	0.9549	0.9873	0.9945	(86)
MIT	19.8383	19.9822	20.2042	20.5497	20.8252	20.9661	20.9939	20.9895	20.9053	20.5661	20.1591	19.8177	(87)
Th 2	20.2008	20.2025	20.2042	20.2123	20.2138	20.2208	20.2208	20.2221	20.2181	20.2138	20.2107	20.2076	(88)
util rest of house	0.9920	0.9863	0.9742	0.9250	0.8012	0.5810	0.4018	0.4549	0.7321	0.9398	0.9837	0.9932	(89)
MIT 2	19.1332	19.2773	19.4980	19.8386	20.0885	20.2029	20.2187	20.2182	20.1608	19.8599	19.4602	19.1180	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.3322	19.4763	19.6973	20.0393	20.2964	20.4183	20.4375	20.4359	20.3709	20.0592	19.6574	19.3155	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3322	19.4763	19.6973	20.0393	20.2964	20.4183	20.4375	20.4359	20.3709	20.0592	19.6574	19.3155	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9897	0.9831	0.9700	0.9210	0.8057	0.5989	0.4252	0.4792	0.7448	0.9362	0.9805	0.9911	(94)
Useful gains	478.1617	516.3048	530.1031	549.6637	506.8187	377.6412	255.4751	266.9248	385.1262	445.3578	457.4807	464.1170	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1035.1272	1001.3652	904.5314	755.1414	581.5555	389.8225	257.1093	269.9135	421.7184	639.9250	853.0770	1031.3318	(97)
Space heating kWh	414.3823	325.9606	278.5746	147.9439	55.6042	0.0000	0.0000	0.0000	0.0000	144.7580	284.8293	422.0078	(98a)
Space heating requirement - total per year (kWh/year)												2074.0608	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	414.3823	325.9606	278.5746	147.9439	55.6042	0.0000	0.0000	0.0000	0.0000	144.7580	284.8293	422.0078	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2074.0608	
Space heating per m2											(98c) / (4) =	25.9322	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	629.7941	495.7954	508.2782	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8684	0.9281	0.8991	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	546.9170	460.1630	456.9884	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	673.7408	641.9781	593.5112	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	91.3131	135.2704	101.5730	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	22.8283	33.8176	25.3933	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												82.0391	(107)
Energy for space heating												25.9322	(99)
Energy for space cooling												1.0257	(108)
Total												26.9580	(109)
Fabric Energy Efficiency (TFEE)												27.0	(109)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.68	**TER**	11.04
Environmental	99 A	**% DER < TER**			84.78
CO_2 Emissions (t/year)	0.11	**DFEE**	19.96	**TFEE**	26.96
Compliance Check	See BREL	**% DFEE < TFEE**			25.94
% DPER < TPER	62.12	**DPER**	22.17	**TPER**	58.53

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation		0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			15583.4798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.2856	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.6117	146.8201	132.6117	137.0321	132.6117	137.0321	132.6117	132.6117	137.0321	132.6117	137.0321	132.6117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	565.9813	580.0257	555.3786	537.2808	511.1311	494.4637	476.3107	477.3819	491.4645	506.5784	536.2944	554.9833	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.6000	11.2829	0.6800	0.7000	0.7700	28.2863	(81)

Solar gains	28.2863	57.5776	103.7365	170.3651	229.0041	244.1426	228.3904	182.0755	126.4045	70.3644	35.5915	23.1000	(83)
Total gains	594.2676	637.6033	659.1151	707.6459	740.1352	738.6063	704.7011	659.4573	617.8691	576.9427	571.8859	578.0833	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9773	0.9632	0.9347	0.8451	0.6836	0.4877	0.3534	0.3944	0.6180	0.8680	0.9566	0.9806	(86)
MIT	20.3425	20.4636	20.6302	20.8424	20.9621	20.9956	20.9995	20.9990	20.9835	20.8407	20.5672	20.3073	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9726	0.9558	0.9218	0.8185	0.6420	0.4382	0.3001	0.3377	0.5634	0.8390	0.9467	0.9766	(89)
MIT 2	19.5703	19.7213	19.9263	20.1747	20.3009	20.3305	20.3331	20.3328	20.3215	20.1774	19.8520	19.5262	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.7882	19.9308	20.1249	20.3631	20.4875	20.5182	20.5211	20.5208	20.5083	20.3646	20.0538	19.7466	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7882	19.9308	20.1249	20.3631	20.4875	20.5182	20.5211	20.5208	20.5083	20.3646	20.0538	19.7466	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9680	0.9506	0.9172	0.8197	0.6519	0.4520	0.3151	0.3537	0.5780	0.8404	0.9418	0.9722	(94)
Useful gains	575.2357	606.1030	604.5711	580.0781	482.4683	333.8757	222.0696	233.2502	357.1337	484.8912	538.6193	562.0159	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	877.6902	851.7679	772.1007	649.5943	497.9703	335.3728	222.2041	233.5205	363.1476	553.3436	734.0715	880.9994	(97)
Space heating kWh	225.0261	165.0868	124.6420	50.0517	11.5334	0.0000	0.0000	0.0000	0.0000	50.9286	140.7256	237.3237	(98a)
Space heating requirement - total per year (kWh/year)												1005.3180	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	225.0261	165.0868	124.6420	50.0517	11.5334	0.0000	0.0000	0.0000	0.0000	50.9286	140.7256	237.3237	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1005.3180	
Space heating per m2											(98c) / (4) =	12.5696	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	225.0261	165.0868	124.6420	50.0517	11.5334	0.0000	0.0000	0.0000	0.0000	50.9286	140.7256	237.3237 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	337.5392	247.6303	186.9630	75.0776	17.3002	0.0000	0.0000	0.0000	0.0000	76.3929	211.0884	355.9856
Space heating requirement												
	337.5392	247.6303	186.9630	75.0776	17.3002	0.0000	0.0000	0.0000	0.0000	76.3929	211.0884	355.9856 (307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement												
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948
Water heating fuel												
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679 (331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year		
Space heating fuel - community heating	1507.9770	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	15.0798	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4815.8004	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1478.6945	0.1569	63.0811	(367)
Electrical energy for heat distribution (space & water)	15.0798	0.0000	8.0533	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			222.8067	(373)
Space and water heating			222.8067	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			134.3251	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6800	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1478.6945	1.5808	635.6630	(467)
Electrical energy for heat distribution (space & water)	15.0798	0.0000	85.2397	(472)
Overall CO2 factor for heat network			0.4253	(486)
Total CO2 associated with community systems			2358.2985	(473)
Space and water heating			2358.2985	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	1.4873	-726.6034	
PV Unit electricity exported	-469.6869	0.4449	-208.9838	
Total			-935.5872	(480)
Total Primary energy kWh/year			1773.3691	(483)
Dwelling Primary energy Rate (DPER)			22.1700	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type			7.6000	1.1450	8.7023			(27)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.1800	5.4450			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
500mm mineral wool	39.9900		39.9900	0.1100	4.3989			(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7164			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.7300	0.0500	0.3365
E3 Sill	5.8800	0.0500	0.2940
E4 Jamb	10.3200	0.0500	0.5160
E6 Intermediate floor within a dwelling	14.1900	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	11.4900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
E7 Party floor between dwellings (in blocks of flats)	14.1900	0.0700	0.9933
P4 Party wall - Roof (insulation at ceiling level)	11.4900	0.1200	1.3788
E10 Eaves (insulation at ceiling level)	8.7100	0.0600	0.5226
E12 Gable (insulation at ceiling level)	5.4100	0.0600	0.3246

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.6278	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	32.3442	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	68.8609	68.6984	68.5391	67.7910	67.6510	66.9994	66.9994	66.8787	67.2504	67.6510	67.9342	68.2302	(39)
Average = Sum(39)m / 12 =												67.7903	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8610	0.8589	0.8570	0.8476	0.8458	0.8377	0.8377	0.8362	0.8408	0.8458	0.8494	0.8531	(40)
HLP (average)												0.8476	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
									Total per year (kWh/year) = Sum(64)m =			2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.1468	142.9840	129.1468	133.4517	129.1468	133.4517	129.1468	129.1468	133.4517	129.1468	133.4517	129.1468	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													

	556.1810	569.8542	545.5784	527.3650	501.3308	481.5479	463.5104	464.5816	478.5488	496.7781	526.3787	545.1830	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.6000	11.2829	0.6300	0.7000	0.7700	26.2064	(81)

Solar gains	26.2064	53.3439	96.1088	157.8383	212.1656	226.1910	211.5970	168.6876	117.1101	65.1905	32.9745	21.4015	(83)
Total gains	582.3874	623.1981	641.6872	685.2033	713.4964	707.7389	675.1074	633.2692	595.6588	561.9686	559.3531	566.5845	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.8622	63.0109	63.1573	63.8543	63.9864	64.6087	64.6087	64.7253	64.3676	63.9864	63.7197	63.4432	
alpha	5.1908	5.2007	5.2105	5.2570	5.2658	5.3072	5.3072	5.3150	5.2912	5.2658	5.2480	5.2295	
util living area													
	0.9853	0.9773	0.9612	0.9053	0.7832	0.5884	0.4336	0.4804	0.7210	0.9184	0.9729	0.9871	(86)
MIT	20.0010	20.1377	20.3456	20.6522	20.8776	20.9785	20.9964	20.9940	20.9398	20.6738	20.3043	19.9803	(87)
Th 2	20.2008	20.2025	20.2042	20.2123	20.2138	20.2208	20.2208	20.2221	20.2181	20.2138	20.2107	20.2076	(88)
util rest of house													
	0.9820	0.9721	0.9520	0.8835	0.7390	0.5232	0.3583	0.4017	0.6573	0.8950	0.9657	0.9842	(89)
MIT 2	19.0370	19.2109	19.4728	19.8518	20.1051	20.2067	20.2193	20.2193	20.1736	19.8846	19.4288	19.0159	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.3090	19.4724	19.7191	20.0777	20.3231	20.4245	20.4386	20.4379	20.3898	20.1073	19.6758	19.2880	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3090	19.4724	19.7191	20.0777	20.3231	20.4245	20.4386	20.4379	20.3898	20.1073	19.6758	19.2880	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9771	0.9661	0.9452	0.8793	0.7456	0.5406	0.3795	0.4238	0.6721	0.8913	0.9597	0.9797	(94)
Useful gains	569.0598	602.0847	606.5356	602.4822	531.9559	382.6264	256.2298	268.3737	400.3189	500.8930	536.8375	555.0892	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1033.5332	1001.1018	906.0259	757.7443	583.3607	390.2352	257.1815	270.0514	422.9920	643.1761	854.3289	1029.4589	(97)
Space heating kWh	345.5682	268.1395	222.8208	111.7887	38.2452	0.0000	0.0000	0.0000	0.0000	105.8587	228.5938	352.9310	(98a)
Space heating requirement - total per year (kWh/year)												1673.9459	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	345.5682	268.1395	222.8208	111.7887	38.2452	0.0000	0.0000	0.0000	0.0000	105.8587	228.5938	352.9310	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1673.9459	
Space heating per m2											(98c) / (4) =	20.9296	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	345.5682	268.1395	222.8208	111.7887	38.2452	0.0000	0.0000	0.0000	0.0000	105.8587	228.5938	352.9310	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	374.3967	290.5087	241.4093	121.1146	41.4357	0.0000	0.0000	0.0000	0.0000	114.6898	247.6639	382.3738	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9867	84.6975	84.1448	82.9215	81.2185	79.8000	79.8000	79.8000	79.8000	82.7861	84.3255	85.0560	(217)
Fuel for water heating, kWh/month	268.6484	238.3203	254.9740	228.1523	226.1781	207.8751	205.6450	213.6686	215.8200	231.4247	240.8624	265.6155	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	26.8342	21.5274	19.3830	14.2008	10.9691	8.9619	10.0064	13.0067	16.8944	22.1664	25.0369	27.5800	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3597	-31.5987	-47.6203	-56.2064	-62.9289	-59.5773	-58.8595	-54.4329	-47.0022	-37.3178	-24.0087	-18.2981	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9169	-17.0101	-34.4870	-52.8069	-70.8246	-71.5366	-70.6859	-59.3742	-42.9070	-24.6402	-10.6698	-6.2334	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1813.5926	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2797.1844	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	216.5670	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3925.0410	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1813.5926	0.2100	380.8544	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2797.1844	0.2100	587.4087	(264)
Space and water heating			968.2632	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	216.5670	0.1443	31.2573	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	0.1336	-69.3640	
PV Unit electricity exported	-469.0927	0.1253	-58.7938	
Total			-128.1578	(269)
Total CO2, kg/year			883.2920	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.0400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1813.5926	1.1300	2049.3596	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2797.1844	1.1300	3160.8184	(278)
Space and water heating			5210.1780	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	216.5670	1.5338	332.1777	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	1.4937	-775.5387	
PV Unit electricity exported	-469.0927	0.4600	-215.8009	
Total			-991.3396	(283)
Total Primary energy kWh/year			4681.1169	(286)
Target Primary Energy Rate (TPER)			58.5300	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.68	**TER**	11.04
Environmental	99 A	**% DER < TER**			84.78
CO_2 Emissions (t/year)	0.11	**DFEE**	19.96	**TFEE**	26.96
Compliance Check	See BREL	**% DFEE < TFEE**			25.94
% DPER < TPER	62.12	**DPER**	22.17	**TPER**	58.53

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			15583.4798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.2856	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	612.2735	609.9558	591.8328	558.1588	524.7912	494.7014	477.0149	480.2399	497.5865	528.2765	565.2104	597.3217	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.6000	11.2829	0.6800	0.7000	0.7700	28.2863	(81)

Solar gains	28.2863	57.5776	103.7365	170.3651	229.0041	244.1426	228.3904	182.0755	126.4045	70.3644	35.5915	23.1000	(83)
Total gains	640.5598	667.5334	695.5693	728.5239	753.7953	738.8440	705.4053	662.3153	623.9910	598.6409	600.8019	620.4217	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9680	0.9551	0.9198	0.8317	0.6733	0.4876	0.3531	0.3928	0.6126	0.8522	0.9466	0.9731	(86)
MIT	20.4131	20.5058	20.6728	20.8565	20.9650	20.9956	20.9995	20.9990	20.9842	20.8576	20.6062	20.3735	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9617	0.9465	0.9049	0.8040	0.6319	0.4381	0.2998	0.3362	0.5583	0.8215	0.9350	0.9676	(89)
MIT 2	19.6581	19.7730	19.9767	20.1899	20.3035	20.3305	20.3331	20.3329	20.3221	20.1954	19.8990	19.6088	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.8712	19.9798	20.1731	20.3780	20.4901	20.5182	20.5211	20.5208	20.5089	20.3822	20.0986	19.8246	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8712	19.9798	20.1731	20.3780	20.4901	20.5182	20.5211	20.5208	20.5089	20.3822	20.0986	19.8246	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9566	0.9412	0.9009	0.8060	0.6419	0.4519	0.3148	0.3522	0.5728	0.8239	0.9303	0.9627	(94)
Useful gains	612.7493	628.2814	626.6355	587.1958	483.8251	333.8786	222.0705	233.2574	357.4456	493.2466	558.9312	597.2983	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	882.3923	854.5442	774.8327	650.4389	498.1223	335.3732	222.2042	233.5213	363.1822	554.3421	736.6073	885.4205	(97)
Space heating kWh	200.6144	152.0486	110.2587	45.5351	10.6372	0.0000	0.0000	0.0000	0.0000	45.4550	127.9267	214.3629	(98a)
Space heating requirement - total per year (kWh/year)												906.8385	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	200.6144	152.0486	110.2587	45.5351	10.6372	0.0000	0.0000	0.0000	0.0000	45.4550	127.9267	214.3629	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												906.8385	
Space heating per m2											(98c) / (4) =	11.3383	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	200.6144	152.0486	110.2587	45.5351	10.6372	0.0000	0.0000	0.0000	0.0000	45.4550	127.9267	214.3629	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	300.9216	228.0728	165.3880	68.3026	15.9557	0.0000	0.0000	0.0000	0.0000	68.1826	191.8901	321.5443	
Space heating requirement													
	300.9216	228.0728	165.3880	68.3026	15.9557	0.0000	0.0000	0.0000	0.0000	68.1826	191.8901	321.5443	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1360.2578	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												13.6026	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)
Total electricity for the above, kWh/year												21.9935	(331)
Electricity for lighting (calculated in Appendix L)												206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4668.0812	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1360.2578	4.4400	60.3954	(340a)
Space heating total			60.3954	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	206.9234	16.4900	34.1217	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	16.4900	-80.5593	
PV Unit electricity exported	-469.6869	5.5900	-26.2555	
Total			-106.8148	(352)
Total energy cost			262.5775	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7563 (357)
SAP value		87.7397
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1439.3027	0.1569	56.9012	(367)
Electrical energy for heat distribution (space & water)	13.6026	0.0000	7.8215	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			216.3951	(373)
Space and water heating			216.3951	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			127.9134	(383)
CO2 emissions per m2			1.6000	(384)
EI value			98.6285	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 79.9800						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate													
	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15583.4798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.2856	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539	(43)

Daily hot water use

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte 211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
								Total per year (kWh/year) = Sum(64)m =			2691.4183	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)

Heat gains from water heating, kWh/month

114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
327.4608 330.8588 322.2959 304.0665 281.0552 259.4278 244.9794 241.5813 250.1442 268.3736 291.3850 313.0124 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 (71)
Water heating gains (Table 5)
154.0336 151.5930 146.8914 136.5869 130.2751 123.6777 119.6256 122.9734 126.8986 134.2191 144.0972 152.7161 (72)
Total internal gains
612.2735 609.9558 591.8328 558.1588 524.7912 494.7014 477.0149 480.2399 497.5865 528.2765 565.2104 597.3217 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.6000	13.7758	0.6800	0.7000	0.7700	34.5358	(81)

Solar gains 34.5358 62.8529 112.0772 186.0500 240.0856 273.9608 251.7314 205.3053 144.2096 81.2215 42.8881 28.3108 (83)
Total gains 646.8093 672.8088 703.9100 744.2088 764.8768 768.6621 728.7463 685.5452 641.7960 609.4980 608.0985 625.6325 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9638	0.9498	0.9049	0.8049	0.6344	0.4262	0.3031	0.3386	0.5735	0.8210	0.9370	0.9696	(86)
MIT	20.4497	20.5390	20.7187	20.8849	20.9758	20.9981	20.9998	20.9996	20.9893	20.8910	20.6488	20.4093	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9567	0.9402	0.8875	0.7746	0.5913	0.3778	0.2514	0.2837	0.5190	0.7859	0.9234	0.9635	(89)
MIT 2	19.7037	19.8140	20.0313	20.2208	20.3134	20.3322	20.3332	20.3332	20.3260	20.2313	19.9508	19.6537	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.9142	20.0185	20.2253	20.4082	20.5004	20.5201	20.5213	20.5212	20.5132	20.4175	20.1478	19.8670	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9142	20.0185	20.2253	20.4082	20.5004	20.5201	20.5213	20.5212	20.5132	20.4175	20.1478	19.8670	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9515	0.9350	0.8845	0.7782	0.6023	0.3914	0.2660	0.2992	0.5339	0.7907	0.9191	0.9585	(94)
Useful gains	615.4279	629.0626	622.5762	579.1351	460.6949	300.8682	193.8367	205.1163	342.6528	481.9013	558.9054	599.6491	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	867.8323	839.7418	749.4557	629.4819	470.3670	301.4808	193.8813	205.2088	346.4250	528.0046	716.7278	870.8201	(97)
Space heating kWh	187.7889	141.5764	94.3984	36.2496	7.1960	0.0000	0.0000	0.0000	0.0000	34.3008	113.6321	201.7512	(98a)
Space heating requirement - total per year (kWh/year)												816.8935	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	187.7889	141.5764	94.3984	36.2496	7.1960	0.0000	0.0000	0.0000	0.0000	34.3008	113.6321	201.7512	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												816.8935	
Space heating per m2										(98c) / (4) =		10.2137	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement
187.7889 141.5764 94.3984 36.2496 7.1960 0.0000 0.0000 0.0000 0.0000 34.3008 113.6321 201.7512 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50
307a 281.6833 212.3646 141.5975 54.3745 10.7940 0.0000 0.0000 0.0000 0.0000 51.4512 170.4482 302.6268
Space heating requirement
281.6833 212.3646 141.5975 54.3745 10.7940 0.0000 0.0000 0.0000 0.0000 51.4512 170.4482 302.6268 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)

Water heating
Annual water heating requirement
266.9446 236.1786 250.9634 220.5542 213.7828 192.6005 189.9534 197.4446 199.5749 222.6078 236.8171 263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50
310a 400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948
Water heating fuel
400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948 (310)
Cooling System Energy Efficiency Ratio 0.0000 (314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (315)
Pumps and Fa 1.8679 1.6872 1.8679 1.8077 1.8679 1.8077 1.8679 1.8679 1.8077 1.8679 1.8077 1.8679 (331)
Lighting 25.6392 20.5688 18.5199 13.5685 10.4807 8.5628 9.5608 12.4275 16.1421 21.1793 23.9220 26.3518 (332)
Electricity generated by PVs (Appendix M) (negative quantity)
(333a)m -17.9904 -26.9468 -45.2798 -58.5762 -66.5604 -66.2871 -64.3781 -58.6940 -48.0761 -34.8334 -20.6614 -14.9764 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(334a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (334a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.0081	-13.0184	-31.9653	-58.9969	-82.6801	-94.8316	-90.1120	-72.5476	-46.2727	-22.1629	-8.3690	-4.5223	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1225.3402	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	12.2534	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4436.6375	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1225.3402	6.5500	80.2598	(340a)
Space heating total			80.2598	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	206.9234	28.4300	58.8283	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	28.4300	-148.7628	
PV Unit electricity exported	-531.4870	5.8100	-30.8794	
Total			-179.6422	(352)
Total energy cost			334.1305	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1403.3247	0.1574	51.4189	(367)
Electrical energy for heat distribution (space & water)	12.2534	0.0000	7.6159	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			210.7071	(373)
Space and water heating			210.7071	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	0.1322	-69.1719	
PV Unit electricity exported	-531.4870	0.1213	-64.4804	
Total			-133.6523	(380)
Total CO2, kg/year			109.9710	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1403.3247	1.5826	517.1137	(467)
Electrical energy for heat distribution (space & water)	12.2534	0.0000	80.7941	(472)
Overall CO2 factor for heat network			0.4248	(486)
Total CO2 associated with community systems			2235.3036	(473)
Space and water heating			2235.3036	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	1.4884	-778.8342	
PV Unit electricity exported	-531.4870	0.4450	-236.5330	
Total			-1015.3671	(480)
Total Primary energy kWh/year			1570.5943	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Northeast

Current energy efficiency rating:	B 88
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£65	£65	£0
Community scheme	£449	£449	£0
Space heating	£191	£191	£0
Water heating	£264	£264	£0
Lighting	£59	£59	£0
Generated (PV)	-£180	-£180	£0
Total cost of fuels	£334	£334	£0
Total cost of uses	£334	£334	£0
Delivered energy	55 kWh/m²	55 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	20 kWh/m²	20 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15583.4798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		194.8422 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.2856 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4625 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
									Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)

Water heating gains (Table 5)

154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)

Total internal gains

612.2735	609.9558	591.8328	558.1588	524.7912	494.7014	477.0149	480.2399	497.5865	528.2765	565.2104	597.3217	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.6000	11.2829	0.6800	0.7000	0.7700	28.2863	(81)

Solar gains	28.2863	57.5776	103.7365	170.3651	229.0041	244.1426	228.3904	182.0755	126.4045	70.3644	35.5915	23.1000	(83)
Total gains	640.5598	667.5334	695.5693	728.5239	753.7953	738.8440	705.4053	662.3153	623.9910	598.6409	600.8019	620.4217	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9680	0.9551	0.9198	0.8317	0.6733	0.4876	0.3531	0.3928	0.6126	0.8522	0.9466	0.9731	(86)
MIT	20.4131	20.5058	20.6728	20.8565	20.9650	20.9956	20.9995	20.9990	20.9842	20.8576	20.6062	20.3735	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9617	0.9465	0.9049	0.8040	0.6319	0.4381	0.2998	0.3362	0.5583	0.8215	0.9350	0.9676	(89)
MIT 2	19.6581	19.7730	19.9767	20.1899	20.3035	20.3305	20.3331	20.3329	20.3221	20.1954	19.8990	19.6088	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.8712	19.9798	20.1731	20.3780	20.4901	20.5182	20.5211	20.5208	20.5089	20.3822	20.0986	19.8246	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8712	19.9798	20.1731	20.3780	20.4901	20.5182	20.5211	20.5208	20.5089	20.3822	20.0986	19.8246	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9566	0.9412	0.9009	0.8060	0.6419	0.4519	0.3148	0.3522	0.5728	0.8239	0.9303	0.9627	(94)
Useful gains	612.7493	628.2814	626.6355	587.1958	483.8251	333.8786	222.0705	233.2574	357.4456	493.2466	558.9312	597.2983	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	882.3923	854.5442	774.8327	650.4389	498.1223	335.3732	222.2042	233.5213	363.1822	554.3421	736.6073	885.4205	(97)
Space heating kWh	200.6144	152.0486	110.2587	45.5351	10.6372	0.0000	0.0000	0.0000	0.0000	45.4550	127.9267	214.3629	(98a)
Space heating requirement - total per year (kWh/year)												906.8385	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	200.6144	152.0486	110.2587	45.5351	10.6372	0.0000	0.0000	0.0000	0.0000	45.4550	127.9267	214.3629	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												906.8385	
Space heating per m2											(98c) / (4) =	11.3383	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	200.6144	152.0486	110.2587	45.5351	10.6372	0.0000	0.0000	0.0000	0.0000	45.4550	127.9267	214.3629	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	300.9216	228.0728	165.3880	68.3026	15.9557	0.0000	0.0000	0.0000	0.0000	68.1826	191.8901	321.5443	
Space heating requirement	300.9216	228.0728	165.3880	68.3026	15.9557	0.0000	0.0000	0.0000	0.0000	68.1826	191.8901	321.5443	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1360.2578	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												13.6026	(313)
Space cooling fuel												0.0000	(321)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)

mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4668.0812	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1360.2578	4.4400	60.3954	(340a)
Space heating total			60.3954	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	206.9234	16.4900	34.1217	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	16.4900	-80.5593	
PV Unit electricity exported	-469.6869	5.5900	-26.2555	
Total			-106.8148	(352)
Total energy cost			262.5775	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7563	(357)
SAP value		87.7397	
SAP rating (Section 12)		88	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1439.3027	0.1569	56.9012	(367)
Electrical energy for heat distribution (space & water)	13.6026	0.0000	7.8215	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			216.3951	(373)
Space and water heating			216.3951	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			127.9134	(383)
CO2 emissions per m2			1.6000	(384)
EI value			98.6285	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor		39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)

Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15583.4798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		194.8422 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.2856 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4625 (42)

Hot water usage for mixer showers

65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)
Total storage loss	

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

											Total per year (kWh/year) = Sum(64)m =	2691.4183	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000		(64a)
Heat gains from water heating, kWh/month													
114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207		(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063		(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124		(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374		(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)													
-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993		(71)
Water heating gains (Table 5)													
154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161		(72)
Total internal gains													
612.2735	609.9558	591.8328	558.1588	524.7912	494.7014	477.0149	480.2399	497.5865	528.2765	565.2104	597.3217		(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.6000	13.7758	0.6800	0.7000	0.7700	34.5358	(81)

Solar gains	34.5358	62.8529	112.0772	186.0500	240.0856	273.9608	251.7314	205.3053	144.2096	81.2215	42.8881	28.3108	(83)
Total gains	646.8093	672.8088	703.9100	744.2088	764.8768	768.6621	728.7463	685.5452	641.7960	609.4980	608.0985	625.6325	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area													
0.9638	0.9498	0.9049	0.8049	0.6344	0.4262	0.3031	0.3386	0.5735	0.8210	0.9370	0.9696		(86)
MIT	20.4497	20.5390	20.7187	20.8849	20.9758	20.9981	20.9998	20.9996	20.9893	20.8910	20.6488	20.4093	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house													
0.9567	0.9402	0.8875	0.7746	0.5913	0.3778	0.2514	0.2837	0.5190	0.7859	0.9234	0.9635		(89)
MIT 2	19.7037	19.8140	20.0313	20.2208	20.3134	20.3322	20.3332	20.3332	20.3260	20.2313	19.9508	19.6537	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.9142	20.0185	20.2253	20.4082	20.5004	20.5201	20.5213	20.5212	20.5132	20.4175	20.1478	19.8670	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9142	20.0185	20.2253	20.4082	20.5004	20.5201	20.5213	20.5212	20.5132	20.4175	20.1478	19.8670	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9515	0.9350	0.8845	0.7782	0.6023	0.3914	0.2660	0.2992	0.5339	0.7907	0.9191	0.9585	(94)
Useful gains	615.4279	629.0626	622.5762	579.1351	460.6949	300.8682	193.8367	205.1163	342.6528	481.9013	558.9054	599.6491	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
867.8323	839.7418	749.4557	629.4819	470.3670	301.4808	193.8813	205.2088	346.4250	528.0046	716.7278	870.8201		(97)
Space heating kWh													
187.7889	141.5764	94.3984	36.2496	7.1960	0.0000	0.0000	0.0000	0.0000	34.3008	113.6321	201.7512		(98a)
Space heating requirement - total per year (kWh/year)												816.8935	
Solar heating kWh													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
187.7889	141.5764	94.3984	36.2496	7.1960	0.0000	0.0000	0.0000	0.0000	34.3008	113.6321	201.7512		(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												816.8935	
Space heating per m2											(98c) / (4) =	10.2137	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement													
187.7889	141.5764	94.3984	36.2496	7.1960	0.0000	0.0000	0.0000	0.0000	34.3008	113.6321	201.7512		(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	281.6833	212.3646	141.5975	54.3745	10.7940	0.0000	0.0000	0.0000	0.0000	51.4512	170.4482	302.6268	
Space heating requirement													
281.6833	212.3646	141.5975	54.3745	10.7940	0.0000	0.0000	0.0000	0.0000	51.4512	170.4482	302.6268		(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.9904	-26.9468	-45.2798	-58.5762	-66.5604	-66.2871	-64.3781	-58.6940	-48.0761	-34.8334	-20.6614	-14.9764	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.0081	-13.0184	-31.9653	-58.9969	-82.6801	-94.8316	-90.1120	-72.5476	-46.2727	-22.1629	-8.3690	-4.5223	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1225.3402	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												12.2534	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)
Total electricity for the above, kWh/year												21.9935	(331)
Electricity for lighting (calculated in Appendix L)												206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1054.7470	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4436.6375	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1225.3402	6.5500	80.2598	(340a)
Space heating total			80.2598	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	206.9234	28.4300	58.8283	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	28.4300	-148.7628	
PV Unit electricity exported	-531.4870	5.8100	-30.8794	
Total			-179.6422	(352)
Total energy cost			334.1305	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1403.3247	0.1574	51.4189	(367)
Electrical energy for heat distribution (space & water)	12.2534	0.0000	7.6159	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			210.7071	(373)
Space and water heating			210.7071	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	0.1322	-69.1719	
PV Unit electricity exported	-531.4870	0.1213	-64.4804	
Total			-133.6523	(380)
Total CO2, kg/year			109.9710	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1403.3247	1.5826	517.1137	(467)
Electrical energy for heat distribution (space & water)	12.2534	0.0000	80.7941	(472)
Overall CO2 factor for heat network			0.4248	(486)
Total CO2 associated with community systems			2235.3036	(473)
Space and water heating			2235.3036	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)

Energy saving/generation technologies			
PV Unit electricity used in dwelling	-523.2600	1.4884	-778.8342
PV Unit electricity exported	-531.4870	0.4450	-236.5330
Total			-1015.3671 (480)
Total Primary energy kWh/year			1570.5943 (483)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.50	**TER**	10.35
Environmental	99 A	**% DER < TER**			85.51
CO_2 Emissions (t/year)	0.1	**DFEE**	16.82	**TFEE**	23.60
Compliance Check	See BREL	**% DFEE < TFEE**			28.74
% DPER < TPER	62.80	**DPER**	20.39	**TPER**	54.81

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			15583.4798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		194.8422 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.2856 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4625 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)		122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:		
Store volume		110.0000 (47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)		0.0152 (51)
Volume factor from Table 2a		1.0294 (52)
Temperature factor from Table 2b		0.6000 (53)
Enter (49) or (54) in (55)		1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
									Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)											2691	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	132.6117	146.8201	132.6117	137.0321	132.6117	137.0321	132.6117	132.6117	137.0321	132.6117	137.0321	132.6117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains													
	565.9813	580.0257	555.3786	537.2808	511.1311	494.4637	476.3107	477.3819	491.4645	506.5784	536.2944	554.9833	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.6000	36.7938	0.6800	0.7000	0.7700	92.2420	(79)

Solar gains	92.2420	157.1223	214.9816	266.3726	298.3595	296.2019	285.5703	261.7066	232.7796	173.6536	110.4847	78.9399	(83)
Total gains	658.2233	737.1480	770.3602	803.6534	809.4905	790.6656	761.8809	739.0884	724.2441	680.2320	646.7791	633.9232	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)		21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9639	0.9328	0.8851	0.7827	0.6336	0.4565	0.3270	0.3523	0.5340	0.7907	0.9285	0.9703	(86)
MIT	20.4390	20.5958	20.7485	20.8981	20.9746	20.9969	20.9997	20.9995	20.9923	20.9074	20.6634	20.3940	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9570	0.9211	0.8664	0.7525	0.5929	0.4098	0.2776	0.3014	0.4846	0.7556	0.9141	0.9644	(89)
MIT 2	19.6901	19.8818	20.0645	20.2337	20.3119	20.3313	20.3332	20.3331	20.3280	20.2466	19.9670	19.6342	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.9014	20.0833	20.2575	20.4212	20.4989	20.5192	20.5212	20.5211	20.5155	20.4331	20.1635	19.8486	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9014	20.0833	20.2575	20.4212	20.4989	20.5192	20.5212	20.5211	20.5155	20.4331	20.1635	19.8486	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9517	0.9161	0.8641	0.7566	0.6032	0.4229	0.2915	0.3158	0.4982	0.7611	0.9100	0.9594	(94)
Useful gains	626.4327	675.3350	665.6546	608.0791	488.2870	334.3867	222.1238	233.3938	360.8157	517.7382	588.5462	608.1554	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	884.1072	860.4113	779.6142	652.8862	498.6199	335.4291	222.2103	233.5368	363.5543	557.2227	740.2875	886.7815	(97)
Space heating kWh	191.7098	124.3713	84.7860	32.2611	7.6876	0.0000	0.0000	0.0000	0.0000	29.3764	109.2537	207.2979	(98a)
Space heating requirement - total per year (kWh/year)												786.7438	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	191.7098	124.3713	84.7860	32.2611	7.6876	0.0000	0.0000	0.0000	0.0000	29.3764	109.2537	207.2979	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												786.7438	
Space heating per m2										(98c) / (4) =		9.8368	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	191.7098	124.3713	84.7860	32.2611	7.6876	0.0000	0.0000	0.0000	0.0000	29.3764	109.2537	207.2979	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	287.5647	186.5569	127.1789	48.3917	11.5315	0.0000	0.0000	0.0000	0.0000	44.0647	163.8806	310.9468	
Space heating requirement													
	287.5647	186.5569	127.1789	48.3917	11.5315	0.0000	0.0000	0.0000	0.0000	44.0647	163.8806	310.9468	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1180.1157	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	11.8012	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4487.9391	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1391.2648	0.1577	49.6122	(367)
Electrical energy for heat distribution (space & water)	11.8012	0.0000	7.5482	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			208.8327	(373)
Space and water heating			208.8327	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			120.3511	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.5000	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1391.2648	1.5836	498.3533	(467)
Electrical energy for heat distribution (space & water)	11.8012	0.0000	80.0906	(472)
Overall CO2 factor for heat network			0.4247	(486)
Total CO2 associated with community systems			2215.8397	(473)
Space and water heating			2215.8397	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	1.4873	-726.6034	
PV Unit electricity exported	-469.6869	0.4449	-208.9838	
Total			-935.5872	(480)
Total Primary energy kWh/year			1630.9103	(483)
Dwelling Primary energy Rate (DPER)			20.3900	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type			7.6000	1.1450	8.7023			(27)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.1800	5.4450			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
500mm mineral wool	39.9900		39.9900	0.1100	4.3989			(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7164			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.7300	0.0500	0.3365
E3 Sill	5.8800	0.0500	0.2940
E4 Jamb	10.3200	0.0500	0.5160
E6 Intermediate floor within a dwelling	14.1900	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	11.4900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
E7 Party floor between dwellings (in blocks of flats)	14.1900	0.0700	0.9933
P4 Party wall - Roof (insulation at ceiling level)	11.4900	0.1200	1.3788
E10 Eaves (insulation at ceiling level)	8.7100	0.0600	0.5226
E12 Gable (insulation at ceiling level)	5.4100	0.0600	0.3246

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.6278	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	32.3442	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	68.8609	68.6984	68.5391	67.7910	67.6510	66.9994	66.9994	66.8787	67.2504	67.6510	67.9342	68.2302	(39)
Average = Sum(39)m / 12 =												67.7903	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8610	0.8589	0.8570	0.8476	0.8458	0.8377	0.8377	0.8362	0.8408	0.8458	0.8494	0.8531	(40)
HLP (average)												0.8476	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
									Total per year (kWh/year) = Sum(64)m =			2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.1468	142.9840	129.1468	133.4517	129.1468	133.4517	129.1468	129.1468	133.4517	129.1468	133.4517	129.1468	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													

	556.1810	569.8542	545.5784	527.3650	501.3308	481.5479	463.5104	464.5816	478.5488	496.7781	526.3787	545.1830	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.6000	36.7938	0.6300	0.7000	0.7700	85.4595	(79)

Solar gains	85.4595	145.5692	199.1741	246.7864	276.4213	274.4224	264.5724	242.4635	215.6634	160.8850	102.3608	73.1355	(83)
Total gains	641.6405	715.4234	744.7525	774.1514	777.7521	755.9703	728.0828	707.0450	694.2122	657.6630	628.7395	618.3185	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.8622	63.0109	63.1573	63.8543	63.9864	64.6087	64.6087	64.7253	64.3676	63.9864	63.7197	63.4432	
alpha	5.1908	5.2007	5.2105	5.2570	5.2658	5.3072	5.3072	5.3150	5.2912	5.2658	5.2480	5.2295	
util living area	0.9780	0.9607	0.9331	0.8635	0.7401	0.5548	0.4029	0.4321	0.6399	0.8673	0.9571	0.9813	(86)
MIT	20.0941	20.2736	20.4812	20.7359	20.9068	20.9836	20.9975	20.9963	20.9654	20.7683	20.4044	20.0628	(87)
Th 2	20.2008	20.2025	20.2042	20.2123	20.2138	20.2208	20.2208	20.2221	20.2181	20.2138	20.2107	20.2076	(88)
util rest of house	0.9732	0.9525	0.9190	0.8362	0.6939	0.4919	0.3325	0.3605	0.5769	0.8357	0.9467	0.9772	(89)
MIT 2	19.1539	19.3792	19.6367	19.9454	20.1328	20.2102	20.2197	20.2204	20.1936	19.9887	19.5515	19.1197	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.4192	19.6316	19.8750	20.1685	20.3512	20.4284	20.4392	20.4394	20.4114	20.2087	19.7922	19.3859	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4192	19.6316	19.8750	20.1685	20.3512	20.4284	20.4392	20.4394	20.4114	20.2087	19.7922	19.3859	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9673	0.9454	0.9123	0.8345	0.7024	0.5089	0.3524	0.3807	0.5930	0.8355	0.9400	0.9718	(94)
Useful gains	620.6324	676.3481	679.4536	646.0502	546.2963	384.7439	256.5577	269.1432	411.6566	549.4528	591.0392	600.8572	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1041.1214	1012.0369	916.7120	763.9030	585.2653	390.5009	257.2236	270.1494	424.4467	650.0390	862.2332	1036.1345	(97)
Space heating kWh	312.8438	225.5829	176.5202	84.8540	28.9929	0.0000	0.0000	0.0000	0.0000	74.8362	195.2597	323.8463	(98a)
Space heating requirement - total per year (kWh/year)												1422.7360	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	312.8438	225.5829	176.5202	84.8540	28.9929	0.0000	0.0000	0.0000	0.0000	74.8362	195.2597	323.8463	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1422.7360	
Space heating per m2											(98c) / (4) =	17.7886	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	312.8438	225.5829	176.5202	84.8540	28.9929	0.0000	0.0000	0.0000	0.0000	74.8362	195.2597	323.8463	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	338.9423	244.4018	191.2462	91.9328	31.4116	0.0000	0.0000	0.0000	0.0000	81.0793	211.5489	350.8628	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.7666	84.3097	83.6257	82.3855	80.9179	79.8000	79.8000	79.8000	79.8000	82.1384	83.9715	84.8667	(217)
Fuel for water heating, kWh/month	269.3460	239.4166	256.5566	229.6368	227.0181	207.8751	205.6450	213.6686	215.8200	233.2496	241.8780	266.2079	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	26.8342	21.5274	19.3830	14.2008	10.9691	8.9619	10.0064	13.0067	16.8944	22.1664	25.0369	27.5800	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3597	-31.5987	-47.6203	-56.2064	-62.9289	-59.5773	-58.8595	-54.4329	-47.0022	-37.3178	-24.0087	-18.2981	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9169	-17.0101	-34.4870	-52.8069	-70.8246	-71.5366	-70.6859	-59.3742	-42.9070	-24.6402	-10.6698	-6.2334	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1541.4258	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2806.3184	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	216.5670	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3662.0081	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1541.4258	0.2100	323.6994	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2806.3184	0.2100	589.3269	(264)
Space and water heating			913.0263	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	216.5670	0.1443	31.2573	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	0.1336	-69.3640	
PV Unit electricity exported	-469.0927	0.1253	-58.7938	
Total			-128.1578	(269)
Total CO2, kg/year			828.0551	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.3500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1541.4258	1.1300	1741.8111	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2806.3184	1.1300	3171.1397	(278)
Space and water heating			4912.9508	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	216.5670	1.5338	332.1777	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	1.4937	-775.5387	
PV Unit electricity exported	-469.0927	0.4600	-215.8009	
Total			-991.3396	(283)
Total Primary energy kWh/year			4383.8897	(286)
Target Primary Energy Rate (TPER)			54.8100	(287)

Full SAP Calculation Printout

elmhurst energy

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.50	**TER**	10.35
Environmental	99 A	**% DER < TER**			85.51
CO_2 Emissions (t/year)	0.1	**DFEE**	16.82	**TFEE**	23.60
Compliance Check	See BREL	**% DFEE < TFEE**			28.74
% DPER < TPER	62.80	**DPER**	20.39	**TPER**	54.81

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		3 * 10 =	30.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1531	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.3031	(18)
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2122	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2705	0.2652	0.2599	0.2334	0.2281	0.2016	0.2016	0.1963	0.2122	0.2281	0.2387	0.2493	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5366	0.5352	0.5338	0.5272	0.5260	0.5203	0.5203	0.5193	0.5225	0.5260	0.5285	0.5311	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15583.4798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							3.2856	(36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.6979	34.6061	34.5160	34.0930	34.0139	33.6455	33.6455	33.5772	33.7874	34.0139	34.1740	34.3414	(38)
Heat transfer coeff	59.0343	58.9424	58.8524	58.4294	58.3502	57.9818	57.9818	57.9136	58.1237	58.3502	58.5103	58.6777	(39)
Average = Sum(39)m / 12 =												58.4290	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7381	0.7370	0.7358	0.7305	0.7296	0.7250	0.7250	0.7241	0.7267	0.7296	0.7316	0.7337	(40)
HLP (average)												0.7305	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												62.4583	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.6117	146.8201	132.6117	137.0321	132.6117	137.0321	132.6117	132.6117	137.0321	132.6117	137.0321	132.6117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains	460.3995	475.6643	453.8350	442.5318	420.3791	407.9331	392.6658	391.8132	403.5720	413.9765	437.2071	450.3260	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.6000	36.7938	0.6800	0.7000	0.7700	92.2420	(79)

Solar gains	92.2420	157.1223	214.9816	266.3726	298.3595	296.2019	285.5703	261.7066	232.7796	173.6536	110.4847	78.9399	(83)
Total gains	552.6415	632.7866	668.8166	708.9044	718.7386	704.1350	678.2360	653.5197	636.3515	587.6301	547.6918	529.2659	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.3259	73.4402	73.5526	74.0851	74.1855	74.6569	74.6569	74.7449	74.4746	74.1855	73.9825	73.7715	
alpha	5.8884	5.8960	5.9035	5.9390	5.9457	5.9771	5.9771	5.9830	5.9650	5.9457	5.9322	5.9181	
util living area	0.9852	0.9675	0.9370	0.8547	0.7145	0.5215	0.3755	0.4065	0.6148	0.8694	0.9666	0.9882	(86)
MIT	20.2117	20.3984	20.5949	20.8192	20.9478	20.9931	20.9992	20.9987	20.9824	20.8283	20.4922	20.1727	(87)

Th 2	20.3073	20.3083	20.3093	20.3139	20.3148	20.3188	20.3188	20.3196	20.3173	20.3148	20.3130	20.3112	(88)
util rest of house	0.9819	0.9607	0.9242	0.8285	0.6720	0.4681	0.3177	0.3469	0.5593	0.8402	0.9585	0.9855	(89)
MIT 2	19.5888	19.7720	19.9616	20.1715	20.2796	20.3153	20.3186	20.3191	20.3075	20.1839	19.8692	19.5537	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.7646	19.9487	20.1404	20.3543	20.4682	20.5066	20.5106	20.5109	20.4980	20.3658	20.0450	19.7283	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7646	19.9487	20.1404	20.3543	20.4682	20.5066	20.5106	20.5109	20.4980	20.3658	20.0450	19.7283	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9788	0.9566	0.9207	0.8301	0.6818	0.4830	0.3340	0.3637	0.5743	0.8425	0.9548	0.9828	(94)
Useful gains	540.9223	605.3536	615.7956	588.4921	490.0513	340.0922	226.5292	237.7161	365.4488	495.0998	522.9110	520.1447	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	912.9429	887.0095	802.7671	669.2680	511.6249	342.4752	226.7454	238.0763	371.8738	569.8341	757.4162	911.1680	(97)
Space heating kWh	276.7833	189.2728	139.1069	58.1586	16.0508	0.0000	0.0000	0.0000	0.0000	55.6023	168.8437	290.9213	(98a)
Space heating requirement - total per year (kWh/year)												1194.7397	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	276.7833	189.2728	139.1069	58.1586	16.0508	0.0000	0.0000	0.0000	0.0000	55.6023	168.8437	290.9213	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1194.7397	
Space heating per m2											(98c) / (4) =	14.9380	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	545.0293	429.0656	440.1434	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9560	0.9822	0.9763	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	521.0533	421.4376	429.7336	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	755.8749	728.7679	702.6605	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	169.0716	228.6537	203.0576	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction											fC = cooled area / (4) =	1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	42.2679	57.1634	50.7644	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												150.1957	(107)
Energy for space heating												14.9380	(99)
Energy for space cooling												1.8779	(108)
Total												16.8159	(109)
Fabric Energy Efficiency (DFEE)												16.8	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type			7.6000	1.1450	8.7023			(27)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.1800	5.4450			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
500mm mineral wool	39.9900		39.9900	0.1100	4.3989			(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7164			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 194.8422 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.7300	0.0500	0.3365
E3 Sill	5.8800	0.0500	0.2940
E4 Jamb	10.3200	0.0500	0.5160
E6 Intermediate floor within a dwelling	14.1900	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	11.4900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
E7 Party floor between dwellings (in blocks of flats)	14.1900	0.0700	0.9933
P4 Party wall - Roof (insulation at ceiling level)	11.4900	0.1200	1.3788
E10 Eaves (insulation at ceiling level)	8.7100	0.0600	0.5226
E12 Gable (insulation at ceiling level)	5.4100	0.0600	0.3246

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.6278 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.3442 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	68.8609	68.6984	68.5391	67.7910	67.6510	66.9994	66.9994	66.8787	67.2504	67.6510	67.9342	68.2302	(39)
Average = Sum(39)m / 12 =												67.7903	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8610	0.8589	0.8570	0.8476	0.8458	0.8377	0.8377	0.8362	0.8408	0.8458	0.8494	0.8531	(40)
HLP (average)												0.8476	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	129.1468	142.9840	129.1468	133.4517	129.1468	133.4517	129.1468	129.1468	133.4517	129.1468	133.4517	129.1468 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993 (71)

Water heating gains (Table 5)

	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587 (72)

Total internal gains

	456.9346	471.8282	450.3701	438.9514	416.9142	404.3527	389.2009	388.3482	399.9916	410.5116	433.6267	446.8611 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.6000	36.7938	0.6300	0.7000	0.7700	85.4595	(79)

Solar gains	85.4595	145.5692	199.1741	246.7864	276.4213	274.4224	264.5724	242.4635	215.6634	160.8850	102.3608	73.1355 (83)
Total gains	542.3941	617.3973	649.5442	685.7378	693.3355	678.7750	653.7733	630.8117	615.6550	571.3965	535.9875	519.9966 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.8622	63.0109	63.1573	63.8543	63.9864	64.6087	64.6087	64.7253	64.3676	63.9864	63.7197	63.4432	
alpha	5.1908	5.2007	5.2105	5.2570	5.2658	5.3072	5.3072	5.3150	5.2912	5.2658	5.2480	5.2295	
util living area	0.9892	0.9781	0.9593	0.9051	0.7970	0.6102	0.4473	0.4821	0.7037	0.9138	0.9772	0.9912	(86)
MIT	19.9363	20.1288	20.3566	20.6528	20.8667	20.9745	20.9959	20.9939	20.9463	20.6843	20.2688	19.9040	(87)
Th 2	20.2008	20.2025	20.2042	20.2123	20.2138	20.2208	20.2208	20.2221	20.2181	20.2138	20.2107	20.2076	(88)
util rest of house	0.9867	0.9731	0.9498	0.8832	0.7537	0.5437	0.3698	0.4032	0.6398	0.8895	0.9711	0.9891	(89)
MIT 2	19.2301	19.4210	19.6447	19.9318	20.1208	20.2076	20.2194	20.2199	20.1875	19.9664	19.5671	19.2036	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.4294	19.6208	19.8456	20.1353	20.3313	20.4241	20.4385	20.4383	20.4016	20.1690	19.7651	19.4013	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4294	19.6208	19.8456	20.1353	20.3313	20.4241	20.4385	20.4383	20.4016	20.1690	19.7651	19.4013	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9835	0.9686	0.9447	0.8808	0.7606	0.5615	0.3917	0.4254	0.6555	0.8879	0.9668	0.9863	(94)
Useful gains	533.4567	598.0176	613.6213	604.0117	527.3231	381.1458	256.0713	268.3679	403.5470	507.3456	518.2029	512.8909	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1041.8237	1011.2929	914.6971	761.6506	583.9148	390.2079	257.1776	270.0767	423.7858	647.3521	860.3929	1037.1867	(97)
Space heating kWh	378.2250	277.7210	224.0004	113.5000	42.1042	0.0000	0.0000	0.0000	0.0000	104.1648	246.3768	390.0760	(98a)
Space heating requirement - total per year (kWh/year)												1776.1683	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	378.2250	277.7210	224.0004	113.5000	42.1042	0.0000	0.0000	0.0000	0.0000	104.1648	246.3768	390.0760	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1776.1683	
Space heating per m2										(98c) / (4) =		22.2077	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	629.7941	495.7954	508.2782	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8966	0.9483	0.9360	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	564.6620	470.1678	475.7387	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	730.1152	703.8974	679.7428	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	119.1263	173.8948	151.7790	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	29.7816	43.4737	37.9448	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												111.2000	(107)
Energy for space heating												22.2077	(99)
Energy for space cooling												1.3903	(108)
Total												23.5980	(109)
Fabric Energy Efficiency (TFEE)												23.6	(109)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.50	**TER**	10.35
Environmental	99 A	**% DER < TER**			85.51
CO_2 Emissions (t/year)	0.1	**DFEE**	16.82	**TFEE**	23.60
Compliance Check	See BREL	**% DFEE < TFEE**			28.74
% DPER < TPER	62.80	**DPER**	20.39	**TPER**	54.81

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			15583.4798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		194.8422 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.2856 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4625 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)		122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:		
Store volume		110.0000 (47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)		0.0152 (51)
Volume factor from Table 2a		1.0294 (52)
Temperature factor from Table 2b		0.6000 (53)
Enter (49) or (54) in (55)		1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
									Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)											2691	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	132.6117	146.8201	132.6117	137.0321	132.6117	137.0321	132.6117	132.6117	137.0321	132.6117	137.0321	132.6117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains													
	565.9813	580.0257	555.3786	537.2808	511.1311	494.4637	476.3107	477.3819	491.4645	506.5784	536.2944	554.9833	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.6000	36.7938	0.6800	0.7000	0.7700	92.2420	(79)

Solar gains	92.2420	157.1223	214.9816	266.3726	298.3595	296.2019	285.5703	261.7066	232.7796	173.6536	110.4847	78.9399	(83)
Total gains	658.2233	737.1480	770.3602	803.6534	809.4905	790.6656	761.8809	739.0884	724.2441	680.2320	646.7791	633.9232	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)		21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9639	0.9328	0.8851	0.7827	0.6336	0.4565	0.3270	0.3523	0.5340	0.7907	0.9285	0.9703	(86)
MIT	20.4390	20.5958	20.7485	20.8981	20.9746	20.9969	20.9997	20.9995	20.9923	20.9074	20.6634	20.3940	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9570	0.9211	0.8664	0.7525	0.5929	0.4098	0.2776	0.3014	0.4846	0.7556	0.9141	0.9644	(89)
MIT 2	19.6901	19.8818	20.0645	20.2337	20.3119	20.3313	20.3332	20.3331	20.3280	20.2466	19.9670	19.6342	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.9014	20.0833	20.2575	20.4212	20.4989	20.5192	20.5212	20.5211	20.5155	20.4331	20.1635	19.8486	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9014	20.0833	20.2575	20.4212	20.4989	20.5192	20.5212	20.5211	20.5155	20.4331	20.1635	19.8486	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9517	0.9161	0.8641	0.7566	0.6032	0.4229	0.2915	0.3158	0.4982	0.7611	0.9100	0.9594	(94)
Useful gains	626.4327	675.3350	665.6546	608.0791	488.2870	334.3867	222.1238	233.3938	360.8157	517.7382	588.5462	608.1554	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	884.1072	860.4113	779.6142	652.8862	498.6199	335.4291	222.2103	233.5368	363.5543	557.2227	740.2875	886.7815	(97)
Space heating kWh	191.7098	124.3713	84.7860	32.2611	7.6876	0.0000	0.0000	0.0000	0.0000	29.3764	109.2537	207.2979	(98a)
Space heating requirement - total per year (kWh/year)												786.7438	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	191.7098	124.3713	84.7860	32.2611	7.6876	0.0000	0.0000	0.0000	0.0000	29.3764	109.2537	207.2979	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												786.7438	
Space heating per m2										(98c) / (4) =		9.8368	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	191.7098	124.3713	84.7860	32.2611	7.6876	0.0000	0.0000	0.0000	0.0000	29.3764	109.2537	207.2979	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	287.5647	186.5569	127.1789	48.3917	11.5315	0.0000	0.0000	0.0000	0.0000	44.0647	163.8806	310.9468	
Space heating requirement													
	287.5647	186.5569	127.1789	48.3917	11.5315	0.0000	0.0000	0.0000	0.0000	44.0647	163.8806	310.9468	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1180.1157	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	11.8012	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4487.9391	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1391.2648	0.1577	49.6122	(367)
Electrical energy for heat distribution (space & water)	11.8012	0.0000	7.5482	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			208.8327	(373)
Space and water heating			208.8327	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			120.3511	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.5000	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1391.2648	1.5836	498.3533	(467)
Electrical energy for heat distribution (space & water)	11.8012	0.0000	80.0906	(472)
Overall CO2 factor for heat network			0.4247	(486)
Total CO2 associated with community systems			2215.8397	(473)
Space and water heating			2215.8397	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	1.4873	-726.6034	
PV Unit electricity exported	-469.6869	0.4449	-208.9838	
Total			-935.5872	(480)
Total Primary energy kWh/year			1630.9103	(483)
Dwelling Primary energy Rate (DPER)			20.3900	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type			7.6000	1.1450	8.7023			(27)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.1800	5.4450			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
500mm mineral wool	39.9900		39.9900	0.1100	4.3989			(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7164			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.7300	0.0500	0.3365
E3 Sill	5.8800	0.0500	0.2940
E4 Jamb	10.3200	0.0500	0.5160
E6 Intermediate floor within a dwelling	14.1900	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	11.4900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
E7 Party floor between dwellings (in blocks of flats)	14.1900	0.0700	0.9933
P4 Party wall - Roof (insulation at ceiling level)	11.4900	0.1200	1.3788
E10 Eaves (insulation at ceiling level)	8.7100	0.0600	0.5226
E12 Gable (insulation at ceiling level)	5.4100	0.0600	0.3246

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.6278	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	32.3442	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	68.8609	68.6984	68.5391	67.7910	67.6510	66.9994	66.9994	66.8787	67.2504	67.6510	67.9342	68.2302	(39)
Average = Sum(39)m / 12 =												67.7903	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8610	0.8589	0.8570	0.8476	0.8458	0.8377	0.8377	0.8362	0.8408	0.8458	0.8494	0.8531	(40)
HLP (average)												0.8476	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
									Total per year (kWh/year) = Sum(64)m =			2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.1468	142.9840	129.1468	133.4517	129.1468	133.4517	129.1468	129.1468	133.4517	129.1468	133.4517	129.1468	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													

	556.1810	569.8542	545.5784	527.3650	501.3308	481.5479	463.5104	464.5816	478.5488	496.7781	526.3787	545.1830	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.6000	36.7938	0.6300	0.7000	0.7700	85.4595	(79)

Solar gains	85.4595	145.5692	199.1741	246.7864	276.4213	274.4224	264.5724	242.4635	215.6634	160.8850	102.3608	73.1355	(83)
Total gains	641.6405	715.4234	744.7525	774.1514	777.7521	755.9703	728.0828	707.0450	694.2122	657.6630	628.7395	618.3185	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.8622	63.0109	63.1573	63.8543	63.9864	64.6087	64.6087	64.7253	64.3676	63.9864	63.7197	63.4432	
alpha	5.1908	5.2007	5.2105	5.2570	5.2658	5.3072	5.3072	5.3150	5.2912	5.2658	5.2480	5.2295	
util living area	0.9780	0.9607	0.9331	0.8635	0.7401	0.5548	0.4029	0.4321	0.6399	0.8673	0.9571	0.9813	(86)
MIT	20.0941	20.2736	20.4812	20.7359	20.9068	20.9836	20.9975	20.9963	20.9654	20.7683	20.4044	20.0628	(87)
Th 2	20.2008	20.2025	20.2042	20.2123	20.2138	20.2208	20.2208	20.2221	20.2181	20.2138	20.2107	20.2076	(88)
util rest of house	0.9732	0.9525	0.9190	0.8362	0.6939	0.4919	0.3325	0.3605	0.5769	0.8357	0.9467	0.9772	(89)
MIT 2	19.1539	19.3792	19.6367	19.9454	20.1328	20.2102	20.2197	20.2204	20.1936	19.9887	19.5515	19.1197	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.4192	19.6316	19.8750	20.1685	20.3512	20.4284	20.4392	20.4394	20.4114	20.2087	19.7922	19.3859	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4192	19.6316	19.8750	20.1685	20.3512	20.4284	20.4392	20.4394	20.4114	20.2087	19.7922	19.3859	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9673	0.9454	0.9123	0.8345	0.7024	0.5089	0.3524	0.3807	0.5930	0.8355	0.9400	0.9718	(94)
Useful gains	620.6324	676.3481	679.4536	646.0502	546.2963	384.7439	256.5577	269.1432	411.6566	549.4528	591.0392	600.8572	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1041.1214	1012.0369	916.7120	763.9030	585.2653	390.5009	257.2236	270.1494	424.4467	650.0390	862.2332	1036.1345	(97)
Space heating kWh	312.8438	225.5829	176.5202	84.8540	28.9929	0.0000	0.0000	0.0000	0.0000	74.8362	195.2597	323.8463	(98a)
Space heating requirement - total per year (kWh/year)												1422.7360	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	312.8438	225.5829	176.5202	84.8540	28.9929	0.0000	0.0000	0.0000	0.0000	74.8362	195.2597	323.8463	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1422.7360	
Space heating per m2											(98c) / (4) =	17.7886	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	312.8438	225.5829	176.5202	84.8540	28.9929	0.0000	0.0000	0.0000	0.0000	74.8362	195.2597	323.8463	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	338.9423	244.4018	191.2462	91.9328	31.4116	0.0000	0.0000	0.0000	0.0000	81.0793	211.5489	350.8628	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.7666	84.3097	83.6257	82.3855	80.9179	79.8000	79.8000	79.8000	79.8000	82.1384	83.9715	84.8667	(217)
Fuel for water heating, kWh/month	269.3460	239.4166	256.5566	229.6368	227.0181	207.8751	205.6450	213.6686	215.8200	233.2496	241.8780	266.2079	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	26.8342	21.5274	19.3830	14.2008	10.9691	8.9619	10.0064	13.0067	16.8944	22.1664	25.0369	27.5800	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3597	-31.5987	-47.6203	-56.2064	-62.9289	-59.5773	-58.8595	-54.4329	-47.0022	-37.3178	-24.0087	-18.2981	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9169	-17.0101	-34.4870	-52.8069	-70.8246	-71.5366	-70.6859	-59.3742	-42.9070	-24.6402	-10.6698	-6.2334	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1541.4258	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2806.3184	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	216.5670	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3662.0081	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1541.4258	0.2100	323.6994	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2806.3184	0.2100	589.3269	(264)
Space and water heating			913.0263	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	216.5670	0.1443	31.2573	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	0.1336	-69.3640	
PV Unit electricity exported	-469.0927	0.1253	-58.7938	
Total			-128.1578	(269)
Total CO2, kg/year			828.0551	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.3500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1541.4258	1.1300	1741.8111	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2806.3184	1.1300	3171.1397	(278)
Space and water heating			4912.9508	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	216.5670	1.5338	332.1777	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	1.4937	-775.5387	
PV Unit electricity exported	-469.0927	0.4600	-215.8009	
Total			-991.3396	(283)
Total Primary energy kWh/year			4383.8897	(286)
Target Primary Energy Rate (TPER)			54.8100	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.50	**TER**	10.35
Environmental	99 A	**% DER < TER**			85.51
CO_2 Emissions (t/year)	0.1	**DFEE**	16.82	**TFEE**	23.60
Compliance Check	See BREL	**% DFEE < TFEE**			28.74
% DPER < TPER	62.80	**DPER**	20.39	**TPER**	54.81

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			15583.4798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.2856	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	612.2735	609.9558	591.8328	558.1588	524.7912	494.7014	477.0149	480.2399	497.5865	528.2765	565.2104	597.3217	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.6000	36.7938	0.6800	0.7000	0.7700	92.2420	(79)

Solar gains	92.2420	157.1223	214.9816	266.3726	298.3595	296.2019	285.5703	261.7066	232.7796	173.6536	110.4847	78.9399	(83)
Total gains	704.5156	767.0781	806.8144	824.5313	823.1507	790.9033	762.5851	741.9464	730.3660	701.9301	675.6951	676.2616	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)		

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area													
	0.9517	0.9218	0.8667	0.7692	0.6243	0.4564	0.3267	0.3509	0.5298	0.7743	0.9158	0.9605	(86)
MIT	20.5038	20.6308	20.7798	20.9074	20.9765	20.9969	20.9997	20.9995	20.9927	20.9175	20.6962	20.4559	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house													
	0.9429	0.9087	0.8463	0.7385	0.5840	0.4097	0.2773	0.3003	0.4806	0.7385	0.8996	0.9530	(89)
MIT 2	19.7695	19.9236	20.1000	20.2433	20.3136	20.3313	20.3332	20.3331	20.3282	20.2567	20.0055	19.7107	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.9767	20.1231	20.2919	20.4307	20.5006	20.5192	20.5212	20.5211	20.5157	20.4432	20.2004	19.9210	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9767	20.1231	20.2919	20.4307	20.5006	20.5192	20.5212	20.5211	20.5157	20.4432	20.2004	19.9210	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9376	0.9041	0.8450	0.7431	0.5943	0.4228	0.2913	0.3146	0.4942	0.7446	0.8961	0.9477	(94)
Useful gains	660.5204	693.5533	681.7475	612.7340	489.1621	334.3885	222.1243	233.3973	360.9454	522.6797	605.4576	640.8650	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	888.3738	862.6692	781.5619	653.4249	498.7170	335.4293	222.2103	233.5372	363.5686	557.7945	742.3761	890.8805	(97)
Space heating kWh													
	169.5229	113.6459	74.2619	29.2974	7.1088	0.0000	0.0000	0.0000	0.0000	26.1254	98.5813	186.0115	(98a)
Space heating requirement - total per year (kWh/year)												704.5552	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	169.5229	113.6459	74.2619	29.2974	7.1088	0.0000	0.0000	0.0000	0.0000	26.1254	98.5813	186.0115	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												704.5552	
Space heating per m2											(98c) / (4) =	8.8091	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	169.5229	113.6459	74.2619	29.2974	7.1088	0.0000	0.0000	0.0000	0.0000	26.1254	98.5813	186.0115 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	254.2844	170.4688	111.3928	43.9461	10.6633	0.0000	0.0000	0.0000	0.0000	39.1881	147.8720	279.0173
Space heating requirement												
	254.2844	170.4688	111.3928	43.9461	10.6633	0.0000	0.0000	0.0000	0.0000	39.1881	147.8720	279.0173 (307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement

	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948
Water heating fuel												
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948 (310)

Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679 (331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												

Space heating fuel - community heating	1056.8329	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	10.5683	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4364.6563	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1056.8329	4.4400	46.9234	(340a)
Space heating total			46.9234	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	206.9234	16.4900	34.1217	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	16.4900	-80.5593	
PV Unit electricity exported	-469.6869	5.5900	-26.2555	
Total			-106.8148	(352)
Total energy cost			249.1055	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7175 (357)
SAP value		88.3687
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1358.3894	0.1576	44.4257	(367)
Electrical energy for heat distribution (space & water)	10.5683	0.0000	7.3537	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			203.4517	(373)
Space and water heating			203.4517	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			114.9701	(383)
CO2 emissions per m2			1.4400	(384)
EI value			98.7673	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 79.9800						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate													
	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15583.4798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.2856	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539	(43)

Daily hot water use

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte 211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
								Total per year (kWh/year) = Sum(64)m =			2691.4183	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)

Heat gains from water heating, kWh/month

114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
327.4608 330.8588 322.2959 304.0665 281.0552 259.4278 244.9794 241.5813 250.1442 268.3736 291.3850 313.0124 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 (71)
Water heating gains (Table 5)
154.0336 151.5930 146.8914 136.5869 130.2751 123.6777 119.6256 122.9734 126.8986 134.2191 144.0972 152.7161 (72)
Total internal gains
612.2735 609.9558 591.8328 558.1588 524.7912 494.7014 477.0149 480.2399 497.5865 528.2765 565.2104 597.3217 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.6000	42.9509	0.6800	0.7000	0.7700	107.6778	(79)

Solar gains 107.6778 162.9933 220.2461 277.7620 301.6848 322.2950 304.4795 282.9087 252.2630 190.1443 127.0279 92.7078 (83)
Total gains 719.9514 772.9491 812.0789 835.9207 826.4760 816.9964 781.4944 763.1486 749.8494 718.4209 692.2383 690.0295 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9431	0.9138	0.8488	0.7436	0.5920	0.4014	0.2827	0.3043	0.4951	0.7350	0.8981	0.9535	(86)
MIT	20.5497	20.6600	20.8128	20.9255	20.9831	20.9986	20.9999	20.9998	20.9951	20.9407	20.7422	20.5016	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9330	0.8995	0.8262	0.7111	0.5505	0.3556	0.2344	0.2549	0.4465	0.6962	0.8793	0.9448	(89)
MIT 2	19.8258	19.9587	20.1380	20.2622	20.3197	20.3325	20.3333	20.3332	20.3301	20.2801	20.0596	19.7671	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	20.0301	20.1566	20.3284	20.4494	20.5069	20.5205	20.5214	20.5213	20.5177	20.4666	20.2523	19.9744	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0301	20.1566	20.3284	20.4494	20.5069	20.5205	20.5214	20.5213	20.5177	20.4666	20.2523	19.9744	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9277	0.8954	0.8261	0.7170	0.5615	0.3685	0.2481	0.2688	0.4601	0.7043	0.8768	0.9395	(94)
Useful gains	667.9261	692.0607	670.8204	599.3285	464.0477	301.0638	193.8534	205.1641	344.9792	505.9609	606.9423	648.2508	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	874.3964	847.5644	755.3000	631.8181	470.7382	301.5024	193.8833	205.2143	346.6814	530.7869	722.6496	876.9069	(97)
Space heating kWh	153.6139	104.4985	62.8528	23.3925	4.9777	0.0000	0.0000	0.0000	0.0000	18.4705	83.3093	170.1201	(98a)
Space heating requirement - total per year (kWh/year)												621.2353	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	153.6139	104.4985	62.8528	23.3925	4.9777	0.0000	0.0000	0.0000	0.0000	18.4705	83.3093	170.1201	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												621.2353	
Space heating per m2										(98c) / (4) =		7.7674	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement
153.6139 104.4985 62.8528 23.3925 4.9777 0.0000 0.0000 0.0000 0.0000 18.4705 83.3093 170.1201 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50
307a 230.4208 156.7477 94.2792 35.0888 7.4666 0.0000 0.0000 0.0000 0.0000 27.7058 124.9639 255.1801
Space heating requirement
230.4208 156.7477 94.2792 35.0888 7.4666 0.0000 0.0000 0.0000 0.0000 27.7058 124.9639 255.1801 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)

Water heating
Annual water heating requirement
266.9446 236.1786 250.9634 220.5542 213.7828 192.6005 189.9534 197.4446 199.5749 222.6078 236.8171 263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50
310a 400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948
Water heating fuel
400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948 (310)
Cooling System Energy Efficiency Ratio 0.0000 (314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (315)
Pumps and Fa 1.8679 1.6872 1.8679 1.8077 1.8679 1.8077 1.8679 1.8679 1.8077 1.8679 1.8077 1.8679 (331)
Lighting 25.6392 20.5688 18.5199 13.5685 10.4807 8.5628 9.5608 12.4275 16.1421 21.1793 23.9220 26.3518 (332)
Electricity generated by PVs (Appendix M) (negative quantity)
(333a)m -17.9904 -26.9468 -45.2798 -58.5762 -66.5604 -66.2871 -64.3781 -58.6940 -48.0761 -34.8334 -20.6614 -14.9764 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(334a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (334a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.0081	-13.0184	-31.9653	-58.9969	-82.6801	-94.8316	-90.1120	-72.5476	-46.2727	-22.1629	-8.3690	-4.5223	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	931.8529	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	9.3185	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4143.1502	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	931.8529	6.5500	61.0364	(340a)
Space heating total			61.0364	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	206.9234	28.4300	58.8283	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	28.4300	-148.7628	
PV Unit electricity exported	-531.4870	5.8100	-30.8794	
Total			-179.6422	(352)
Total energy cost			314.9071	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1325.0614	0.1581	39.2795	(367)
Electrical energy for heat distribution (space & water)	9.3185	0.0000	7.1607	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			198.1125	(373)
Space and water heating			198.1125	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	0.1322	-69.1719	
PV Unit electricity exported	-531.4870	0.1213	-64.4804	
Total			-133.6523	(380)
Total CO2, kg/year			97.3764	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1325.0614	1.5851	393.8997	(467)
Electrical energy for heat distribution (space & water)	9.3185	0.0000	76.1736	(472)
Overall CO2 factor for heat network			0.4241	(486)
Total CO2 associated with community systems			2107.4691	(473)
Space and water heating			2107.4691	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	1.4884	-778.8342	
PV Unit electricity exported	-531.4870	0.4450	-236.5330	
Total			-1015.3671	(480)
Total Primary energy kWh/year			1442.7598	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Northwest

Current energy efficiency rating:	B 88
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£65	£65	£0
Community scheme	£429	£429	£0
Space heating	£171	£171	£0
Water heating	£264	£264	£0
Lighting	£59	£59	£0
Generated (PV)	-£180	-£180	£0
Total cost of fuels	£314	£314	£0
Total cost of uses	£314	£314	£0
Delivered energy	52 kWh/m²	52 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	18 kWh/m²	18 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15583.4798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		194.8422 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.2856 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4625 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
									Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)

Water heating gains (Table 5)

154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)

Total internal gains

612.2735	609.9558	591.8328	558.1588	524.7912	494.7014	477.0149	480.2399	497.5865	528.2765	565.2104	597.3217	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.6000	36.7938	0.6800	0.7000	0.7700	92.2420	(79)

Solar gains	92.2420	157.1223	214.9816	266.3726	298.3595	296.2019	285.5703	261.7066	232.7796	173.6536	110.4847	78.9399	(83)
Total gains	704.5156	767.0781	806.8144	824.5313	823.1507	790.9033	762.5851	741.9464	730.3660	701.9301	675.6951	676.2616	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9517	0.9218	0.8667	0.7692	0.6243	0.4564	0.3267	0.3509	0.5298	0.7743	0.9158	0.9605	(86)
MIT	20.5038	20.6308	20.7798	20.9074	20.9765	20.9969	20.9997	20.9995	20.9927	20.9175	20.6962	20.4559	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9429	0.9087	0.8463	0.7385	0.5840	0.4097	0.2773	0.3003	0.4806	0.7385	0.8996	0.9530	(89)
MIT 2	19.7695	19.9236	20.1000	20.2433	20.3136	20.3313	20.3332	20.3331	20.3282	20.2567	20.0055	19.7107	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.9767	20.1231	20.2919	20.4307	20.5006	20.5192	20.5212	20.5211	20.5157	20.4432	20.2004	19.9210	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9767	20.1231	20.2919	20.4307	20.5006	20.5192	20.5212	20.5211	20.5157	20.4432	20.2004	19.9210	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9376	0.9041	0.8450	0.7431	0.5943	0.4228	0.2913	0.3146	0.4942	0.7446	0.8961	0.9477	(94)
Useful gains	660.5204	693.5533	681.7475	612.7340	489.1621	334.3885	222.1243	233.3973	360.9454	522.6797	605.4576	640.8650	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	888.3738	862.6692	781.5619	653.4249	498.7170	335.4293	222.2103	233.5372	363.5686	557.7945	742.3761	890.8805	(97)
Space heating kWh	169.5229	113.6459	74.2619	29.2974	7.1088	0.0000	0.0000	0.0000	0.0000	26.1254	98.5813	186.0115	(98a)
Space heating requirement - total per year (kWh/year)												704.5552	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	169.5229	113.6459	74.2619	29.2974	7.1088	0.0000	0.0000	0.0000	0.0000	26.1254	98.5813	186.0115	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												704.5552	
Space heating per m2											(98c) / (4) =	8.8091	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	169.5229	113.6459	74.2619	29.2974	7.1088	0.0000	0.0000	0.0000	0.0000	26.1254	98.5813	186.0115	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	254.2844	170.4688	111.3928	43.9461	10.6633	0.0000	0.0000	0.0000	0.0000	39.1881	147.8720	279.0173	
Space heating requirement	254.2844	170.4688	111.3928	43.9461	10.6633	0.0000	0.0000	0.0000	0.0000	39.1881	147.8720	279.0173	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1056.8329	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												10.5683	(313)
Space cooling fuel												0.0000	(321)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)

mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4364.6563	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1056.8329	4.4400	46.9234	(340a)
Space heating total			46.9234	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	206.9234	16.4900	34.1217	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	16.4900	-80.5593	
PV Unit electricity exported	-469.6869	5.5900	-26.2555	
Total			-106.8148	(352)
Total energy cost			249.1055	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7175	(357)
SAP value		88.3687	
SAP rating (Section 12)		88	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1358.3894	0.1576	44.4257	(367)
Electrical energy for heat distribution (space & water)	10.5683	0.0000	7.3537	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			203.4517	(373)
Space and water heating			203.4517	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			114.9701	(383)
CO2 emissions per m2			1.4400	(384)
EI value			98.7673	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor		39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800						(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =				195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)

Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15583.4798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		194.8422 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.2856 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4625 (42)

Hot water usage for mixer showers

65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)
Total storage loss	

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

											Total per year (kWh/year) = Sum(64)m =	2691.4183	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000		(64a)
Heat gains from water heating, kWh/month													
114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207		(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains													
	612.2735	609.9558	591.8328	558.1588	524.7912	494.7014	477.0149	480.2399	497.5865	528.2765	565.2104	597.3217	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.6000	42.9509	0.6800	0.7000	0.7700	107.6778	(79)

Solar gains	107.6778	162.9933	220.2461	277.7620	301.6848	322.2950	304.4795	282.9087	252.2630	190.1443	127.0279	92.7078	(83)
Total gains	719.9514	772.9491	812.0789	835.9207	826.4760	816.9964	781.4944	763.1486	749.8494	718.4209	692.2383	690.0295	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area													
	0.9431	0.9138	0.8488	0.7436	0.5920	0.4014	0.2827	0.3043	0.4951	0.7350	0.8981	0.9535	(86)
MIT	20.5497	20.6600	20.8128	20.9255	20.9831	20.9986	20.9999	20.9998	20.9951	20.9407	20.7422	20.5016	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house													
	0.9330	0.8995	0.8262	0.7111	0.5505	0.3556	0.2344	0.2549	0.4465	0.6962	0.8793	0.9448	(89)
MIT 2	19.8258	19.9587	20.1380	20.2622	20.3197	20.3325	20.3333	20.3332	20.3301	20.2801	20.0596	19.7671	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	20.0301	20.1566	20.3284	20.4494	20.5069	20.5205	20.5214	20.5213	20.5177	20.4666	20.2523	19.9744	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0301	20.1566	20.3284	20.4494	20.5069	20.5205	20.5214	20.5213	20.5177	20.4666	20.2523	19.9744	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9277	0.8954	0.8261	0.7170	0.5615	0.3685	0.2481	0.2688	0.4601	0.7043	0.8768	0.9395	(94)
Useful gains	667.9261	692.0607	670.8204	599.3285	464.0477	301.0638	193.8534	205.1641	344.9792	505.9609	606.9423	648.2508	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	874.3964	847.5644	755.3000	631.8181	470.7382	301.5024	193.8833	205.2143	346.6814	530.7869	722.6496	876.9069	(97)
Space heating kWh													
	153.6139	104.4985	62.8528	23.3925	4.9777	0.0000	0.0000	0.0000	0.0000	18.4705	83.3093	170.1201	(98a)
Space heating requirement - total per year (kWh/year)												621.2353	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	153.6139	104.4985	62.8528	23.3925	4.9777	0.0000	0.0000	0.0000	0.0000	18.4705	83.3093	170.1201	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												621.2353	
Space heating per m2											(98c) / (4) =	7.7674	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement													
	153.6139	104.4985	62.8528	23.3925	4.9777	0.0000	0.0000	0.0000	0.0000	18.4705	83.3093	170.1201	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	230.4208	156.7477	94.2792	35.0888	7.4666	0.0000	0.0000	0.0000	0.0000	27.7058	124.9639	255.1801	
Space heating requirement													
	230.4208	156.7477	94.2792	35.0888	7.4666	0.0000	0.0000	0.0000	0.0000	27.7058	124.9639	255.1801	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.9904	-26.9468	-45.2798	-58.5762	-66.5604	-66.2871	-64.3781	-58.6940	-48.0761	-34.8334	-20.6614	-14.9764	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.0081	-13.0184	-31.9653	-58.9969	-82.6801	-94.8316	-90.1120	-72.5476	-46.2727	-22.1629	-8.3690	-4.5223	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												931.8529	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												9.3185	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)
Total electricity for the above, kWh/year												21.9935	(331)
Electricity for lighting (calculated in Appendix L)												206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1054.7470	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4143.1502	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	931.8529	6.5500	61.0364	(340a)
Space heating total			61.0364	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	206.9234	28.4300	58.8283	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	28.4300	-148.7628	
PV Unit electricity exported	-531.4870	5.8100	-30.8794	
Total			-179.6422	(352)
Total energy cost			314.9071	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1325.0614	0.1581	39.2795	(367)
Electrical energy for heat distribution (space & water)	9.3185	0.0000	7.1607	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			198.1125	(373)
Space and water heating			198.1125	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	0.1322	-69.1719	
PV Unit electricity exported	-531.4870	0.1213	-64.4804	
Total			-133.6523	(380)
Total CO2, kg/year			97.3764	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1325.0614	1.5851	393.8997	(467)
Electrical energy for heat distribution (space & water)	9.3185	0.0000	76.1736	(472)
Overall CO2 factor for heat network			0.4241	(486)
Total CO2 associated with community systems			2107.4691	(473)
Space and water heating			2107.4691	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)

Energy saving/generation technologies				
PV Unit electricity used in dwelling		-523.2600	1.4884	-778.8342
PV Unit electricity exported		-531.4870	0.4450	-236.5330
Total				-1015.3671 (480)
Total Primary energy kWh/year				1442.7598 (483)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.60	**TER**	10.74
Environmental	99 A	**% DER < TER**			85.10
CO_2 Emissions (t/year)	0.1	**DFEE**	18.72	**TFEE**	25.56
Compliance Check	See BREL	**% DFEE < TFEE**			26.77
% DPER < TPER	62.38	**DPER**	21.39	**TPER**	56.87

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			15583.4798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.2856	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.6117	146.8201	132.6117	137.0321	132.6117	137.0321	132.6117	132.6117	137.0321	132.6117	137.0321	132.6117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	565.9813	580.0257	555.3786	537.2808	511.1311	494.4637	476.3107	477.3819	491.4645	506.5784	536.2944	554.9833	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	7.6000	19.6403	0.6800	0.7000	0.7700	49.2381	(76)
Solar gains	49.2381	96.3201	158.6255	231.3459	283.5231	290.2363	276.3168	237.3520	184.4881	114.2919	61.3941	40.4910	(83)
Total gains	615.2193	676.3458	714.0042	768.6267	794.6541	784.7000	752.6275	714.7339	675.9526	620.8703	597.6885	595.4743	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9734	0.9526	0.9117	0.8056	0.6439	0.4599	0.3310	0.3642	0.5696	0.8357	0.9477	0.9777	(86)
MIT	20.3749	20.5178	20.6929	20.8804	20.9723	20.9968	20.9996	20.9994	20.9892	20.8732	20.6021	20.3348	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9680	0.9435	0.8958	0.7764	0.6029	0.4129	0.2810	0.3117	0.5177	0.8035	0.9363	0.9731	(89)
MIT 2	19.6107	19.7876	20.0002	20.2152	20.3100	20.3313	20.3331	20.3330	20.3258	20.2117	19.8941	19.5607	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.8264	19.9937	20.1957	20.4029	20.4969	20.5191	20.5212	20.5211	20.5130	20.3984	20.0939	19.7791	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8264	19.9937	20.1957	20.4029	20.4969	20.5191	20.5212	20.5211	20.5130	20.3984	20.0939	19.7791	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9631	0.9383	0.8922	0.7796	0.6132	0.4261	0.2951	0.3265	0.5319	0.8068	0.9316	0.9685	(94)
Useful gains	592.5008	634.5932	637.0264	599.2031	487.2474	334.3382	222.1168	233.3604	359.5340	500.9488	556.8060	576.7276	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	879.8541	855.3333	776.1130	651.8520	498.5043	335.4237	222.2095	233.5330	363.4131	555.2558	736.3423	882.8423	(97)
Space heating kWh	213.7908	148.3374	103.4804	37.9072	8.3751	0.0000	0.0000	0.0000	0.0000	40.4044	129.2662	227.7493	(98a)
Space heating requirement - total per year (kWh/year)												909.3108	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	213.7908	148.3374	103.4804	37.9072	8.3751	0.0000	0.0000	0.0000	0.0000	40.4044	129.2662	227.7493	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												909.3108	
Space heating per m2										(98c) / (4) =		11.3692	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	213.7908	148.3374	103.4804	37.9072	8.3751	0.0000	0.0000	0.0000	0.0000	40.4044	129.2662	227.7493 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	320.6862	222.5061	155.2206	56.8608	12.5627	0.0000	0.0000	0.0000	0.0000	60.6066	193.8992	341.6240
Space heating requirement												
	320.6862	222.5061	155.2206	56.8608	12.5627	0.0000	0.0000	0.0000	0.0000	60.6066	193.8992	341.6240 (307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement												
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948
Water heating fuel												
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679 (331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year	
Space heating fuel - community heating	1363.9662 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4037.1274 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	13.6397 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)	
mechanical ventilation fans (SFP = 0.0920)	21.9935 (330a)
Total electricity for the above, kWh/year	21.9935 (331)
Electricity for lighting (calculated in Appendix L)	206.9234 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-958.2209 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4671.7896 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1440.2916	0.1573	57.2312	(367)
Electrical energy for heat distribution (space & water)	13.6397	0.0000	7.8339	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			216.7374	(373)
Space and water heating			216.7374	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			128.2557	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6000	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1440.2916	1.5825	575.5913	(467)
Electrical energy for heat distribution (space & water)	13.6397	0.0000	82.9870	(472)
Overall CO2 factor for heat network			0.4251	(486)
Total CO2 associated with community systems			2295.9741	(473)
Space and water heating			2295.9741	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	1.4873	-726.6034	
PV Unit electricity exported	-469.6869	0.4449	-208.9838	
Total			-935.5872	(480)
Total Primary energy kWh/year			1711.0447	(483)
Dwelling Primary energy Rate (DPER)			21.3900	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type			7.6000	1.1450	8.7023			(27)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.1800	5.4450			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
500mm mineral wool	39.9900		39.9900	0.1100	4.3989			(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7164			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.7300	0.0500	0.3365
E3 Sill	5.8800	0.0500	0.2940
E4 Jamb	10.3200	0.0500	0.5160
E6 Intermediate floor within a dwelling	14.1900	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	11.4900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
E7 Party floor between dwellings (in blocks of flats)	14.1900	0.0700	0.9933
P4 Party wall - Roof (insulation at ceiling level)	11.4900	0.1200	1.3788
E10 Eaves (insulation at ceiling level)	8.7100	0.0600	0.5226
E12 Gable (insulation at ceiling level)	5.4100	0.0600	0.3246

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.6278	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	32.3442	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	68.8609	68.6984	68.5391	67.7910	67.6510	66.9994	66.9994	66.8787	67.2504	67.6510	67.9342	68.2302	(39)
Average = Sum(39)m / 12 =												67.7903	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8610	0.8589	0.8570	0.8476	0.8458	0.8377	0.8377	0.8362	0.8408	0.8458	0.8494	0.8531	(40)
HLP (average)												0.8476	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
									Total per year (kWh/year) = Sum(64)m =			2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.1468	142.9840	129.1468	133.4517	129.1468	133.4517	129.1468	129.1468	133.4517	129.1468	133.4517	129.1468	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													

	556.1810	569.8542	545.5784	527.3650	501.3308	481.5479	463.5104	464.5816	478.5488	496.7781	526.3787	545.1830 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	7.6000	19.6403	0.6300	0.7000	0.7700	45.6176	(76)

Solar gains	45.6176	89.2378	146.9619	214.3352	262.6758	268.8954	255.9994	219.8997	170.9228	105.8881	56.8798	37.5137 (83)
Total gains	601.7986	659.0920	692.5403	741.7002	764.0066	750.4433	719.5098	684.4813	649.4715	602.6662	583.2585	582.6967 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.8622	63.0109	63.1573	63.8543	63.9864	64.6087	64.6087	64.7253	64.3676	63.9864	63.7197	63.4432	
alpha	5.1908	5.2007	5.2105	5.2570	5.2658	5.3072	5.3072	5.3150	5.2912	5.2658	5.2480	5.2295	
util living area	0.9832	0.9715	0.9484	0.8793	0.7492	0.5585	0.4076	0.4459	0.6753	0.8978	0.9679	0.9855	(86)
MIT	20.0319	20.1920	20.4150	20.7076	20.9012	20.9831	20.9973	20.9958	20.9557	20.7172	20.3397	20.0063	(87)
Th 2	20.2008	20.2025	20.2042	20.2123	20.2138	20.2208	20.2208	20.2221	20.2181	20.2138	20.2107	20.2076	(88)
util rest of house	0.9793	0.9652	0.9368	0.8539	0.7034	0.4953	0.3365	0.3722	0.6115	0.8706	0.9597	0.9822	(89)
MIT 2	19.0758	19.2784	19.5572	19.9141	20.1276	20.2098	20.2197	20.2202	20.1862	19.9331	19.4724	19.0486	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.3456	19.5362	19.7993	20.1381	20.3459	20.4280	20.4391	20.4390	20.4033	20.1544	19.7172	19.3189	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3456	19.5362	19.7993	20.1381	20.3459	20.4280	20.4391	20.4390	20.4033	20.1544	19.7172	19.3189	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9741	0.9587	0.9299	0.8512	0.7115	0.5124	0.3565	0.3929	0.6272	0.8683	0.9534	0.9774	(94)
Useful gains	586.2231	631.8626	643.9713	631.3458	543.5623	384.5337	256.5134	268.9541	407.3704	523.2921	556.0918	569.5320	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1036.0557	1005.4847	911.5210	761.8383	584.9046	390.4746	257.2179	270.1253	423.9001	646.3623	857.1371	1031.5631	(97)
Space heating kWh	334.6754	251.0741	199.0570	93.9545	30.7587	0.0000	0.0000	0.0000	0.0000	91.5642	216.7526	343.7511	(98a)
Space heating requirement - total per year (kWh/year)												1561.5877	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	334.6754	251.0741	199.0570	93.9545	30.7587	0.0000	0.0000	0.0000	0.0000	91.5642	216.7526	343.7511	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1561.5877	
Space heating per m2											(98c) / (4) =	19.5247	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	334.6754	251.0741	199.0570	93.9545	30.7587	0.0000	0.0000	0.0000	0.0000	91.5642	216.7526	343.7511	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	362.5953	272.0196	215.6630	101.7926	33.3247	0.0000	0.0000	0.0000	0.0000	99.2028	234.8349	372.4281	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9161	84.5503	83.8921	82.5772	80.9771	79.8000	79.8000	79.8000	79.8000	82.5040	84.2059	84.9983	(217)
Fuel for water heating, kWh/month	268.8716	238.7352	255.7420	229.1037	226.8522	207.8751	205.6450	213.6686	215.8200	232.2159	241.2047	265.7959	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	26.8342	21.5274	19.3830	14.2008	10.9691	8.9619	10.0064	13.0067	16.8944	22.1664	25.0369	27.5800	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3597	-31.5987	-47.6203	-56.2064	-62.9289	-59.5773	-58.8595	-54.4329	-47.0022	-37.3178	-24.0087	-18.2981	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9169	-17.0101	-34.4870	-52.8069	-70.8246	-71.5366	-70.6859	-59.3742	-42.9070	-24.6402	-10.6698	-6.2334	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1691.8610	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2801.5299	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	216.5670	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3807.6549	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1691.8610	0.2100	355.2908	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2801.5299	0.2100	588.3213	(264)
Space and water heating			943.6121	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	216.5670	0.1443	31.2573	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	0.1336	-69.3640	
PV Unit electricity exported	-469.0927	0.1253	-58.7938	
Total			-128.1578	(269)
Total CO2, kg/year			858.6409	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.7400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1691.8610	1.1300	1911.8029	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2801.5299	1.1300	3165.7288	(278)
Space and water heating			5077.5317	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	216.5670	1.5338	332.1777	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	1.4937	-775.5387	
PV Unit electricity exported	-469.0927	0.4600	-215.8009	
Total			-991.3396	(283)
Total Primary energy kWh/year			4548.4706	(286)
Target Primary Energy Rate (TPER)			56.8700	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.60	**TER**	10.74
Environmental	99 A	**% DER < TER**			85.10
CO_2 Emissions (t/year)	0.1	**DFEE**	18.72	**TFEE**	25.56
Compliance Check	See BREL	**% DFEE < TFEE**			26.77
% DPER < TPER	62.38	**DPER**	21.39	**TPER**	56.87

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2122	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2705	0.2652	0.2599	0.2334	0.2281	0.2016	0.2016	0.1963	0.2122	0.2281	0.2387	0.2493	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5366	0.5352	0.5338	0.5272	0.5260	0.5203	0.5203	0.5193	0.5225	0.5260	0.5285	0.5311	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15583.4798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.2856	(36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.6979	34.6061	34.5160	34.0930	34.0139	33.6455	33.6455	33.5772	33.7874	34.0139	34.1740	34.3414	(38)
Heat transfer coeff	59.0343	58.9424	58.8524	58.4294	58.3502	57.9818	57.9818	57.9136	58.1237	58.3502	58.5103	58.6777	(39)
Average = Sum(39)m / 12 =												58.4290	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7381	0.7370	0.7358	0.7305	0.7296	0.7250	0.7250	0.7241	0.7267	0.7296	0.7316	0.7337	(40)
HLP (average)												0.7305	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.6117	146.8201	132.6117	137.0321	132.6117	137.0321	132.6117	132.6117	137.0321	132.6117	137.0321	132.6117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains	460.3995	475.6643	453.8350	442.5318	420.3791	407.9331	392.6658	391.8132	403.5720	413.9765	437.2071	450.3260	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	7.6000	19.6403	0.6800	0.7000	0.7700	49.2381	(76)

Solar gains	49.2381	96.3201	158.6255	231.3459	283.5231	290.2363	276.3168	237.3520	184.4881	114.2919	61.3941	40.4910	(83)
Total gains	509.6376	571.9844	612.4605	673.8777	703.9021	698.1694	668.9826	629.1652	588.0600	528.2684	498.6012	490.8170	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.3259	73.4402	73.5526	74.0851	74.1855	74.6569	74.6569	74.7449	74.4746	74.1855	73.9825	73.7715	
alpha	5.8884	5.8960	5.9035	5.9390	5.9457	5.9771	5.9771	5.9830	5.9650	5.9457	5.9322	5.9181	
util living area	0.9900	0.9793	0.9557	0.8756	0.7259	0.5257	0.3806	0.4220	0.6582	0.9082	0.9780	0.9918	(86)
MIT	20.1404	20.3055	20.5211	20.7908	20.9433	20.9928	20.9991	20.9984	20.9750	20.7726	20.4176	20.1080	(87)

Th 2	20.3073	20.3083	20.3093	20.3139	20.3148	20.3188	20.3188	20.3196	20.3173	20.3148	20.3130	20.3112	(88)
util rest of house	0.9877	0.9747	0.9460	0.8514	0.6836	0.4720	0.3221	0.3603	0.6011	0.8844	0.9724	0.9900	(89)
MIT 2	19.5187	19.6819	19.8924	20.1472	20.2764	20.3152	20.3185	20.3190	20.3031	20.1364	19.7974	19.4898	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.6941	19.8579	20.0698	20.3288	20.4646	20.5064	20.5106	20.5107	20.4927	20.3160	19.9724	19.6643	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6941	19.8579	20.0698	20.3288	20.4646	20.5064	20.5106	20.5107	20.4927	20.3160	19.9724	19.6643	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9852	0.9711	0.9421	0.8520	0.6932	0.4870	0.3386	0.3777	0.6162	0.8844	0.9690	0.9877	(94)
Useful gains	502.0704	555.4803	576.9841	574.1225	487.9318	339.9763	226.5104	237.6249	362.3464	467.2173	483.1270	484.7967	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	908.7822	881.6531	798.6135	667.7803	511.4149	342.4638	226.7434	238.0670	371.5693	566.9289	753.1698	907.4073	(97)
Space heating kWh	302.5936	219.1881	164.8922	67.4336	17.4714	0.0000	0.0000	0.0000	0.0000	74.1854	194.4308	314.4223	(98a)
Space heating requirement - total per year (kWh/year)												1354.6174	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	302.5936	219.1881	164.8922	67.4336	17.4714	0.0000	0.0000	0.0000	0.0000	74.1854	194.4308	314.4223	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1354.6174	
Space heating per m2											(98c) / (4) =	16.9370	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	545.0293	429.0656	440.1434	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9543	0.9809	0.9715	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	520.1083	420.8815	427.5884	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	748.9021	717.9521	674.1942	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	164.7315	221.0206	183.4747	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	41.1829	55.2551	45.8687	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												142.3067	(107)
Energy for space heating												16.9370	(99)
Energy for space cooling												1.7793	(108)
Total												18.7162	(109)
Fabric Energy Efficiency (DFEE)												18.7	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type			7.6000	1.1450	8.7023			(27)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.1800	5.4450			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
500mm mineral wool	39.9900		39.9900	0.1100	4.3989			(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7164			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 194.8422 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.7300	0.0500	0.3365
E3 Sill	5.8800	0.0500	0.2940
E4 Jamb	10.3200	0.0500	0.5160
E6 Intermediate floor within a dwelling	14.1900	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	11.4900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
E7 Party floor between dwellings (in blocks of flats)	14.1900	0.0700	0.9933
P4 Party wall - Roof (insulation at ceiling level)	11.4900	0.1200	1.3788
E10 Eaves (insulation at ceiling level)	8.7100	0.0600	0.5226
E12 Gable (insulation at ceiling level)	5.4100	0.0600	0.3246

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.6278 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.3442 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	68.8609	68.6984	68.5391	67.7910	67.6510	66.9994	66.9994	66.8787	67.2504	67.6510	67.9342	68.2302	(39)
Average = Sum(39)m / 12 =												67.7903	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8610	0.8589	0.8570	0.8476	0.8458	0.8377	0.8377	0.8362	0.8408	0.8458	0.8494	0.8531	(40)
HLP (average)												0.8476	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

129.1468	142.9840	129.1468	133.4517	129.1468	133.4517	129.1468	129.1468	133.4517	129.1468	133.4517	129.1468 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124 (69)

Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993 (71)

Water heating gains (Table 5)

48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587 (72)

Total internal gains

456.9346	471.8282	450.3701	438.9514	416.9142	404.3527	389.2009	388.3482	399.9916	410.5116	433.6267	446.8611 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	7.6000	19.6403	0.6300	0.7000	0.7700	45.6176	(76)

Solar gains	45.6176	89.2378	146.9619	214.3352	262.6758	268.8954	255.9994	219.8997	170.9228	105.8881	56.8798	37.5137 (83)
Total gains	502.5522	561.0659	597.3320	653.2866	679.5899	673.2481	645.2002	608.2479	570.9143	516.3997	490.5065	484.3748 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.8622	63.0109	63.1573	63.8543	63.9864	64.6087	64.6087	64.7253	64.3676	63.9864	63.7197	63.4432	
alpha	5.1908	5.2007	5.2105	5.2570	5.2658	5.3072	5.3072	5.3150	5.2912	5.2658	5.2480	5.2295	
util living area	0.9923	0.9853	0.9706	0.9190	0.8063	0.6145	0.4530	0.4990	0.7430	0.9390	0.9843	0.9936	(86)
MIT	19.8706	20.0403	20.2814	20.6174	20.8587	20.9737	20.9956	20.9928	20.9306	20.6195	20.1976	19.8447	(87)
Th 2	20.2008	20.2025	20.2042	20.2123	20.2138	20.2208	20.2208	20.2221	20.2181	20.2138	20.2107	20.2076	(88)
util rest of house	0.9904	0.9818	0.9634	0.8993	0.7637	0.5478	0.3747	0.4178	0.6799	0.9200	0.9799	0.9920	(89)
MIT 2	19.1652	19.3344	19.5728	19.9002	20.1147	20.2072	20.2193	20.2195	20.1775	19.9087	19.4978	19.1449	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.3643	19.5336	19.7727	20.1026	20.3246	20.4235	20.4384	20.4377	20.3901	20.1093	19.6953	19.3424	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3643	19.5336	19.7727	20.1026	20.3246	20.4235	20.4384	20.4377	20.3901	20.1093	19.6953	19.3424	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9879	0.9781	0.9586	0.8962	0.7702	0.5656	0.3968	0.4406	0.6946	0.9170	0.9763	0.9898	(94)
Useful gains	496.4624	548.7942	572.6030	585.4698	523.3918	380.8002	255.9920	268.0202	396.5753	473.5615	478.8580	479.4335	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1037.3405	1005.3059	909.7014	759.4376	583.4652	390.1699	257.1685	270.0373	423.0082	643.3135	855.6488	1033.1682	(97)
Space heating kWh	402.4133	306.7759	250.8012	125.2568	44.6946	0.0000	0.0000	0.0000	0.0000	126.2955	271.2894	411.9786	(98a)
Space heating requirement - total per year (kWh/year)												1939.5053	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	402.4133	306.7759	250.8012	125.2568	44.6946	0.0000	0.0000	0.0000	0.0000	126.2955	271.2894	411.9786	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1939.5053	
Space heating per m2											(98c) / (4) =	24.2499	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	629.7941	495.7954	508.2782	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8937	0.9455	0.9265	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	562.8363	468.7781	470.9138	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	723.6551	693.8769	653.3695	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	115.7895	167.4735	135.7471	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	28.9474	41.8684	33.9368	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												104.7525	(107)
Energy for space heating												24.2499	(99)
Energy for space cooling												1.3097	(108)
Total												25.5596	(109)
Fabric Energy Efficiency (TFEE)												25.6	(109)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.60	**TER**	10.74
Environmental	99 A	**% DER < TER**			85.10
CO_2 Emissions (t/year)	0.1	**DFEE**	18.72	**TFEE**	25.56
Compliance Check	See BREL	**% DFEE < TFEE**			26.77
% DPER < TPER	62.38	**DPER**	21.39	**TPER**	56.87

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			15583.4798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.2856	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.6117	146.8201	132.6117	137.0321	132.6117	137.0321	132.6117	132.6117	137.0321	132.6117	137.0321	132.6117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	565.9813	580.0257	555.3786	537.2808	511.1311	494.4637	476.3107	477.3819	491.4645	506.5784	536.2944	554.9833	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	7.6000	19.6403	0.6800	0.7000	0.7700	49.2381	(76)
Solar gains	49.2381	96.3201	158.6255	231.3459	283.5231	290.2363	276.3168	237.3520	184.4881	114.2919	61.3941	40.4910	(83)
Total gains	615.2193	676.3458	714.0042	768.6267	794.6541	784.7000	752.6275	714.7339	675.9526	620.8703	597.6885	595.4743	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9734	0.9526	0.9117	0.8056	0.6439	0.4599	0.3310	0.3642	0.5696	0.8357	0.9477	0.9777	(86)
MIT	20.3749	20.5178	20.6929	20.8804	20.9723	20.9968	20.9996	20.9994	20.9892	20.8732	20.6021	20.3348	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9680	0.9435	0.8958	0.7764	0.6029	0.4129	0.2810	0.3117	0.5177	0.8035	0.9363	0.9731	(89)
MIT 2	19.6107	19.7876	20.0002	20.2152	20.3100	20.3313	20.3331	20.3330	20.3258	20.2117	19.8941	19.5607	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.8264	19.9937	20.1957	20.4029	20.4969	20.5191	20.5212	20.5211	20.5130	20.3984	20.0939	19.7791	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8264	19.9937	20.1957	20.4029	20.4969	20.5191	20.5212	20.5211	20.5130	20.3984	20.0939	19.7791	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9631	0.9383	0.8922	0.7796	0.6132	0.4261	0.2951	0.3265	0.5319	0.8068	0.9316	0.9685	(94)
Useful gains	592.5008	634.5932	637.0264	599.2031	487.2474	334.3382	222.1168	233.3604	359.5340	500.9488	556.8060	576.7276	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	879.8541	855.3333	776.1130	651.8520	498.5043	335.4237	222.2095	233.5330	363.4131	555.2558	736.3423	882.8423	(97)
Space heating kWh	213.7908	148.3374	103.4804	37.9072	8.3751	0.0000	0.0000	0.0000	0.0000	40.4044	129.2662	227.7493	(98a)
Space heating requirement - total per year (kWh/year)												909.3108	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	213.7908	148.3374	103.4804	37.9072	8.3751	0.0000	0.0000	0.0000	0.0000	40.4044	129.2662	227.7493	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												909.3108	
Space heating per m2										(98c) / (4) =		11.3692	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	213.7908	148.3374	103.4804	37.9072	8.3751	0.0000	0.0000	0.0000	0.0000	40.4044	129.2662	227.7493 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	320.6862	222.5061	155.2206	56.8608	12.5627	0.0000	0.0000	0.0000	0.0000	60.6066	193.8992	341.6240
Space heating requirement												
	320.6862	222.5061	155.2206	56.8608	12.5627	0.0000	0.0000	0.0000	0.0000	60.6066	193.8992	341.6240 (307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement												
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948
Water heating fuel												
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679 (331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year	
Space heating fuel - community heating	1363.9662 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4037.1274 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	13.6397 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)	
mechanical ventilation fans (SFP = 0.0920)	21.9935 (330a)
Total electricity for the above, kWh/year	21.9935 (331)
Electricity for lighting (calculated in Appendix L)	206.9234 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-958.2209 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4671.7896 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1440.2916	0.1573	57.2312	(367)
Electrical energy for heat distribution (space & water)	13.6397	0.0000	7.8339	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			216.7374	(373)
Space and water heating			216.7374	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			128.2557	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6000	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1440.2916	1.5825	575.5913	(467)
Electrical energy for heat distribution (space & water)	13.6397	0.0000	82.9870	(472)
Overall CO2 factor for heat network			0.4251	(486)
Total CO2 associated with community systems			2295.9741	(473)
Space and water heating			2295.9741	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	1.4873	-726.6034	
PV Unit electricity exported	-469.6869	0.4449	-208.9838	
Total			-935.5872	(480)
Total Primary energy kWh/year			1711.0447	(483)
Dwelling Primary energy Rate (DPER)			21.3900	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type			7.6000	1.1450	8.7023			(27)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.1800	5.4450			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
500mm mineral wool	39.9900		39.9900	0.1100	4.3989			(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7164			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.7300	0.0500	0.3365
E3 Sill	5.8800	0.0500	0.2940
E4 Jamb	10.3200	0.0500	0.5160
E6 Intermediate floor within a dwelling	14.1900	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	11.4900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
E7 Party floor between dwellings (in blocks of flats)	14.1900	0.0700	0.9933
P4 Party wall - Roof (insulation at ceiling level)	11.4900	0.1200	1.3788
E10 Eaves (insulation at ceiling level)	8.7100	0.0600	0.5226
E12 Gable (insulation at ceiling level)	5.4100	0.0600	0.3246

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.6278	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	32.3442	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	68.8609	68.6984	68.5391	67.7910	67.6510	66.9994	66.9994	66.8787	67.2504	67.6510	67.9342	68.2302	(39)
Average = Sum(39)m / 12 =												67.7903	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8610	0.8589	0.8570	0.8476	0.8458	0.8377	0.8377	0.8362	0.8408	0.8458	0.8494	0.8531	(40)
HLP (average)												0.8476	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
									Total per year (kWh/year) = Sum(64)m =			2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.1468	142.9840	129.1468	133.4517	129.1468	133.4517	129.1468	129.1468	133.4517	129.1468	133.4517	129.1468	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													

	556.1810	569.8542	545.5784	527.3650	501.3308	481.5479	463.5104	464.5816	478.5488	496.7781	526.3787	545.1830 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	7.6000	19.6403	0.6300	0.7000	0.7700	45.6176	(76)

Solar gains	45.6176	89.2378	146.9619	214.3352	262.6758	268.8954	255.9994	219.8997	170.9228	105.8881	56.8798	37.5137 (83)
Total gains	601.7986	659.0920	692.5403	741.7002	764.0066	750.4433	719.5098	684.4813	649.4715	602.6662	583.2585	582.6967 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.8622	63.0109	63.1573	63.8543	63.9864	64.6087	64.6087	64.7253	64.3676	63.9864	63.7197	63.4432	
alpha	5.1908	5.2007	5.2105	5.2570	5.2658	5.3072	5.3072	5.3150	5.2912	5.2658	5.2480	5.2295	
util living area	0.9832	0.9715	0.9484	0.8793	0.7492	0.5585	0.4076	0.4459	0.6753	0.8978	0.9679	0.9855	(86)
MIT	20.0319	20.1920	20.4150	20.7076	20.9012	20.9831	20.9973	20.9958	20.9557	20.7172	20.3397	20.0063	(87)
Th 2	20.2008	20.2025	20.2042	20.2123	20.2138	20.2208	20.2208	20.2221	20.2181	20.2138	20.2107	20.2076	(88)
util rest of house	0.9793	0.9652	0.9368	0.8539	0.7034	0.4953	0.3365	0.3722	0.6115	0.8706	0.9597	0.9822	(89)
MIT 2	19.0758	19.2784	19.5572	19.9141	20.1276	20.2098	20.2197	20.2202	20.1862	19.9331	19.4724	19.0486	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.3456	19.5362	19.7993	20.1381	20.3459	20.4280	20.4391	20.4390	20.4033	20.1544	19.7172	19.3189	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3456	19.5362	19.7993	20.1381	20.3459	20.4280	20.4391	20.4390	20.4033	20.1544	19.7172	19.3189	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9741	0.9587	0.9299	0.8512	0.7115	0.5124	0.3565	0.3929	0.6272	0.8683	0.9534	0.9774	(94)
Useful gains	586.2231	631.8626	643.9713	631.3458	543.5623	384.5337	256.5134	268.9541	407.3704	523.2921	556.0918	569.5320	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1036.0557	1005.4847	911.5210	761.8383	584.9046	390.4746	257.2179	270.1253	423.9001	646.3623	857.1371	1031.5631	(97)
Space heating kWh	334.6754	251.0741	199.0570	93.9545	30.7587	0.0000	0.0000	0.0000	0.0000	91.5642	216.7526	343.7511	(98a)
Space heating requirement - total per year (kWh/year)												1561.5877	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	334.6754	251.0741	199.0570	93.9545	30.7587	0.0000	0.0000	0.0000	0.0000	91.5642	216.7526	343.7511	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1561.5877	
Space heating per m2											(98c) / (4) =	19.5247	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	334.6754	251.0741	199.0570	93.9545	30.7587	0.0000	0.0000	0.0000	0.0000	91.5642	216.7526	343.7511	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	362.5953	272.0196	215.6630	101.7926	33.3247	0.0000	0.0000	0.0000	0.0000	99.2028	234.8349	372.4281	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9161	84.5503	83.8921	82.5772	80.9771	79.8000	79.8000	79.8000	79.8000	82.5040	84.2059	84.9983	(217)
Fuel for water heating, kWh/month	268.8716	238.7352	255.7420	229.1037	226.8522	207.8751	205.6450	213.6686	215.8200	232.2159	241.2047	265.7959	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	26.8342	21.5274	19.3830	14.2008	10.9691	8.9619	10.0064	13.0067	16.8944	22.1664	25.0369	27.5800	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3597	-31.5987	-47.6203	-56.2064	-62.9289	-59.5773	-58.8595	-54.4329	-47.0022	-37.3178	-24.0087	-18.2981	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9169	-17.0101	-34.4870	-52.8069	-70.8246	-71.5366	-70.6859	-59.3742	-42.9070	-24.6402	-10.6698	-6.2334	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1691.8610	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2801.5299	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	216.5670	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3807.6549	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1691.8610	0.2100	355.2908	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2801.5299	0.2100	588.3213	(264)
Space and water heating			943.6121	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	216.5670	0.1443	31.2573	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	0.1336	-69.3640	
PV Unit electricity exported	-469.0927	0.1253	-58.7938	
Total			-128.1578	(269)
Total CO2, kg/year			858.6409	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.7400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1691.8610	1.1300	1911.8029	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2801.5299	1.1300	3165.7288	(278)
Space and water heating			5077.5317	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	216.5670	1.5338	332.1777	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	1.4937	-775.5387	
PV Unit electricity exported	-469.0927	0.4600	-215.8009	
Total			-991.3396	(283)
Total Primary energy kWh/year			4548.4706	(286)
Target Primary Energy Rate (TPER)			56.8700	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - South	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.60	**TER**	10.74
Environmental	99 A	**% DER < TER**			85.10
CO_2 Emissions (t/year)	0.1	**DFEE**	18.72	**TFEE**	25.56
Compliance Check	See BREL	**% DFEE < TFEE**			26.77
% DPER < TPER	62.38	**DPER**	21.39	**TPER**	56.87

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				4	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			15583.4798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.2856	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	612.2735	609.9558	591.8328	558.1588	524.7912	494.7014	477.0149	480.2399	497.5865	528.2765	565.2104	597.3217	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	7.6000	19.6403	0.6800	0.7000	0.7700	49.2381	(76)

Solar gains	49.2381	96.3201	158.6255	231.3459	283.5231	290.2363	276.3168	237.3520	184.4881	114.2919	61.3941	40.4910	(83)
Total gains	661.5116	706.2759	750.4584	789.5046	808.3143	784.9377	753.3317	717.5919	682.0745	642.5685	626.6045	637.8127	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area													
	0.9631	0.9433	0.8948	0.7920	0.6344	0.4598	0.3307	0.3628	0.5649	0.8193	0.9368	0.9695	(86)
MIT	20.4438	20.5573	20.7299	20.8913	20.9744	20.9968	20.9996	20.9994	20.9897	20.8869	20.6390	20.3998	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house													
	0.9560	0.9329	0.8770	0.7621	0.5937	0.4128	0.2807	0.3104	0.5133	0.7859	0.9236	0.9634	(89)
MIT 2	19.6960	19.8356	20.0431	20.2266	20.3118	20.3313	20.3332	20.3330	20.3261	20.2258	19.9382	19.6415	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.9070	20.0392	20.2369	20.4142	20.4988	20.5191	20.5212	20.5211	20.5134	20.4124	20.1360	19.8555	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9070	20.0392	20.2369	20.4142	20.4988	20.5191	20.5212	20.5211	20.5134	20.4124	20.1360	19.8555	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9508	0.9278	0.8742	0.7659	0.6040	0.4259	0.2948	0.3252	0.5274	0.7901	0.9192	0.9583	(94)
Useful gains	628.9398	655.2678	656.0766	604.6618	488.2081	334.3402	222.1173	233.3647	359.7257	507.6884	575.9619	611.2458	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	884.4213	857.9142	778.4476	652.4891	498.6111	335.4240	222.2095	233.5335	363.4342	556.0496	738.7267	887.1689	(97)
Space heating kWh													
	190.0782	136.1784	91.0440	34.4357	7.7398	0.0000	0.0000	0.0000	0.0000	35.9808	117.1907	205.2868	(98a)
Space heating requirement - total per year (kWh/year)												817.9344	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	190.0782	136.1784	91.0440	34.4357	7.7398	0.0000	0.0000	0.0000	0.0000	35.9808	117.1907	205.2868	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												817.9344	
Space heating per m2											(98c) / (4) =	10.2267	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	190.0782	136.1784	91.0440	34.4357	7.7398	0.0000	0.0000	0.0000	0.0000	35.9808	117.1907	205.2868	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	285.1173	204.2676	136.5660	51.6535	11.6098	0.0000	0.0000	0.0000	0.0000	53.9712	175.7860	307.9302	
Space heating requirement													
	285.1173	204.2676	136.5660	51.6535	11.6098	0.0000	0.0000	0.0000	0.0000	53.9712	175.7860	307.9302	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1226.9016	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												12.2690	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)
Total electricity for the above, kWh/year												21.9935	(331)
Electricity for lighting (calculated in Appendix L)												206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4534.7250	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1226.9016	4.4400	54.4744	(340a)
Space heating total			54.4744	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	206.9234	16.4900	34.1217	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	16.4900	-80.5593	
PV Unit electricity exported	-469.6869	5.5900	-26.2555	
Total			-106.8148	(352)
Total energy cost			256.6565	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7393 (357)
SAP value		88.0161
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1403.7411	0.1573	51.4792	(367)
Electrical energy for heat distribution (space & water)	12.2690	0.0000	7.6182	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			210.7697	(373)
Space and water heating			210.7697	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			122.2880	(383)
CO2 emissions per m2			1.5300	(384)
EI value			98.6889	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 79.9800						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate													
	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15583.4798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.2856	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539	(43)

Daily hot water use

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte 211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
								Total per year (kWh/year) = Sum(64)m =			2691.4183	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)

Heat gains from water heating, kWh/month

114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
327.4608 330.8588 322.2959 304.0665 281.0552 259.4278 244.9794 241.5813 250.1442 268.3736 291.3850 313.0124 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 (71)
Water heating gains (Table 5)
154.0336 151.5930 146.8914 136.5869 130.2751 123.6777 119.6256 122.9734 126.8986 134.2191 144.0972 152.7161 (72)
Total internal gains
612.2735 609.9558 591.8328 558.1588 524.7912 494.7014 477.0149 480.2399 497.5865 528.2765 565.2104 597.3217 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	7.6000	23.7835	0.6800	0.7000	0.7700	59.6251	(76)

Solar gains 59.6251 103.6406 167.9167 247.1276 291.2895 319.6931 298.7175 261.9205 205.9597 129.6904 73.2361 49.3147 (83)
Total gains 671.8987 713.5964 759.7496 805.2864 816.0807 814.3945 775.7324 742.1603 703.5461 657.9669 638.4465 646.6364 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9573	0.9363	0.8769	0.7638	0.5989	0.4026	0.2848	0.3129	0.5262	0.7824	0.9239	0.9648	(86)
MIT	20.4854	20.5913	20.7713	20.9138	20.9821	20.9986	20.9999	20.9998	20.9932	20.9169	20.6850	20.4404	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9492	0.9248	0.8566	0.7319	0.5571	0.3568	0.2362	0.2621	0.4751	0.7450	0.9084	0.9579	(89)
MIT 2	19.7475	19.8771	20.0915	20.2505	20.3188	20.3325	20.3333	20.3332	20.3288	20.2571	19.9934	19.6921	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.9557	20.0787	20.2834	20.4377	20.5060	20.5205	20.5214	20.5213	20.5163	20.4433	20.1886	19.9032	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9557	20.0787	20.2834	20.4377	20.5060	20.5205	20.5214	20.5213	20.5163	20.4433	20.1886	19.9032	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9439	0.9198	0.8550	0.7371	0.5680	0.3697	0.2499	0.2764	0.4893	0.7515	0.9046	0.9527	(94)
Useful gains	634.1980	656.3948	649.5837	593.5428	463.5728	301.0551	193.8520	205.1543	344.2286	494.4496	577.5599	616.0490	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	870.1828	843.1482	752.7460	631.1540	470.6858	301.5014	193.8831	205.2132	346.5988	529.4663	719.0389	872.8755	(97)
Space heating kWh	175.5727	125.4983	76.7527	27.0801	5.2920	0.0000	0.0000	0.0000	0.0000	26.0524	101.8648	191.0789	(98a)
Space heating requirement - total per year (kWh/year)												729.1921	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	175.5727	125.4983	76.7527	27.0801	5.2920	0.0000	0.0000	0.0000	0.0000	26.0524	101.8648	191.0789	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												729.1921	
Space heating per m2										(98c) / (4) =		9.1172	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement
175.5727 125.4983 76.7527 27.0801 5.2920 0.0000 0.0000 0.0000 0.0000 26.0524 101.8648 191.0789 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50
307a 263.3590 188.2475 115.1291 40.6202 7.9380 0.0000 0.0000 0.0000 0.0000 39.0787 152.7973 286.6184
Space heating requirement
263.3590 188.2475 115.1291 40.6202 7.9380 0.0000 0.0000 0.0000 0.0000 39.0787 152.7973 286.6184 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)

Water heating
Annual water heating requirement
266.9446 236.1786 250.9634 220.5542 213.7828 192.6005 189.9534 197.4446 199.5749 222.6078 236.8171 263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50
310a 400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948
Water heating fuel
400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948 (310)
Cooling System Energy Efficiency Ratio 0.0000 (314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (315)
Pumps and Fa 1.8679 1.6872 1.8679 1.8077 1.8679 1.8077 1.8679 1.8679 1.8077 1.8679 1.8077 1.8679 (331)
Lighting 25.6392 20.5688 18.5199 13.5685 10.4807 8.5628 9.5608 12.4275 16.1421 21.1793 23.9220 26.3518 (332)
Electricity generated by PVs (Appendix M) (negative quantity)
(333a)m -17.9904 -26.9468 -45.2798 -58.5762 -66.5604 -66.2871 -64.3781 -58.6940 -48.0761 -34.8334 -20.6614 -14.9764 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(334a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (334a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)

Electricity generated by PVs (Appendix M) (negative quantity)

(333b)m	-6.0081	-13.0184	-31.9653	-58.9969	-82.6801	-94.8316	-90.1120	-72.5476	-46.2727	-22.1629	-8.3690	-4.5223	(333b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1093.7881	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	10.9379	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4305.0855	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1093.7881	6.5500	71.6431	(340a)
Space heating total			71.6431	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	206.9234	28.4300	58.8283	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	28.4300	-148.7628	
PV Unit electricity exported	-531.4870	5.8100	-30.8794	
Total			-179.6422	(352)
Total energy cost			325.5138	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1368.2441	0.1578	46.0331	(367)
Electrical energy for heat distribution (space & water)	10.9379	0.0000	7.4140	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			205.1194	(373)
Space and water heating			205.1194	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	0.1322	-69.1719	
PV Unit electricity exported	-531.4870	0.1213	-64.4804	
Total			-133.6523	(380)
Total CO2, kg/year			104.3833	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1368.2441	1.5842	462.0861	(467)
Electrical energy for heat distribution (space & water)	10.9379	0.0000	78.7306	(472)
Overall CO2 factor for heat network			0.4245	(486)
Total CO2 associated with community systems			2178.2125	(473)
Space and water heating			2178.2125	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	1.4884	-778.8342	
PV Unit electricity exported	-531.4870	0.4450	-236.5330	
Total			-1015.3671	(480)
Total Primary energy kWh/year			1513.5032	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - South

Current energy efficiency rating:	B 88
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£65	£65	£0
Community scheme	£440	£440	£0
Space heating	£182	£182	£0
Water heating	£264	£264	£0
Lighting	£59	£59	£0
Generated (PV)	-£180	-£180	£0
Total cost of fuels	£325	£325	£0
Total cost of uses	£325	£325	£0
Delivered energy	54 kWh/m²	54 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	19 kWh/m²	19 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15583.4798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		194.8422 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.2856 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4625 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
									Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)

Water heating gains (Table 5)

154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)

Total internal gains

612.2735	609.9558	591.8328	558.1588	524.7912	494.7014	477.0149	480.2399	497.5865	528.2765	565.2104	597.3217	(73)

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6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			Gains W	
East				7.6000	19.6403	0.6800	0.7000	0.7700			49.2381	(76)
Solar gains	49.2381	96.3201	158.6255	231.3459	283.5231	290.2363	276.3168	237.3520	184.4881	114.2919	61.3941	40.4910 (83)
Total gains	661.5116	706.2759	750.4584	789.5046	808.3143	784.9377	753.3317	717.5919	682.0745	642.5685	626.6045	637.8127 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9631	0.9433	0.8948	0.7920	0.6344	0.4598	0.3307	0.3628	0.5649	0.8193	0.9368	0.9695	(86)
MIT	20.4438	20.5573	20.7299	20.8913	20.9744	20.9968	20.9996	20.9994	20.9897	20.8869	20.6390	20.3998	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9560	0.9329	0.8770	0.7621	0.5937	0.4128	0.2807	0.3104	0.5133	0.7859	0.9236	0.9634	(89)
MIT 2	19.6960	19.8356	20.0431	20.2266	20.3118	20.3313	20.3332	20.3330	20.3261	20.2258	19.9382	19.6415	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.9070	20.0392	20.2369	20.4142	20.4988	20.5191	20.5212	20.5211	20.5134	20.4124	20.1360	19.8555	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9070	20.0392	20.2369	20.4142	20.4988	20.5191	20.5212	20.5211	20.5134	20.4124	20.1360	19.8555	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9508	0.9278	0.8742	0.7659	0.6040	0.4259	0.2948	0.3252	0.5274	0.7901	0.9192	0.9583	(94)
Useful gains	628.9398	655.2678	656.0766	604.6618	488.2081	334.3402	222.1173	233.3647	359.7257	507.6884	575.9619	611.2458	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	884.4213	857.9142	778.4476	652.4891	498.6111	335.4240	222.2095	233.5335	363.4342	556.0496	738.7267	887.1689	(97)
Space heating kWh	190.0782	136.1784	91.0440	34.4357	7.7398	0.0000	0.0000	0.0000	0.0000	35.9808	117.1907	205.2868	(98a)
Space heating requirement - total per year (kWh/year)												817.9344	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	190.0782	136.1784	91.0440	34.4357	7.7398	0.0000	0.0000	0.0000	0.0000	35.9808	117.1907	205.2868	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												817.9344	
Space heating per m2										(98c) / (4) =		10.2267	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	190.0782	136.1784	91.0440	34.4357	7.7398	0.0000	0.0000	0.0000	0.0000	35.9808	117.1907	205.2868	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	285.1173	204.2676	136.5660	51.6535	11.6098	0.0000	0.0000	0.0000	0.0000	53.9712	175.7860	307.9302	
Space heating requirement													
	285.1173	204.2676	136.5660	51.6535	11.6098	0.0000	0.0000	0.0000	0.0000	53.9712	175.7860	307.9302	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1226.9016	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												12.2690	(313)
Space cooling fuel												0.0000	(321)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)

mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4534.7250	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1226.9016	4.4400	54.4744	(340a)
Space heating total			54.4744	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	206.9234	16.4900	34.1217	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	16.4900	-80.5593	
PV Unit electricity exported	-469.6869	5.5900	-26.2555	
Total			-106.8148	(352)
Total energy cost			256.6565	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7393	(357)
SAP value		88.0161	
SAP rating (Section 12)		88	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1403.7411	0.1573	51.4792	(367)
Electrical energy for heat distribution (space & water)	12.2690	0.0000	7.6182	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			210.7697	(373)
Space and water heating			210.7697	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			122.2880	(383)
CO2 emissions per m2			1.5300	(384)
EI value			98.6889	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)

Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15583.4798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		194.8422 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.2856 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4625 (42)

Hot water usage for mixer showers

65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)
Total storage loss	

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

Total per year (kWh/year) = Sum(64)m = 2691.4183 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)

Water heating gains (Table 5)

154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)

Total internal gains

612.2735	609.9558	591.8328	558.1588	524.7912	494.7014	477.0149	480.2399	497.5865	528.2765	565.2104	597.3217	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	7.6000	23.7835	0.6800	0.7000	0.7700	59.6251	(76)

Solar gains	59.6251	103.6406	167.9167	247.1276	291.2895	319.6931	298.7175	261.9205	205.9597	129.6904	73.2361	49.3147	(83)
Total gains	671.8987	713.5964	759.7496	805.2864	816.0807	814.3945	775.7324	742.1603	703.5461	657.9669	638.4465	646.6364	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area													
	0.9573	0.9363	0.8769	0.7638	0.5989	0.4026	0.2848	0.3129	0.5262	0.7824	0.9239	0.9648	(86)
MIT	20.4854	20.5913	20.7713	20.9138	20.9821	20.9986	20.9999	20.9998	20.9932	20.9169	20.6850	20.4404	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house													
	0.9492	0.9248	0.8566	0.7319	0.5571	0.3568	0.2362	0.2621	0.4751	0.7450	0.9084	0.9579	(89)
MIT 2	19.7475	19.8771	20.0915	20.2505	20.3188	20.3325	20.3333	20.3332	20.3288	20.2571	19.9934	19.6921	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.9557	20.0787	20.2834	20.4377	20.5060	20.5205	20.5214	20.5213	20.5163	20.4433	20.1886	19.9032	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9557	20.0787	20.2834	20.4377	20.5060	20.5205	20.5214	20.5213	20.5163	20.4433	20.1886	19.9032	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9439	0.9198	0.8550	0.7371	0.5680	0.3697	0.2499	0.2764	0.4893	0.7515	0.9046	0.9527	(94)
Useful gains	634.1980	656.3948	649.5837	593.5428	463.5728	301.0551	193.8520	205.1543	344.2286	494.4496	577.5599	616.0490	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	870.1828	843.1482	752.7460	631.1540	470.6858	301.5014	193.8831	205.2132	346.5988	529.4663	719.0389	872.8755	(97)
Space heating kWh													
	175.5727	125.4983	76.7527	27.0801	5.2920	0.0000	0.0000	0.0000	0.0000	26.0524	101.8648	191.0789	(98a)
Space heating requirement - total per year (kWh/year)												729.1921	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	175.5727	125.4983	76.7527	27.0801	5.2920	0.0000	0.0000	0.0000	0.0000	26.0524	101.8648	191.0789	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												729.1921	
Space heating per m2											(98c) / (4) =	9.1172	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement

175.5727	125.4983	76.7527	27.0801	5.2920	0.0000	0.0000	0.0000	0.0000	26.0524	101.8648	191.0789	(98)

Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50

307a	263.3590	188.2475	115.1291	40.6202	7.9380	0.0000	0.0000	0.0000	0.0000	39.0787	152.7973	286.6184	
Space heating requirement													
	263.3590	188.2475	115.1291	40.6202	7.9380	0.0000	0.0000	0.0000	0.0000	39.0787	152.7973	286.6184	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)

Space heating fuel for secondary/supplementary system

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement												
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948
Water heating fuel												
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679 (331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-17.9904	-26.9468	-45.2798	-58.5762	-66.5604	-66.2871	-64.3781	-58.6940	-48.0761	-34.8334	-20.6614	-14.9764 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-6.0081	-13.0184	-31.9653	-58.9969	-82.6801	-94.8316	-90.1120	-72.5476	-46.2727	-22.1629	-8.3690	-4.5223 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year	
Space heating fuel - community heating	1093.7881 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4037.1274 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	10.9379 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)	
mechanical ventilation fans (SFP = 0.0920)	21.9935 (330a)
Total electricity for the above, kWh/year	21.9935 (331)
Electricity for lighting (calculated in Appendix L)	206.9234 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4305.0855 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1093.7881	6.5500	71.6431	(340a)
Space heating total			71.6431	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	206.9234	28.4300	58.8283	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	28.4300	-148.7628	
PV Unit electricity exported	-531.4870	5.8100	-30.8794	
Total			-179.6422	(352)
Total energy cost			325.5138	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1368.2441	0.1578	46.0331	(367)
Electrical energy for heat distribution (space & water)	10.9379	0.0000	7.4140	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			205.1194	(373)
Space and water heating			205.1194	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	0.1322	-69.1719	
PV Unit electricity exported	-531.4870	0.1213	-64.4804	
Total			-133.6523	(380)
Total CO2, kg/year			104.3833	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1368.2441	1.5842	462.0861	(467)
Electrical energy for heat distribution (space & water)	10.9379	0.0000	78.7306	(472)
Overall CO2 factor for heat network			0.4245	(486)
Total CO2 associated with community systems			2178.2125	(473)
Space and water heating			2178.2125	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)

Energy saving/generation technologies			
PV Unit electricity used in dwelling	-523.2600	1.4884	-778.8342
PV Unit electricity exported	-531.4870	0.4450	-236.5330
Total			-1015.3671 (480)
Total Primary energy kWh/year			1513.5032 (483)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.68	**TER**	11.04
Environmental	99 A	**% DER < TER**			84.78
CO_2 Emissions (t/year)	0.11	**DFEE**	19.96	**TFEE**	26.96
Compliance Check	See BREL	**% DFEE < TFEE**			25.94
% DPER < TPER	62.12	**DPER**	22.17	**TPER**	58.53

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			15583.4798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.2856	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.6117	146.8201	132.6117	137.0321	132.6117	137.0321	132.6117	132.6117	137.0321	132.6117	137.0321	132.6117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	565.9813	580.0257	555.3786	537.2808	511.1311	494.4637	476.3107	477.3819	491.4645	506.5784	536.2944	554.9833	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.6000	11.2829	0.6800	0.7000	0.7700	28.2863	(75)
Solar gains	28.2863	57.5776	103.7365	170.3651	229.0041	244.1426	228.3904	182.0755	126.4045	70.3644	35.5915	23.1000	(83)
Total gains	594.2676	637.6033	659.1151	707.6459	740.1352	738.6063	704.7011	659.4573	617.8691	576.9427	571.8859	578.0833	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9773	0.9632	0.9347	0.8451	0.6836	0.4877	0.3534	0.3944	0.6180	0.8680	0.9566	0.9806	(86)
MIT	20.3425	20.4636	20.6302	20.8424	20.9621	20.9956	20.9995	20.9990	20.9835	20.8407	20.5672	20.3073	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9726	0.9558	0.9218	0.8185	0.6420	0.4382	0.3001	0.3377	0.5634	0.8390	0.9467	0.9766	(89)
MIT 2	19.5703	19.7213	19.9263	20.1747	20.3009	20.3305	20.3331	20.3328	20.3215	20.1774	19.8520	19.5262	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.7882	19.9308	20.1249	20.3631	20.4875	20.5182	20.5211	20.5208	20.5083	20.3646	20.0538	19.7466	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7882	19.9308	20.1249	20.3631	20.4875	20.5182	20.5211	20.5208	20.5083	20.3646	20.0538	19.7466	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9680	0.9506	0.9172	0.8197	0.6519	0.4520	0.3151	0.3537	0.5780	0.8404	0.9418	0.9722	(94)
Useful gains	575.2357	606.1030	604.5711	580.0781	482.4683	333.8757	222.0696	233.2502	357.1337	484.8912	538.6193	562.0159	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	877.6902	851.7679	772.1007	649.5943	497.9703	335.3728	222.2041	233.5205	363.1476	553.3436	734.0715	880.9994	(97)
Space heating kWh	225.0261	165.0868	124.6420	50.0517	11.5334	0.0000	0.0000	0.0000	0.0000	50.9286	140.7256	237.3237	(98a)
Space heating requirement - total per year (kWh/year)												1005.3180	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	225.0261	165.0868	124.6420	50.0517	11.5334	0.0000	0.0000	0.0000	0.0000	50.9286	140.7256	237.3237	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1005.3180	
Space heating per m2											(98c) / (4) =	12.5696	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	225.0261	165.0868	124.6420	50.0517	11.5334	0.0000	0.0000	0.0000	0.0000	50.9286	140.7256	237.3237 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	337.5392	247.6303	186.9630	75.0776	17.3002	0.0000	0.0000	0.0000	0.0000	76.3929	211.0884	355.9856
Space heating requirement												
	337.5392	247.6303	186.9630	75.0776	17.3002	0.0000	0.0000	0.0000	0.0000	76.3929	211.0884	355.9856 (307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement												
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948
Water heating fuel												
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679 (331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year		
Space heating fuel - community heating	1507.9770	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	15.0798	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4815.8004	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1478.6945	0.1569	63.0811	(367)
Electrical energy for heat distribution (space & water)	15.0798	0.0000	8.0533	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			222.8067	(373)
Space and water heating			222.8067	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			134.3251	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6800	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1478.6945	1.5808	635.6630	(467)
Electrical energy for heat distribution (space & water)	15.0798	0.0000	85.2397	(472)
Overall CO2 factor for heat network			0.4253	(486)
Total CO2 associated with community systems			2358.2985	(473)
Space and water heating			2358.2985	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	1.4873	-726.6034	
PV Unit electricity exported	-469.6869	0.4449	-208.9838	
Total			-935.5872	(480)
Total Primary energy kWh/year			1773.3691	(483)
Dwelling Primary energy Rate (DPER)			22.1700	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type			7.6000	1.1450	8.7023			(27)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.1800	5.4450			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
500mm mineral wool	39.9900		39.9900	0.1100	4.3989			(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7164			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.7300	0.0500	0.3365
E3 Sill	5.8800	0.0500	0.2940
E4 Jamb	10.3200	0.0500	0.5160
E6 Intermediate floor within a dwelling	14.1900	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	11.4900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
E7 Party floor between dwellings (in blocks of flats)	14.1900	0.0700	0.9933
P4 Party wall - Roof (insulation at ceiling level)	11.4900	0.1200	1.3788
E10 Eaves (insulation at ceiling level)	8.7100	0.0600	0.5226
E12 Gable (insulation at ceiling level)	5.4100	0.0600	0.3246

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.6278	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	32.3442	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	68.8609	68.6984	68.5391	67.7910	67.6510	66.9994	66.9994	66.8787	67.2504	67.6510	67.9342	68.2302	(39)
Average = Sum(39)m / 12 =												67.7903	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8610	0.8589	0.8570	0.8476	0.8458	0.8377	0.8377	0.8362	0.8408	0.8458	0.8494	0.8531	(40)
HLP (average)												0.8476	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
									Total per year (kWh/year) = Sum(64)m =			2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.1468	142.9840	129.1468	133.4517	129.1468	133.4517	129.1468	129.1468	133.4517	129.1468	133.4517	129.1468	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													

	556.1810	569.8542	545.5784	527.3650	501.3308	481.5479	463.5104	464.5816	478.5488	496.7781	526.3787	545.1830	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.6000	11.2829	0.6300	0.7000	0.7700	26.2064	(75)

Solar gains	26.2064	53.3439	96.1088	157.8383	212.1656	226.1910	211.5970	168.6876	117.1101	65.1905	32.9745	21.4015	(83)
Total gains	582.3874	623.1981	641.6872	685.2033	713.4964	707.7389	675.1074	633.2692	595.6588	561.9686	559.3531	566.5845	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.8622	63.0109	63.1573	63.8543	63.9864	64.6087	64.6087	64.7253	64.3676	63.9864	63.7197	63.4432	
alpha	5.1908	5.2007	5.2105	5.2570	5.2658	5.3072	5.3072	5.3150	5.2912	5.2658	5.2480	5.2295	
util living area	0.9853	0.9773	0.9612	0.9053	0.7832	0.5884	0.4336	0.4804	0.7210	0.9184	0.9729	0.9871	(86)
MIT	20.0010	20.1377	20.3456	20.6522	20.8776	20.9785	20.9964	20.9940	20.9398	20.6738	20.3043	19.9803	(87)
Th 2	20.2008	20.2025	20.2042	20.2123	20.2138	20.2208	20.2208	20.2221	20.2181	20.2138	20.2107	20.2076	(88)
util rest of house	0.9820	0.9721	0.9520	0.8835	0.7390	0.5232	0.3583	0.4017	0.6573	0.8950	0.9657	0.9842	(89)
MIT 2	19.0370	19.2109	19.4728	19.8518	20.1051	20.2067	20.2193	20.2193	20.1736	19.8846	19.4288	19.0159	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.3090	19.4724	19.7191	20.0777	20.3231	20.4245	20.4386	20.4379	20.3898	20.1073	19.6758	19.2880	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3090	19.4724	19.7191	20.0777	20.3231	20.4245	20.4386	20.4379	20.3898	20.1073	19.6758	19.2880	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9771	0.9661	0.9452	0.8793	0.7456	0.5406	0.3795	0.4238	0.6721	0.8913	0.9597	0.9797	(94)
Useful gains	569.0598	602.0847	606.5356	602.4822	531.9559	382.6264	256.2298	268.3737	400.3189	500.8930	536.8375	555.0892	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1033.5332	1001.1018	906.0259	757.7443	583.3607	390.2352	257.1815	270.0514	422.9920	643.1761	854.3289	1029.4589	(97)
Space heating kWh	345.5682	268.1395	222.8208	111.7887	38.2452	0.0000	0.0000	0.0000	0.0000	105.8587	228.5938	352.9310	(98a)
Space heating requirement - total per year (kWh/year)												1673.9459	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	345.5682	268.1395	222.8208	111.7887	38.2452	0.0000	0.0000	0.0000	0.0000	105.8587	228.5938	352.9310	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1673.9459	
Space heating per m2											(98c) / (4) =	20.9296	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	345.5682	268.1395	222.8208	111.7887	38.2452	0.0000	0.0000	0.0000	0.0000	105.8587	228.5938	352.9310	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	374.3967	290.5087	241.4093	121.1146	41.4357	0.0000	0.0000	0.0000	0.0000	114.6898	247.6639	382.3738	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9867	84.6975	84.1448	82.9215	81.2185	79.8000	79.8000	79.8000	79.8000	82.7861	84.3255	85.0560	(217)
Fuel for water heating, kWh/month	268.6484	238.3203	254.9740	228.1523	226.1781	207.8751	205.6450	213.6686	215.8200	231.4247	240.8624	265.6155	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	26.8342	21.5274	19.3830	14.2008	10.9691	8.9619	10.0064	13.0067	16.8944	22.1664	25.0369	27.5800	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3597	-31.5987	-47.6203	-56.2064	-62.9289	-59.5773	-58.8595	-54.4329	-47.0022	-37.3178	-24.0087	-18.2981	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9169	-17.0101	-34.4870	-52.8069	-70.8246	-71.5366	-70.6859	-59.3742	-42.9070	-24.6402	-10.6698	-6.2334	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1813.5926	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2797.1844	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	216.5670	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3925.0410	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1813.5926	0.2100	380.8544	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2797.1844	0.2100	587.4087	(264)
Space and water heating			968.2632	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	216.5670	0.1443	31.2573	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	0.1336	-69.3640	
PV Unit electricity exported	-469.0927	0.1253	-58.7938	
Total			-128.1578	(269)
Total CO2, kg/year			883.2920	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.0400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1813.5926	1.1300	2049.3596	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2797.1844	1.1300	3160.8184	(278)
Space and water heating			5210.1780	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	216.5670	1.5338	332.1777	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	1.4937	-775.5387	
PV Unit electricity exported	-469.0927	0.4600	-215.8009	
Total			-991.3396	(283)
Total Primary energy kWh/year			4681.1169	(286)
Target Primary Energy Rate (TPER)			58.5300	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.68	**TER**	11.04
Environmental	99 A	**% DER < TER**			84.78
CO_2 Emissions (t/year)	0.11	**DFEE**	19.96	**TFEE**	26.96
Compliance Check	See BREL	**% DFEE < TFEE**			25.94
% DPER < TPER	62.12	**DPER**	22.17	**TPER**	58.53

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2122	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2705	0.2652	0.2599	0.2334	0.2281	0.2016	0.2016	0.1963	0.2122	0.2281	0.2387	0.2493	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5366	0.5352	0.5338	0.5272	0.5260	0.5203	0.5203	0.5193	0.5225	0.5260	0.5285	0.5311	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15583.4798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		194.8422 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.2856 (36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.6979	34.6061	34.5160	34.0930	34.0139	33.6455	33.6455	33.5772	33.7874	34.0139	34.1740	34.3414	(38)
Heat transfer coeff	59.0343	58.9424	58.8524	58.4294	58.3502	57.9818	57.9818	57.9136	58.1237	58.3502	58.5103	58.6777	(39)
Average = Sum(39)m / 12 =												58.4290	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7381	0.7370	0.7358	0.7305	0.7296	0.7250	0.7250	0.7241	0.7267	0.7296	0.7316	0.7337	(40)
HLP (average)												0.7305	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.6117	146.8201	132.6117	137.0321	132.6117	137.0321	132.6117	132.6117	137.0321	132.6117	137.0321	132.6117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains	460.3995	475.6643	453.8350	442.5318	420.3791	407.9331	392.6658	391.8132	403.5720	413.9765	437.2071	450.3260	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.6000	11.2829	0.6800	0.7000	0.7700	28.2863	(75)

Solar gains	28.2863	57.5776	103.7365	170.3651	229.0041	244.1426	228.3904	182.0755	126.4045	70.3644	35.5915	23.1000	(83)
Total gains	488.6858	533.2419	557.5715	612.8969	649.3832	652.0757	621.0562	573.8887	529.9765	484.3408	472.7986	473.4260	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.3259	73.4402	73.5526	74.0851	74.1855	74.6569	74.6569	74.7449	74.4746	74.1855	73.9825	73.7715	
alpha	5.8884	5.8960	5.9035	5.9390	5.9457	5.9771	5.9771	5.9830	5.9650	5.9457	5.9322	5.9181	
util living area	0.9918	0.9851	0.9703	0.9094	0.7694	0.5605	0.4096	0.4617	0.7160	0.9332	0.9828	0.9932	(86)
MIT	20.1050	20.2432	20.4420	20.7323	20.9230	20.9899	20.9987	20.9974	20.9613	20.7229	20.3765	20.0783	(87)

Th 2	20.3073	20.3083	20.3093	20.3139	20.3148	20.3188	20.3188	20.3196	20.3173	20.3148	20.3130	20.3112	(88)
util rest of house	0.9900	0.9817	0.9633	0.8894	0.7282	0.5041	0.3468	0.3946	0.6581	0.9141	0.9783	0.9916	(89)
MIT 2	19.4837	19.6211	19.8169	20.0960	20.2615	20.3137	20.3184	20.3186	20.2947	20.0926	19.7576	19.4604	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.6590	19.7966	19.9933	20.2756	20.4481	20.5045	20.5104	20.5102	20.4829	20.2705	19.9322	19.6348	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6590	19.7966	19.9933	20.2756	20.4481	20.5045	20.5104	20.5102	20.4829	20.2705	19.9322	19.6348	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9877	0.9786	0.9596	0.8882	0.7366	0.5197	0.3645	0.4135	0.6727	0.9126	0.9752	0.9896	(94)
Useful gains	482.6840	521.8101	535.0183	544.3613	478.3162	338.8591	226.3810	237.3137	356.5283	442.0298	461.0590	468.5093	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	906.7105	878.0432	794.1118	664.6685	510.4561	342.3544	226.7301	238.0352	370.9952	564.2763	750.8171	905.6778	(97)
Space heating kWh	315.4757	239.3887	192.7656	86.6211	23.9121	0.0000	0.0000	0.0000	0.0000	90.9514	208.6259	325.2533	(98a)
Space heating requirement - total per year (kWh/year)												1482.9937	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	315.4757	239.3887	192.7656	86.6211	23.9121	0.0000	0.0000	0.0000	0.0000	90.9514	208.6259	325.2533	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1482.9937	
Space heating per m2											(98c) / (4) =	18.5421	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	545.0293	429.0656	440.1434	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9382	0.9723	0.9559	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	511.3466	417.1806	420.7125	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	695.0264	661.9343	609.5852	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	132.2495	182.0967	140.5213	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	33.0624	45.5242	35.1303	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												113.7169	(107)
Energy for space heating												18.5421	(99)
Energy for space cooling												1.4218	(108)
Total												19.9639	(109)
Fabric Energy Efficiency (DFEE)												20.0	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type			7.6000	1.1450	8.7023			(27)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.1800	5.4450			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
500mm mineral wool	39.9900		39.9900	0.1100	4.3989			(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7164			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 194.8422 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.7300	0.0500	0.3365
E3 Sill	5.8800	0.0500	0.2940
E4 Jamb	10.3200	0.0500	0.5160
E6 Intermediate floor within a dwelling	14.1900	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	11.4900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
E7 Party floor between dwellings (in blocks of flats)	14.1900	0.0700	0.9933
P4 Party wall - Roof (insulation at ceiling level)	11.4900	0.1200	1.3788
E10 Eaves (insulation at ceiling level)	8.7100	0.0600	0.5226
E12 Gable (insulation at ceiling level)	5.4100	0.0600	0.3246

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.6278 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.3442 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	68.8609	68.6984	68.5391	67.7910	67.6510	66.9994	66.9994	66.8787	67.2504	67.6510	67.9342	68.2302	(39)
Average = Sum(39)m / 12 =												67.7903	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8610	0.8589	0.8570	0.8476	0.8458	0.8377	0.8377	0.8362	0.8408	0.8458	0.8494	0.8531	(40)
HLP (average)												0.8476	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	129.1468	142.9840	129.1468	133.4517	129.1468	133.4517	129.1468	129.1468	133.4517	129.1468	133.4517	129.1468 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993 (71)

Water heating gains (Table 5)

	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587 (72)

Total internal gains

	456.9346	471.8282	450.3701	438.9514	416.9142	404.3527	389.2009	388.3482	399.9916	410.5116	433.6267	446.8611 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.6000	11.2829	0.6300	0.7000	0.7700	26.2064	(75)

Solar gains	26.2064	53.3439	96.1088	157.8383	212.1656	226.1910	211.5970	168.6876	117.1101	65.1905	32.9745	21.4015 (83)
Total gains	483.1410	525.1721	546.4789	596.7897	629.0798	630.5436	600.7979	557.0358	517.1016	475.7021	466.6012	468.2626 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.8622	63.0109	63.1573	63.8543	63.9864	64.6087	64.6087	64.7253	64.3676	63.9864	63.7197	63.4432	
alpha	5.1908	5.2007	5.2105	5.2570	5.2658	5.3072	5.3072	5.3150	5.2912	5.2658	5.2480	5.2295	
util living area	0.9935	0.9890	0.9795	0.9407	0.8405	0.6492	0.4849	0.5415	0.7923	0.9549	0.9873	0.9945	(86)
MIT	19.8383	19.9822	20.2042	20.5497	20.8252	20.9661	20.9939	20.9895	20.9053	20.5661	20.1591	19.8177	(87)
Th 2	20.2008	20.2025	20.2042	20.2123	20.2138	20.2208	20.2208	20.2221	20.2181	20.2138	20.2107	20.2076	(88)
util rest of house	0.9920	0.9863	0.9742	0.9250	0.8012	0.5810	0.4018	0.4549	0.7321	0.9398	0.9837	0.9932	(89)
MIT 2	19.1332	19.2773	19.4980	19.8386	20.0885	20.2029	20.2187	20.2182	20.1608	19.8599	19.4602	19.1180	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.3322	19.4763	19.6973	20.0393	20.2964	20.4183	20.4375	20.4359	20.3709	20.0592	19.6574	19.3155	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3322	19.4763	19.6973	20.0393	20.2964	20.4183	20.4375	20.4359	20.3709	20.0592	19.6574	19.3155	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9897	0.9831	0.9700	0.9210	0.8057	0.5989	0.4252	0.4792	0.7448	0.9362	0.9805	0.9911	(94)
Useful gains	478.1617	516.3048	530.1031	549.6637	506.8187	377.6412	255.4751	266.9248	385.1262	445.3578	457.4807	464.1170	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1035.1272	1001.3652	904.5314	755.1414	581.5555	389.8225	257.1093	269.9135	421.7184	639.9250	853.0770	1031.3318	(97)
Space heating kWh	414.3823	325.9606	278.5746	147.9439	55.6042	0.0000	0.0000	0.0000	0.0000	144.7580	284.8293	422.0078	(98a)
Space heating requirement - total per year (kWh/year)												2074.0608	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	414.3823	325.9606	278.5746	147.9439	55.6042	0.0000	0.0000	0.0000	0.0000	144.7580	284.8293	422.0078	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2074.0608	
Space heating per m2											(98c) / (4) =	25.9322	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	629.7941	495.7954	508.2782	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8684	0.9281	0.8991	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	546.9170	460.1630	456.9884	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	673.7408	641.9781	593.5112	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	91.3131	135.2704	101.5730	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	22.8283	33.8176	25.3933	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												82.0391	(107)
Energy for space heating												25.9322	(99)
Energy for space cooling												1.0257	(108)
Total												26.9580	(109)
Fabric Energy Efficiency (TFEE)												27.0	(109)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.68	**TER**	11.04
Environmental	99 A	**% DER < TER**			84.78
CO_2 Emissions (t/year)	0.11	**DFEE**	19.96	**TFEE**	26.96
Compliance Check	See BREL	**% DFEE < TFEE**			25.94
% DPER < TPER	62.12	**DPER**	22.17	**TPER**	58.53

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			15583.4798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.2856	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.6117	146.8201	132.6117	137.0321	132.6117	137.0321	132.6117	132.6117	137.0321	132.6117	137.0321	132.6117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	565.9813	580.0257	555.3786	537.2808	511.1311	494.4637	476.3107	477.3819	491.4645	506.5784	536.2944	554.9833	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.6000	11.2829	0.6800	0.7000	0.7700	28.2863	(75)
Solar gains	28.2863	57.5776	103.7365	170.3651	229.0041	244.1426	228.3904	182.0755	126.4045	70.3644	35.5915	23.1000	(83)
Total gains	594.2676	637.6033	659.1151	707.6459	740.1352	738.6063	704.7011	659.4573	617.8691	576.9427	571.8859	578.0833	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9773	0.9632	0.9347	0.8451	0.6836	0.4877	0.3534	0.3944	0.6180	0.8680	0.9566	0.9806	(86)
MIT	20.3425	20.4636	20.6302	20.8424	20.9621	20.9956	20.9995	20.9990	20.9835	20.8407	20.5672	20.3073	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9726	0.9558	0.9218	0.8185	0.6420	0.4382	0.3001	0.3377	0.5634	0.8390	0.9467	0.9766	(89)
MIT 2	19.5703	19.7213	19.9263	20.1747	20.3009	20.3305	20.3331	20.3328	20.3215	20.1774	19.8520	19.5262	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.7882	19.9308	20.1249	20.3631	20.4875	20.5182	20.5211	20.5208	20.5083	20.3646	20.0538	19.7466	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7882	19.9308	20.1249	20.3631	20.4875	20.5182	20.5211	20.5208	20.5083	20.3646	20.0538	19.7466	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9680	0.9506	0.9172	0.8197	0.6519	0.4520	0.3151	0.3537	0.5780	0.8404	0.9418	0.9722	(94)
Useful gains	575.2357	606.1030	604.5711	580.0781	482.4683	333.8757	222.0696	233.2502	357.1337	484.8912	538.6193	562.0159	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	877.6902	851.7679	772.1007	649.5943	497.9703	335.3728	222.2041	233.5205	363.1476	553.3436	734.0715	880.9994	(97)
Space heating kWh	225.0261	165.0868	124.6420	50.0517	11.5334	0.0000	0.0000	0.0000	0.0000	50.9286	140.7256	237.3237	(98a)
Space heating requirement - total per year (kWh/year)												1005.3180	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	225.0261	165.0868	124.6420	50.0517	11.5334	0.0000	0.0000	0.0000	0.0000	50.9286	140.7256	237.3237	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1005.3180	
Space heating per m2											(98c) / (4) =	12.5696	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	225.0261	165.0868	124.6420	50.0517	11.5334	0.0000	0.0000	0.0000	0.0000	50.9286	140.7256	237.3237 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	337.5392	247.6303	186.9630	75.0776	17.3002	0.0000	0.0000	0.0000	0.0000	76.3929	211.0884	355.9856
Space heating requirement												
	337.5392	247.6303	186.9630	75.0776	17.3002	0.0000	0.0000	0.0000	0.0000	76.3929	211.0884	355.9856 (307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement												
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948
Water heating fuel												
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679 (331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year		
Space heating fuel - community heating	1507.9770	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	15.0798	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4815.8004	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1478.6945	0.1569	63.0811	(367)
Electrical energy for heat distribution (space & water)	15.0798	0.0000	8.0533	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			222.8067	(373)
Space and water heating			222.8067	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			134.3251	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6800	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1478.6945	1.5808	635.6630	(467)
Electrical energy for heat distribution (space & water)	15.0798	0.0000	85.2397	(472)
Overall CO2 factor for heat network			0.4253	(486)
Total CO2 associated with community systems			2358.2985	(473)
Space and water heating			2358.2985	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	1.4873	-726.6034	
PV Unit electricity exported	-469.6869	0.4449	-208.9838	
Total			-935.5872	(480)
Total Primary energy kWh/year			1773.3691	(483)
Dwelling Primary energy Rate (DPER)			22.1700	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type			7.6000	1.1450	8.7023			(27)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.1800	5.4450			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
500mm mineral wool	39.9900		39.9900	0.1100	4.3989			(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7164			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.7300	0.0500	0.3365
E3 Sill	5.8800	0.0500	0.2940
E4 Jamb	10.3200	0.0500	0.5160
E6 Intermediate floor within a dwelling	14.1900	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	11.4900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
E7 Party floor between dwellings (in blocks of flats)	14.1900	0.0700	0.9933
P4 Party wall - Roof (insulation at ceiling level)	11.4900	0.1200	1.3788
E10 Eaves (insulation at ceiling level)	8.7100	0.0600	0.5226
E12 Gable (insulation at ceiling level)	5.4100	0.0600	0.3246

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.6278	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	32.3442	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	68.8609	68.6984	68.5391	67.7910	67.6510	66.9994	66.9994	66.8787	67.2504	67.6510	67.9342	68.2302	(39)
Average = Sum(39)m / 12 =												67.7903	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8610	0.8589	0.8570	0.8476	0.8458	0.8377	0.8377	0.8362	0.8408	0.8458	0.8494	0.8531	(40)
HLP (average)												0.8476	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
									Total per year (kWh/year) = Sum(64)m =			2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.1468	142.9840	129.1468	133.4517	129.1468	133.4517	129.1468	129.1468	133.4517	129.1468	133.4517	129.1468	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													

	556.1810	569.8542	545.5784	527.3650	501.3308	481.5479	463.5104	464.5816	478.5488	496.7781	526.3787	545.1830	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.6000	11.2829	0.6300	0.7000	0.7700	26.2064	(75)

Solar gains	26.2064	53.3439	96.1088	157.8383	212.1656	226.1910	211.5970	168.6876	117.1101	65.1905	32.9745	21.4015	(83)
Total gains	582.3874	623.1981	641.6872	685.2033	713.4964	707.7389	675.1074	633.2692	595.6588	561.9686	559.3531	566.5845	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.8622	63.0109	63.1573	63.8543	63.9864	64.6087	64.6087	64.7253	64.3676	63.9864	63.7197	63.4432	
alpha	5.1908	5.2007	5.2105	5.2570	5.2658	5.3072	5.3072	5.3150	5.2912	5.2658	5.2480	5.2295	
util living area	0.9853	0.9773	0.9612	0.9053	0.7832	0.5884	0.4336	0.4804	0.7210	0.9184	0.9729	0.9871	(86)
MIT	20.0010	20.1377	20.3456	20.6522	20.8776	20.9785	20.9964	20.9940	20.9398	20.6738	20.3043	19.9803	(87)
Th 2	20.2008	20.2025	20.2042	20.2123	20.2138	20.2208	20.2208	20.2221	20.2181	20.2138	20.2107	20.2076	(88)
util rest of house	0.9820	0.9721	0.9520	0.8835	0.7390	0.5232	0.3583	0.4017	0.6573	0.8950	0.9657	0.9842	(89)
MIT 2	19.0370	19.2109	19.4728	19.8518	20.1051	20.2067	20.2193	20.2193	20.1736	19.8846	19.4288	19.0159	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.3090	19.4724	19.7191	20.0777	20.3231	20.4245	20.4386	20.4379	20.3898	20.1073	19.6758	19.2880	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3090	19.4724	19.7191	20.0777	20.3231	20.4245	20.4386	20.4379	20.3898	20.1073	19.6758	19.2880	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9771	0.9661	0.9452	0.8793	0.7456	0.5406	0.3795	0.4238	0.6721	0.8913	0.9597	0.9797	(94)
Useful gains	569.0598	602.0847	606.5356	602.4822	531.9559	382.6264	256.2298	268.3737	400.3189	500.8930	536.8375	555.0892	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1033.5332	1001.1018	906.0259	757.7443	583.3607	390.2352	257.1815	270.0514	422.9920	643.1761	854.3289	1029.4589	(97)
Space heating kWh	345.5682	268.1395	222.8208	111.7887	38.2452	0.0000	0.0000	0.0000	0.0000	105.8587	228.5938	352.9310	(98a)
Space heating requirement - total per year (kWh/year)												1673.9459	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	345.5682	268.1395	222.8208	111.7887	38.2452	0.0000	0.0000	0.0000	0.0000	105.8587	228.5938	352.9310	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1673.9459	
Space heating per m2											(98c) / (4) =	20.9296	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	345.5682	268.1395	222.8208	111.7887	38.2452	0.0000	0.0000	0.0000	0.0000	105.8587	228.5938	352.9310	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	374.3967	290.5087	241.4093	121.1146	41.4357	0.0000	0.0000	0.0000	0.0000	114.6898	247.6639	382.3738	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9867	84.6975	84.1448	82.9215	81.2185	79.8000	79.8000	79.8000	79.8000	82.7861	84.3255	85.0560	(217)
Fuel for water heating, kWh/month	268.6484	238.3203	254.9740	228.1523	226.1781	207.8751	205.6450	213.6686	215.8200	231.4247	240.8624	265.6155	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	26.8342	21.5274	19.3830	14.2008	10.9691	8.9619	10.0064	13.0067	16.8944	22.1664	25.0369	27.5800	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3597	-31.5987	-47.6203	-56.2064	-62.9289	-59.5773	-58.8595	-54.4329	-47.0022	-37.3178	-24.0087	-18.2981	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9169	-17.0101	-34.4870	-52.8069	-70.8246	-71.5366	-70.6859	-59.3742	-42.9070	-24.6402	-10.6698	-6.2334	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1813.5926	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2797.1844	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	216.5670	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3925.0410	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1813.5926	0.2100	380.8544	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2797.1844	0.2100	587.4087	(264)
Space and water heating			968.2632	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	216.5670	0.1443	31.2573	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	0.1336	-69.3640	
PV Unit electricity exported	-469.0927	0.1253	-58.7938	
Total			-128.1578	(269)
Total CO2, kg/year			883.2920	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.0400	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1813.5926	1.1300	2049.3596	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2797.1844	1.1300	3160.8184	(278)
Space and water heating			5210.1780	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	216.5670	1.5338	332.1777	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	1.4937	-775.5387	
PV Unit electricity exported	-469.0927	0.4600	-215.8009	
Total			-991.3396	(283)
Total Primary energy kWh/year			4681.1169	(286)
Target Primary Energy Rate (TPER)			58.5300	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.68	**TER**	11.04
Environmental	99 A	**% DER < TER**			84.78
CO_2 Emissions (t/year)	0.11	**DFEE**	19.96	**TFEE**	26.96
Compliance Check	See BREL	**% DFEE < TFEE**			25.94
% DPER < TPER	62.12	**DPER**	22.17	**TPER**	58.53

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			15583.4798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.2856	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	612.2735	609.9558	591.8328	558.1588	524.7912	494.7014	477.0149	480.2399	497.5865	528.2765	565.2104	597.3217	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.6000	11.2829	0.6800	0.7000	0.7700	28.2863	(75)

Solar gains	28.2863	57.5776	103.7365	170.3651	229.0041	244.1426	228.3904	182.0755	126.4045	70.3644	35.5915	23.1000	(83)
Total gains	640.5598	667.5334	695.5693	728.5239	753.7953	738.8440	705.4053	662.3153	623.9910	598.6409	600.8019	620.4217	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)		

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9680	0.9551	0.9198	0.8317	0.6733	0.4876	0.3531	0.3928	0.6126	0.8522	0.9466	0.9731	(86)
MIT	20.4131	20.5058	20.6728	20.8565	20.9650	20.9956	20.9995	20.9990	20.9842	20.8576	20.6062	20.3735	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9617	0.9465	0.9049	0.8040	0.6319	0.4381	0.2998	0.3362	0.5583	0.8215	0.9350	0.9676	(89)
MIT 2	19.6581	19.7730	19.9767	20.1899	20.3035	20.3305	20.3331	20.3329	20.3221	20.1954	19.8990	19.6088	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.8712	19.9798	20.1731	20.3780	20.4901	20.5182	20.5211	20.5208	20.5089	20.3822	20.0986	19.8246	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8712	19.9798	20.1731	20.3780	20.4901	20.5182	20.5211	20.5208	20.5089	20.3822	20.0986	19.8246	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9566	0.9412	0.9009	0.8060	0.6419	0.4519	0.3148	0.3522	0.5728	0.8239	0.9303	0.9627	(94)
Useful gains	612.7493	628.2814	626.6355	587.1958	483.8251	333.8786	222.0705	233.2574	357.4456	493.2466	558.9312	597.2983	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	882.3923	854.5442	774.8327	650.4389	498.1223	335.3732	222.2042	233.5213	363.1822	554.3421	736.6073	885.4205	(97)
Space heating kWh	200.6144	152.0486	110.2587	45.5351	10.6372	0.0000	0.0000	0.0000	0.0000	45.4550	127.9267	214.3629	(98a)
Space heating requirement - total per year (kWh/year)												906.8385	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	200.6144	152.0486	110.2587	45.5351	10.6372	0.0000	0.0000	0.0000	0.0000	45.4550	127.9267	214.3629	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												906.8385	
Space heating per m2											(98c) / (4) =	11.3383	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	200.6144	152.0486	110.2587	45.5351	10.6372	0.0000	0.0000	0.0000	0.0000	45.4550	127.9267	214.3629	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	300.9216	228.0728	165.3880	68.3026	15.9557	0.0000	0.0000	0.0000	0.0000	68.1826	191.8901	321.5443	
Space heating requirement													
	300.9216	228.0728	165.3880	68.3026	15.9557	0.0000	0.0000	0.0000	0.0000	68.1826	191.8901	321.5443	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1360.2578	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												13.6026	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)
Total electricity for the above, kWh/year												21.9935	(331)
Electricity for lighting (calculated in Appendix L)												206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4668.0812	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1360.2578	4.4400	60.3954	(340a)
Space heating total			60.3954	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	206.9234	16.4900	34.1217	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	16.4900	-80.5593	
PV Unit electricity exported	-469.6869	5.5900	-26.2555	
Total			-106.8148	(352)
Total energy cost			262.5775	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7563 (357)
SAP value		87.7397
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1439.3027	0.1569	56.9012	(367)
Electrical energy for heat distribution (space & water)	13.6026	0.0000	7.8215	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			216.3951	(373)
Space and water heating			216.3951	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			127.9134	(383)
CO2 emissions per m2			1.6000	(384)
EI value			98.6285	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 79.9800						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate													
	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15583.4798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.2856	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539	(43)

Daily hot water use

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte 211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
								Total per year (kWh/year) = Sum(64)m =			2691.4183	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)

Heat gains from water heating, kWh/month

114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
327.4608 330.8588 322.2959 304.0665 281.0552 259.4278 244.9794 241.5813 250.1442 268.3736 291.3850 313.0124 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 (71)
Water heating gains (Table 5)
154.0336 151.5930 146.8914 136.5869 130.2751 123.6777 119.6256 122.9734 126.8986 134.2191 144.0972 152.7161 (72)
Total internal gains
612.2735 609.9558 591.8328 558.1588 524.7912 494.7014 477.0149 480.2399 497.5865 528.2765 565.2104 597.3217 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.6000	13.7758	0.6800	0.7000	0.7700	34.5358	(75)

Solar gains	34.5358	62.8529	112.0772	186.0500	240.0856	273.9608	251.7314	205.3053	144.2096	81.2215	42.8881	28.3108	(83)
Total gains	646.8093	672.8088	703.9100	744.2088	764.8768	768.6221	728.7463	685.5452	641.7960	609.4980	608.0985	625.6325	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9638	0.9498	0.9049	0.8049	0.6344	0.4262	0.3031	0.3386	0.5735	0.8210	0.9370	0.9696	(86)
MIT	20.4497	20.5390	20.7187	20.8849	20.9758	20.9981	20.9998	20.9996	20.9893	20.8910	20.6488	20.4093	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9567	0.9402	0.8875	0.7746	0.5913	0.3778	0.2514	0.2837	0.5190	0.7859	0.9234	0.9635	(89)
MIT 2	19.7037	19.8140	20.0313	20.2208	20.3134	20.3322	20.3332	20.3332	20.3260	20.2313	19.9508	19.6537	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.9142	20.0185	20.2253	20.4082	20.5004	20.5201	20.5213	20.5212	20.5132	20.4175	20.1478	19.8670	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9142	20.0185	20.2253	20.4082	20.5004	20.5201	20.5213	20.5212	20.5132	20.4175	20.1478	19.8670	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9515	0.9350	0.8845	0.7782	0.6023	0.3914	0.2660	0.2992	0.5339	0.7907	0.9191	0.9585	(94)
Useful gains	615.4279	629.0626	622.5762	579.1351	460.6949	300.8682	193.8367	205.1163	342.6528	481.9013	558.9054	599.6491	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	867.8323	839.7418	749.4557	629.4819	470.3670	301.4808	193.8813	205.2088	346.4250	528.0046	716.7278	870.8201	(97)
Space heating kWh	187.7889	141.5764	94.3984	36.2496	7.1960	0.0000	0.0000	0.0000	0.0000	34.3008	113.6321	201.7512	(98a)
Space heating requirement - total per year (kWh/year)												816.8935	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	187.7889	141.5764	94.3984	36.2496	7.1960	0.0000	0.0000	0.0000	0.0000	34.3008	113.6321	201.7512	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												816.8935	
Space heating per m2										(98c) / (4) =		10.2137	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement
187.7889 141.5764 94.3984 36.2496 7.1960 0.0000 0.0000 0.0000 0.0000 34.3008 113.6321 201.7512 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50
307a 281.6833 212.3646 141.5975 54.3745 10.7940 0.0000 0.0000 0.0000 0.0000 51.4512 170.4482 302.6268
Space heating requirement
281.6833 212.3646 141.5975 54.3745 10.7940 0.0000 0.0000 0.0000 0.0000 51.4512 170.4482 302.6268 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)

Water heating
Annual water heating requirement
266.9446 236.1786 250.9634 220.5542 213.7828 192.6005 189.9534 197.4446 199.5749 222.6078 236.8171 263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50
310a 400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948
Water heating fuel
400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948 (310)
Cooling System Energy Efficiency Ratio 0.0000 (314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (315)
Pumps and Fa 1.8679 1.6872 1.8679 1.8077 1.8679 1.8077 1.8679 1.8679 1.8077 1.8679 1.8077 1.8679 (331)
Lighting 25.6392 20.5688 18.5199 13.5685 10.4807 8.5628 9.5608 12.4275 16.1421 21.1793 23.9220 26.3518 (332)
Electricity generated by PVs (Appendix M) (negative quantity)
(333a)m -17.9904 -26.9468 -45.2798 -58.5762 -66.5604 -66.2871 -64.3781 -58.6940 -48.0761 -34.8334 -20.6614 -14.9764 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(334a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (334a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.0081	-13.0184	-31.9653	-58.9969	-82.6801	-94.8316	-90.1120	-72.5476	-46.2727	-22.1629	-8.3690	-4.5223	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1225.3402	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	12.2534	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4436.6375	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1225.3402	6.5500	80.2598	(340a)
Space heating total			80.2598	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	206.9234	28.4300	58.8283	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	28.4300	-148.7628	
PV Unit electricity exported	-531.4870	5.8100	-30.8794	
Total			-179.6422	(352)
Total energy cost			334.1305	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1403.3247	0.1574	51.4189	(367)
Electrical energy for heat distribution (space & water)	12.2534	0.0000	7.6159	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			210.7071	(373)
Space and water heating			210.7071	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	0.1322	-69.1719	
PV Unit electricity exported	-531.4870	0.1213	-64.4804	
Total			-133.6523	(380)
Total CO2, kg/year			109.9710	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1403.3247	1.5826	517.1137	(467)
Electrical energy for heat distribution (space & water)	12.2534	0.0000	80.7941	(472)
Overall CO2 factor for heat network			0.4248	(486)
Total CO2 associated with community systems			2235.3036	(473)
Space and water heating			2235.3036	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	1.4884	-778.8342	
PV Unit electricity exported	-531.4870	0.4450	-236.5330	
Total			-1015.3671	(480)
Total Primary energy kWh/year			1570.5943	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Southeast

Current energy efficiency rating:	B 88
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£65	£65	£0
Community scheme	£449	£449	£0
Space heating	£191	£191	£0
Water heating	£264	£264	£0
Lighting	£59	£59	£0
Generated (PV)	-£180	-£180	£0
Total cost of fuels	£334	£334	£0
Total cost of uses	£334	£334	£0
Delivered energy	55 kWh/m²	55 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	20 kWh/m²	20 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15583.4798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		194.8422 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.2856 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4625 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
									Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)

Water heating gains (Table 5)

154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)

Total internal gains

612.2735	609.9558	591.8328	558.1588	524.7912	494.7014	477.0149	480.2399	497.5865	528.2765	565.2104	597.3217	(73)

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6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast				7.6000	11.2829	0.6800	0.7000	0.7700	28.2863	(75)
Solar gains	28.2863	57.5776	103.7365	170.3651	229.0041	244.1426	228.3904	182.0755	126.4045	70.3644	35.5915	23.1000	(83)
Total gains	640.5598	667.5334	695.5693	728.5239	753.7953	738.8440	705.4053	662.3153	623.9910	598.6409	600.8019	620.4217	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9680	0.9551	0.9198	0.8317	0.6733	0.4876	0.3531	0.3928	0.6126	0.8522	0.9466	0.9731	(86)
MIT	20.4131	20.5058	20.6728	20.8565	20.9650	20.9956	20.9995	20.9990	20.9842	20.8576	20.6062	20.3735	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9617	0.9465	0.9049	0.8040	0.6319	0.4381	0.2998	0.3362	0.5583	0.8215	0.9350	0.9676	(89)
MIT 2	19.6581	19.7730	19.9767	20.1899	20.3035	20.3305	20.3331	20.3329	20.3221	20.1954	19.8990	19.6088	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.8712	19.9798	20.1731	20.3780	20.4901	20.5182	20.5211	20.5208	20.5089	20.3822	20.0986	19.8246	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8712	19.9798	20.1731	20.3780	20.4901	20.5182	20.5211	20.5208	20.5089	20.3822	20.0986	19.8246	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9566	0.9412	0.9009	0.8060	0.6419	0.4519	0.3148	0.3522	0.5728	0.8239	0.9303	0.9627	(94)
Useful gains	612.7493	628.2814	626.6355	587.1958	483.8251	333.8786	222.0705	233.2574	357.4456	493.2466	558.9312	597.2983	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	882.3923	854.5442	774.8327	650.4389	498.1223	335.3732	222.2042	233.5213	363.1822	554.3421	736.6073	885.4205	(97)
Space heating kWh	200.6144	152.0486	110.2587	45.5351	10.6372	0.0000	0.0000	0.0000	0.0000	45.4550	127.9267	214.3629	(98a)
Space heating requirement - total per year (kWh/year)												906.8385	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	200.6144	152.0486	110.2587	45.5351	10.6372	0.0000	0.0000	0.0000	0.0000	45.4550	127.9267	214.3629	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												906.8385	
Space heating per m2										(98c) / (4) =		11.3383	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	200.6144	152.0486	110.2587	45.5351	10.6372	0.0000	0.0000	0.0000	0.0000	45.4550	127.9267	214.3629	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	300.9216	228.0728	165.3880	68.3026	15.9557	0.0000	0.0000	0.0000	0.0000	68.1826	191.8901	321.5443	
Space heating requirement	300.9216	228.0728	165.3880	68.3026	15.9557	0.0000	0.0000	0.0000	0.0000	68.1826	191.8901	321.5443	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1360.2578	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												13.6026	(313)
Space cooling fuel												0.0000	(321)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)

mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4668.0812	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1360.2578	4.4400	60.3954	(340a)
Space heating total			60.3954	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	206.9234	16.4900	34.1217	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	16.4900	-80.5593	
PV Unit electricity exported	-469.6869	5.5900	-26.2555	
Total			-106.8148	(352)
Total energy cost			262.5775	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7563	(357)
SAP value		87.7397	
SAP rating (Section 12)		88	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1439.3027	0.1569	56.9012	(367)
Electrical energy for heat distribution (space & water)	13.6026	0.0000	7.8215	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			216.3951	(373)
Space and water heating			216.3951	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			127.9134	(383)
CO2 emissions per m2			1.6000	(384)
EI value			98.6285	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor		39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)

Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15583.4798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		194.8422 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.2856 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4625 (42)

Hot water usage for mixer showers

65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)
Total storage loss	

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

Total per year (kWh/year) = Sum(64)m = 2691.4183 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)

Water heating gains (Table 5)

154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)

Total internal gains

612.2735	609.9558	591.8328	558.1588	524.7912	494.7014	477.0149	480.2399	497.5865	528.2765	565.2104	597.3217	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.6000	13.7758	0.6800	0.7000	0.7700	34.5358	(75)

Solar gains	34.5358	62.8529	112.0772	186.0500	240.0856	273.9608	251.7314	205.3053	144.2096	81.2215	42.8881	28.3108	(83)
Total gains	646.8093	672.8088	703.9100	744.2088	764.8768	768.6621	728.7463	685.5452	641.7960	609.4980	608.0985	625.6325	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area													
	0.9638	0.9498	0.9049	0.8049	0.6344	0.4262	0.3031	0.3386	0.5735	0.8210	0.9370	0.9696	(86)
MIT	20.4497	20.5390	20.7187	20.8849	20.9758	20.9981	20.9998	20.9996	20.9893	20.8910	20.6488	20.4093	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house													
	0.9567	0.9402	0.8875	0.7746	0.5913	0.3778	0.2514	0.2837	0.5190	0.7859	0.9234	0.9635	(89)
MIT 2	19.7037	19.8140	20.0313	20.2208	20.3134	20.3322	20.3332	20.3332	20.3260	20.2313	19.9508	19.6537	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.9142	20.0185	20.2253	20.4082	20.5004	20.5201	20.5213	20.5212	20.5132	20.4175	20.1478	19.8670	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9142	20.0185	20.2253	20.4082	20.5004	20.5201	20.5213	20.5212	20.5132	20.4175	20.1478	19.8670	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9515	0.9350	0.8845	0.7782	0.6023	0.3914	0.2660	0.2992	0.5339	0.7907	0.9191	0.9585	(94)
Useful gains	615.4279	629.0626	622.5762	579.1351	460.6949	300.8682	193.8367	205.1163	342.6528	481.9013	558.9054	599.6491	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	867.8323	839.7418	749.4557	629.4819	470.3670	301.4808	193.8813	205.2088	346.4250	528.0046	716.7278	870.8201	(97)
Space heating kWh													
	187.7889	141.5764	94.3984	36.2496	7.1960	0.0000	0.0000	0.0000	0.0000	34.3008	113.6321	201.7512	(98a)
Space heating requirement - total per year (kWh/year)												816.8935	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	187.7889	141.5764	94.3984	36.2496	7.1960	0.0000	0.0000	0.0000	0.0000	34.3008	113.6321	201.7512	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												816.8935	
Space heating per m2											(98c) / (4) =	10.2137	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement

187.7889	141.5764	94.3984	36.2496	7.1960	0.0000	0.0000	0.0000	0.0000	34.3008	113.6321	201.7512	(98)

Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50

307a 281.6833	212.3646	141.5975	54.3745	10.7940	0.0000	0.0000	0.0000	0.0000	51.4512	170.4482	302.6268	

Space heating requirement

281.6833	212.3646	141.5975	54.3745	10.7940	0.0000	0.0000	0.0000	0.0000	51.4512	170.4482	302.6268	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.9904	-26.9468	-45.2798	-58.5762	-66.5604	-66.2871	-64.3781	-58.6940	-48.0761	-34.8334	-20.6614	-14.9764	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.0081	-13.0184	-31.9653	-58.9969	-82.6801	-94.8316	-90.1120	-72.5476	-46.2727	-22.1629	-8.3690	-4.5223	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1225.3402	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												12.2534	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)
Total electricity for the above, kWh/year												21.9935	(331)
Electricity for lighting (calculated in Appendix L)												206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1054.7470	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4436.6375	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1225.3402	6.5500	80.2598	(340a)
Space heating total			80.2598	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	206.9234	28.4300	58.8283	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	28.4300	-148.7628	
PV Unit electricity exported	-531.4870	5.8100	-30.8794	
Total			-179.6422	(352)
Total energy cost			334.1305	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1403.3247	0.1574	51.4189	(367)
Electrical energy for heat distribution (space & water)	12.2534	0.0000	7.6159	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			210.7071	(373)
Space and water heating			210.7071	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	0.1322	-69.1719	
PV Unit electricity exported	-531.4870	0.1213	-64.4804	
Total			-133.6523	(380)
Total CO2, kg/year			109.9710	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1403.3247	1.5826	517.1137	(467)
Electrical energy for heat distribution (space & water)	12.2534	0.0000	80.7941	(472)
Overall CO2 factor for heat network			0.4248	(486)
Total CO2 associated with community systems			2235.3036	(473)
Space and water heating			2235.3036	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)

Energy saving/generation technologies			
PV Unit electricity used in dwelling	-523.2600	1.4884	-778.8342
PV Unit electricity exported	-531.4870	0.4450	-236.5330
Total			-1015.3671 (480)
Total Primary energy kWh/year			1570.5943 (483)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.50	**TER**	10.35
Environmental	99 A	**% DER < TER**			85.51
CO_2 Emissions (t/year)	0.1	**DFEE**	16.82	**TFEE**	23.60
Compliance Check	See BREL	**% DFEE < TFEE**			28.74
% DPER < TPER	62.80	**DPER**	20.39	**TPER**	54.81

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				4	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			15583.4798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 194.8422 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 3.2856 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)

Average = Sum(39)m / 12 = 56.6683

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)

Energy content (annual) Total = Sum(45)m = 2040.5785

Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)

Total per year (kWh/year) = Sum(64)m = 2691.4183 (64)
12Total per year (kWh/year) 2691 (64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.6117	146.8201	132.6117	137.0321	132.6117	137.0321	132.6117	132.6117	137.0321	132.6117	137.0321	132.6117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	565.9813	580.0257	555.3786	537.2808	511.1311	494.4637	476.3107	477.3819	491.4645	506.5784	536.2944	554.9833	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.6000	36.7938	0.6800	0.7000	0.7700	92.2420	(77)

Solar gains	92.2420	157.1223	214.9816	266.3726	298.3595	296.2019	285.5703	261.7066	232.7796	173.6536	110.4847	78.9399	(83)
Total gains	658.2233	737.1480	770.3602	803.6534	809.4905	790.6656	761.8809	739.0884	724.2441	680.2320	646.7791	633.9232	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9639	0.9328	0.8851	0.7827	0.6336	0.4565	0.3270	0.3523	0.5340	0.7907	0.9285	0.9703	(86)
MIT	20.4390	20.5958	20.7485	20.8981	20.9746	20.9969	20.9997	20.9995	20.9923	20.9074	20.6634	20.3940	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9570	0.9211	0.8664	0.7525	0.5929	0.4098	0.2776	0.3014	0.4846	0.7556	0.9141	0.9644	(89)
MIT 2	19.6901	19.8818	20.0645	20.2337	20.3119	20.3313	20.3332	20.3331	20.3280	20.2466	19.9670	19.6342	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.9014	20.0833	20.2575	20.4212	20.4989	20.5192	20.5212	20.5211	20.5155	20.4331	20.1635	19.8486	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9014	20.0833	20.2575	20.4212	20.4989	20.5192	20.5212	20.5211	20.5155	20.4331	20.1635	19.8486	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9517	0.9161	0.8641	0.7566	0.6032	0.4229	0.2915	0.3158	0.4982	0.7611	0.9100	0.9594	(94)
Useful gains	626.4327	675.3350	665.6546	608.0791	488.2870	334.3867	222.1238	233.3938	360.8157	517.7382	588.5462	608.1554	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	884.1072	860.4113	779.6142	652.8862	498.6199	335.4291	222.2103	233.5368	363.5543	557.2227	740.2875	886.7815	(97)
Space heating kWh	191.7098	124.3713	84.7860	32.2611	7.6876	0.0000	0.0000	0.0000	0.0000	29.3764	109.2537	207.2979	(98a)
Space heating requirement - total per year (kWh/year)												786.7438	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	191.7098	124.3713	84.7860	32.2611	7.6876	0.0000	0.0000	0.0000	0.0000	29.3764	109.2537	207.2979	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												786.7438	
Space heating per m2										(98c) / (4) =		9.8368	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	191.7098	124.3713	84.7860	32.2611	7.6876	0.0000	0.0000	0.0000	0.0000	29.3764	109.2537	207.2979	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	287.5647	186.5569	127.1789	48.3917	11.5315	0.0000	0.0000	0.0000	0.0000	44.0647	163.8806	310.9468	
Space heating requirement													
	287.5647	186.5569	127.1789	48.3917	11.5315	0.0000	0.0000	0.0000	0.0000	44.0647	163.8806	310.9468	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1180.1157	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	11.8012	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4487.9391	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1391.2648	0.1577	49.6122	(367)
Electrical energy for heat distribution (space & water)	11.8012	0.0000	7.5482	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			208.8327	(373)
Space and water heating			208.8327	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			120.3511	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.5000	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1391.2648	1.5836	498.3533	(467)
Electrical energy for heat distribution (space & water)	11.8012	0.0000	80.0906	(472)
Overall CO2 factor for heat network			0.4247	(486)
Total CO2 associated with community systems			2215.8397	(473)
Space and water heating			2215.8397	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	1.4873	-726.6034	
PV Unit electricity exported	-469.6869	0.4449	-208.9838	
Total			-935.5872	(480)
Total Primary energy kWh/year			1630.9103	(483)
Dwelling Primary energy Rate (DPER)			20.3900	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type			7.6000	1.1450	8.7023			(27)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.1800	5.4450			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
500mm mineral wool	39.9900		39.9900	0.1100	4.3989			(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7164			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.7300	0.0500	0.3365
E3 Sill	5.8800	0.0500	0.2940
E4 Jamb	10.3200	0.0500	0.5160
E6 Intermediate floor within a dwelling	14.1900	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	11.4900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
E7 Party floor between dwellings (in blocks of flats)	14.1900	0.0700	0.9933
P4 Party wall - Roof (insulation at ceiling level)	11.4900	0.1200	1.3788
E10 Eaves (insulation at ceiling level)	8.7100	0.0600	0.5226
E12 Gable (insulation at ceiling level)	5.4100	0.0600	0.3246

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.6278	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	32.3442	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	68.8609	68.6984	68.5391	67.7910	67.6510	66.9994	66.9994	66.8787	67.2504	67.6510	67.9342	68.2302	(39)
Average = Sum(39)m / 12 =												67.7903	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8610	0.8589	0.8570	0.8476	0.8458	0.8377	0.8377	0.8362	0.8408	0.8458	0.8494	0.8531	(40)
HLP (average)												0.8476	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
									Total per year (kWh/year) = Sum(64)m =			2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.1468	142.9840	129.1468	133.4517	129.1468	133.4517	129.1468	129.1468	133.4517	129.1468	133.4517	129.1468	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													

	556.1810	569.8542	545.5784	527.3650	501.3308	481.5479	463.5104	464.5816	478.5488	496.7781	526.3787	545.1830	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.6000	36.7938	0.6300	0.7000	0.7700	85.4595	(77)

Solar gains	85.4595	145.5692	199.1741	246.7864	276.4213	274.4224	264.5724	242.4635	215.6634	160.8850	102.3608	73.1355	(83)
Total gains	641.6405	715.4234	744.7525	774.1514	777.7521	755.9703	728.0828	707.0450	694.2122	657.6630	628.7395	618.3185	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.8622	63.0109	63.1573	63.8543	63.9864	64.6087	64.6087	64.7253	64.3676	63.9864	63.7197	63.4432	
alpha	5.1908	5.2007	5.2105	5.2570	5.2658	5.3072	5.3072	5.3150	5.2912	5.2658	5.2480	5.2295	
util living area	0.9780	0.9607	0.9331	0.8635	0.7401	0.5548	0.4029	0.4321	0.6399	0.8673	0.9571	0.9813	(86)
MIT	20.0941	20.2736	20.4812	20.7359	20.9068	20.9836	20.9975	20.9963	20.9654	20.7683	20.4044	20.0628	(87)
Th 2	20.2008	20.2025	20.2042	20.2123	20.2138	20.2208	20.2208	20.2221	20.2181	20.2138	20.2107	20.2076	(88)
util rest of house	0.9732	0.9525	0.9190	0.8362	0.6939	0.4919	0.3325	0.3605	0.5769	0.8357	0.9467	0.9772	(89)
MIT 2	19.1539	19.3792	19.6367	19.9454	20.1328	20.2102	20.2197	20.2204	20.1936	19.9887	19.5515	19.1197	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.4192	19.6316	19.8750	20.1685	20.3512	20.4284	20.4392	20.4394	20.4114	20.2087	19.7922	19.3859	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4192	19.6316	19.8750	20.1685	20.3512	20.4284	20.4392	20.4394	20.4114	20.2087	19.7922	19.3859	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9673	0.9454	0.9123	0.8345	0.7024	0.5089	0.3524	0.3807	0.5930	0.8355	0.9400	0.9718	(94)
Useful gains	620.6324	676.3481	679.4536	646.0502	546.2963	384.7439	256.5577	269.1432	411.6566	549.4528	591.0392	600.8572	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1041.1214	1012.0369	916.7120	763.9030	585.2653	390.5009	257.2236	270.1494	424.4467	650.0390	862.2332	1036.1345	(97)
Space heating kWh	312.8438	225.5829	176.5202	84.8540	28.9929	0.0000	0.0000	0.0000	0.0000	74.8362	195.2597	323.8463	(98a)
Space heating requirement - total per year (kWh/year)												1422.7360	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	312.8438	225.5829	176.5202	84.8540	28.9929	0.0000	0.0000	0.0000	0.0000	74.8362	195.2597	323.8463	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1422.7360	
Space heating per m2											(98c) / (4) =	17.7886	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	312.8438	225.5829	176.5202	84.8540	28.9929	0.0000	0.0000	0.0000	0.0000	74.8362	195.2597	323.8463	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	338.9423	244.4018	191.2462	91.9328	31.4116	0.0000	0.0000	0.0000	0.0000	81.0793	211.5489	350.8628	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.7666	84.3097	83.6257	82.3855	80.9179	79.8000	79.8000	79.8000	79.8000	82.1384	83.9715	84.8667	(217)
Fuel for water heating, kWh/month	269.3460	239.4166	256.5566	229.6368	227.0181	207.8751	205.6450	213.6686	215.8200	233.2496	241.8780	266.2079	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	26.8342	21.5274	19.3830	14.2008	10.9691	8.9619	10.0064	13.0067	16.8944	22.1664	25.0369	27.5800	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3597	-31.5987	-47.6203	-56.2064	-62.9289	-59.5773	-58.8595	-54.4329	-47.0022	-37.3178	-24.0087	-18.2981	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9169	-17.0101	-34.4870	-52.8069	-70.8246	-71.5366	-70.6859	-59.3742	-42.9070	-24.6402	-10.6698	-6.2334	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1541.4258	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2806.3184	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	216.5670	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3662.0081	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1541.4258	0.2100	323.6994	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2806.3184	0.2100	589.3269	(264)
Space and water heating			913.0263	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	216.5670	0.1443	31.2573	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	0.1336	-69.3640	
PV Unit electricity exported	-469.0927	0.1253	-58.7938	
Total			-128.1578	(269)
Total CO2, kg/year			828.0551	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.3500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1541.4258	1.1300	1741.8111	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2806.3184	1.1300	3171.1397	(278)
Space and water heating			4912.9508	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	216.5670	1.5338	332.1777	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	1.4937	-775.5387	
PV Unit electricity exported	-469.0927	0.4600	-215.8009	
Total			-991.3396	(283)
Total Primary energy kWh/year			4383.8897	(286)
Target Primary Energy Rate (TPER)			54.8100	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.50	**TER**	10.35
Environmental	99 A	**% DER < TER**			85.51
CO_2 Emissions (t/year)	0.1	**DFEE**	16.82	**TFEE**	23.60
Compliance Check	See BREL	**% DFEE < TFEE**			28.74
% DPER < TPER	62.80	**DPER**	20.39	**TPER**	54.81

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2122	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2705	0.2652	0.2599	0.2334	0.2281	0.2016	0.2016	0.1963	0.2122	0.2281	0.2387	0.2493	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5366	0.5352	0.5338	0.5272	0.5260	0.5203	0.5203	0.5193	0.5225	0.5260	0.5285	0.5311	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15583.4798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.2856	(36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.6979	34.6061	34.5160	34.0930	34.0139	33.6455	33.6455	33.5772	33.7874	34.0139	34.1740	34.3414	(38)
Heat transfer coeff													
	59.0343	58.9424	58.8524	58.4294	58.3502	57.9818	57.9818	57.9136	58.1237	58.3502	58.5103	58.6777	(39)
Average = Sum(39)m / 12 =												58.4290	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7381	0.7370	0.7358	0.7305	0.7296	0.7250	0.7250	0.7241	0.7267	0.7296	0.7316	0.7337	(40)
HLP (average)												0.7305	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)													
	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						596.7355	(64a)
Heat gains from water heating, kWh/month													
	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	132.6117	146.8201	132.6117	137.0321	132.6117	137.0321	132.6117	132.6117	137.0321	132.6117	137.0321	132.6117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains													
	460.3995	475.6643	453.8350	442.5318	420.3791	407.9331	392.6658	391.8132	403.5720	413.9765	437.2071	450.3260	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.6000	36.7938	0.6800	0.7000	0.7700	92.2420	(77)

Solar gains	92.2420	157.1223	214.9816	266.3726	298.3595	296.2019	285.5703	261.7066	232.7796	173.6536	110.4847	78.9399	(83)
Total gains	552.6415	632.7866	668.8166	708.9044	718.7386	704.1350	678.2360	653.5197	636.3515	587.6301	547.6918	529.2659	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.3259	73.4402	73.5526	74.0851	74.1855	74.6569	74.6569	74.7449	74.4746	74.1855	73.9825	73.7715	
alpha	5.8884	5.8960	5.9035	5.9390	5.9457	5.9771	5.9771	5.9830	5.9650	5.9457	5.9322	5.9181	
util living area													
	0.9852	0.9675	0.9370	0.8547	0.7145	0.5215	0.3755	0.4065	0.6148	0.8694	0.9666	0.9882	(86)
MIT	20.2117	20.3984	20.5949	20.8192	20.9478	20.9931	20.9992	20.9987	20.9824	20.8283	20.4922	20.1727	(87)

Th 2	20.3073	20.3083	20.3093	20.3139	20.3148	20.3188	20.3188	20.3196	20.3173	20.3148	20.3130	20.3112	(88)
util rest of house	0.9819	0.9607	0.9242	0.8285	0.6720	0.4681	0.3177	0.3469	0.5593	0.8402	0.9585	0.9855	(89)
MIT 2	19.5888	19.7720	19.9616	20.1715	20.2796	20.3153	20.3186	20.3191	20.3075	20.1839	19.8692	19.5537	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.7646	19.9487	20.1404	20.3543	20.4682	20.5066	20.5106	20.5109	20.4980	20.3658	20.0450	19.7283	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7646	19.9487	20.1404	20.3543	20.4682	20.5066	20.5106	20.5109	20.4980	20.3658	20.0450	19.7283	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9788	0.9566	0.9207	0.8301	0.6818	0.4830	0.3340	0.3637	0.5743	0.8425	0.9548	0.9828	(94)
Useful gains	540.9223	605.3536	615.7956	588.4921	490.0513	340.0922	226.5292	237.7161	365.4488	495.0998	522.9110	520.1447	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	912.9429	887.0095	802.7671	669.2680	511.6249	342.4752	226.7454	238.0763	371.8738	569.8341	757.4162	911.1680	(97)
Space heating kWh	276.7833	189.2728	139.1069	58.1586	16.0508	0.0000	0.0000	0.0000	0.0000	55.6023	168.8437	290.9213	(98a)
Space heating requirement - total per year (kWh/year)												1194.7397	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	276.7833	189.2728	139.1069	58.1586	16.0508	0.0000	0.0000	0.0000	0.0000	55.6023	168.8437	290.9213	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1194.7397	
Space heating per m2											(98c) / (4) =	14.9380	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	545.0293	429.0656	440.1434	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9560	0.9822	0.9763	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	521.0533	421.4376	429.7336	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	755.8749	728.7679	702.6605	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	169.0716	228.6537	203.0576	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction											fC = cooled area / (4) =	1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	42.2679	57.1634	50.7644	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												150.1957	(107)
Energy for space heating												14.9380	(99)
Energy for space cooling												1.8779	(108)
Total												16.8159	(109)
Fabric Energy Efficiency (DFEE)												16.8	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type			7.6000	1.1450	8.7023			(27)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.1800	5.4450			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
500mm mineral wool	39.9900		39.9900	0.1100	4.3989			(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7164			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 194.8422 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.7300	0.0500	0.3365
E3 Sill	5.8800	0.0500	0.2940
E4 Jamb	10.3200	0.0500	0.5160
E6 Intermediate floor within a dwelling	14.1900	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	11.4900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
E7 Party floor between dwellings (in blocks of flats)	14.1900	0.0700	0.9933
P4 Party wall - Roof (insulation at ceiling level)	11.4900	0.1200	1.3788
E10 Eaves (insulation at ceiling level)	8.7100	0.0600	0.5226
E12 Gable (insulation at ceiling level)	5.4100	0.0600	0.3246

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.6278 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.3442 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	68.8609	68.6984	68.5391	67.7910	67.6510	66.9994	66.9994	66.8787	67.2504	67.6510	67.9342	68.2302	(39)
Average = Sum(39)m / 12 =												67.7903	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8610	0.8589	0.8570	0.8476	0.8458	0.8377	0.8377	0.8362	0.8408	0.8458	0.8494	0.8531	(40)
HLP (average)												0.8476	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

129.1468	142.9840	129.1468	133.4517	129.1468	133.4517	129.1468	129.1468	133.4517	129.1468	133.4517	129.1468 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124 (69)

Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993 (71)

Water heating gains (Table 5)

48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587 (72)

Total internal gains

456.9346	471.8282	450.3701	438.9514	416.9142	404.3527	389.2009	388.3482	399.9916	410.5116	433.6267	446.8611 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.6000	36.7938	0.6300	0.7000	0.7700	85.4595	(77)

Solar gains	85.4595	145.5692	199.1741	246.7864	276.4213	274.4224	264.5724	242.4635	215.6634	160.8850	102.3608	73.1355 (83)
Total gains	542.3941	617.3973	649.5442	685.7378	693.3355	678.7750	653.7733	630.8117	615.6550	571.3965	535.9875	519.9966 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.8622	63.0109	63.1573	63.8543	63.9864	64.6087	64.6087	64.7253	64.3676	63.9864	63.7197	63.4432	
alpha	5.1908	5.2007	5.2105	5.2570	5.2658	5.3072	5.3072	5.3150	5.2912	5.2658	5.2480	5.2295	
util living area	0.9892	0.9781	0.9593	0.9051	0.7970	0.6102	0.4473	0.4821	0.7037	0.9138	0.9772	0.9912	(86)
MIT	19.9363	20.1288	20.3566	20.6528	20.8667	20.9745	20.9959	20.9939	20.9463	20.6843	20.2688	19.9040	(87)
Th 2	20.2008	20.2025	20.2042	20.2123	20.2138	20.2208	20.2208	20.2221	20.2181	20.2138	20.2107	20.2076	(88)
util rest of house	0.9867	0.9731	0.9498	0.8832	0.7537	0.5437	0.3698	0.4032	0.6398	0.8895	0.9711	0.9891	(89)
MIT 2	19.2301	19.4210	19.6447	19.9318	20.1208	20.2076	20.2194	20.2199	20.1875	19.9664	19.5671	19.2036	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.4294	19.6208	19.8456	20.1353	20.3313	20.4241	20.4385	20.4383	20.4016	20.1690	19.7651	19.4013	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4294	19.6208	19.8456	20.1353	20.3313	20.4241	20.4385	20.4383	20.4016	20.1690	19.7651	19.4013	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9835	0.9686	0.9447	0.8808	0.7606	0.5615	0.3917	0.4254	0.6555	0.8879	0.9668	0.9863	(94)
Useful gains	533.4567	598.0176	613.6213	604.0117	527.3231	381.1458	256.0713	268.3679	403.5470	507.3456	518.2029	512.8909	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1041.8237	1011.2929	914.6971	761.6506	583.9148	390.2079	257.1776	270.0767	423.7858	647.3521	860.3929	1037.1867	(97)
Space heating kWh	378.2250	277.7210	224.0004	113.5000	42.1042	0.0000	0.0000	0.0000	0.0000	104.1648	246.3768	390.0760	(98a)
Space heating requirement - total per year (kWh/year)												1776.1683	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	378.2250	277.7210	224.0004	113.5000	42.1042	0.0000	0.0000	0.0000	0.0000	104.1648	246.3768	390.0760	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1776.1683	
Space heating per m2											(98c) / (4) =	22.2077	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	629.7941	495.7954	508.2782	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8966	0.9483	0.9360	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	564.6620	470.1678	475.7387	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	730.1152	703.8974	679.7428	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	119.1263	173.8948	151.7790	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	29.7816	43.4737	37.9448	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												111.2000	(107)
Energy for space heating												22.2077	(99)
Energy for space cooling												1.3903	(108)
Total												23.5980	(109)
Fabric Energy Efficiency (TFEE)												23.6	(109)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.50	**TER**	10.35
Environmental	99 A	**% DER < TER**			85.51
CO_2 Emissions (t/year)	0.1	**DFEE**	16.82	**TFEE**	23.60
Compliance Check	See BREL	**% DFEE < TFEE**			28.74
% DPER < TPER	62.80	**DPER**	20.39	**TPER**	54.81

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				4	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			15583.4798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 194.8422 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 3.2856 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)

Average = Sum(39)m / 12 = 56.6683

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)

Energy content (annual) Total = Sum(45)m = 2040.5785

Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)

Total per year (kWh/year) = Sum(64)m = 2691.4183 (64)
12Total per year (kWh/year) 2691 (64)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.6117	146.8201	132.6117	137.0321	132.6117	137.0321	132.6117	132.6117	137.0321	132.6117	137.0321	132.6117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	565.9813	580.0257	555.3786	537.2808	511.1311	494.4637	476.3107	477.3819	491.4645	506.5784	536.2944	554.9833	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.6000	36.7938	0.6800	0.7000	0.7700	92.2420	(77)

Solar gains	92.2420	157.1223	214.9816	266.3726	298.3595	296.2019	285.5703	261.7066	232.7796	173.6536	110.4847	78.9399	(83)
Total gains	658.2233	737.1480	770.3602	803.6534	809.4905	790.6656	761.8809	739.0884	724.2441	680.2320	646.7791	633.9232	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9639	0.9328	0.8851	0.7827	0.6336	0.4565	0.3270	0.3523	0.5340	0.7907	0.9285	0.9703	(86)
MIT	20.4390	20.5958	20.7485	20.8981	20.9746	20.9969	20.9997	20.9995	20.9923	20.9074	20.6634	20.3940	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9570	0.9211	0.8664	0.7525	0.5929	0.4098	0.2776	0.3014	0.4846	0.7556	0.9141	0.9644	(89)
MIT 2	19.6901	19.8818	20.0645	20.2337	20.3119	20.3313	20.3332	20.3331	20.3280	20.2466	19.9670	19.6342	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.9014	20.0833	20.2575	20.4212	20.4989	20.5192	20.5212	20.5211	20.5155	20.4331	20.1635	19.8486	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9014	20.0833	20.2575	20.4212	20.4989	20.5192	20.5212	20.5211	20.5155	20.4331	20.1635	19.8486	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9517	0.9161	0.8641	0.7566	0.6032	0.4229	0.2915	0.3158	0.4982	0.7611	0.9100	0.9594	(94)
Useful gains	626.4327	675.3350	665.6546	608.0791	488.2870	334.3867	222.1238	233.3938	360.8157	517.7382	588.5462	608.1554	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	884.1072	860.4113	779.6142	652.8862	498.6199	335.4291	222.2103	233.5368	363.5543	557.2227	740.2875	886.7815	(97)
Space heating kWh	191.7098	124.3713	84.7860	32.2611	7.6876	0.0000	0.0000	0.0000	0.0000	29.3764	109.2537	207.2979	(98a)
Space heating requirement - total per year (kWh/year)												786.7438	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	191.7098	124.3713	84.7860	32.2611	7.6876	0.0000	0.0000	0.0000	0.0000	29.3764	109.2537	207.2979	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												786.7438	
Space heating per m2										(98c) / (4) =		9.8368	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	191.7098	124.3713	84.7860	32.2611	7.6876	0.0000	0.0000	0.0000	0.0000	29.3764	109.2537	207.2979	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	287.5647	186.5569	127.1789	48.3917	11.5315	0.0000	0.0000	0.0000	0.0000	44.0647	163.8806	310.9468	
Space heating requirement													
	287.5647	186.5569	127.1789	48.3917	11.5315	0.0000	0.0000	0.0000	0.0000	44.0647	163.8806	310.9468	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	1180.1157	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	11.8012	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4487.9391	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1391.2648	0.1577	49.6122	(367)
Electrical energy for heat distribution (space & water)	11.8012	0.0000	7.5482	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			208.8327	(373)
Space and water heating			208.8327	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			120.3511	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.5000	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1391.2648	1.5836	498.3533	(467)
Electrical energy for heat distribution (space & water)	11.8012	0.0000	80.0906	(472)
Overall CO2 factor for heat network			0.4247	(486)
Total CO2 associated with community systems			2215.8397	(473)
Space and water heating			2215.8397	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	1.4873	-726.6034	
PV Unit electricity exported	-469.6869	0.4449	-208.9838	
Total			-935.5872	(480)
Total Primary energy kWh/year			1630.9103	(483)
Dwelling Primary energy Rate (DPER)			20.3900	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type			7.6000	1.1450	8.7023			(27)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.1800	5.4450			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
500mm mineral wool	39.9900		39.9900	0.1100	4.3989			(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7164			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.7300	0.0500	0.3365
E3 Sill	5.8800	0.0500	0.2940
E4 Jamb	10.3200	0.0500	0.5160
E6 Intermediate floor within a dwelling	14.1900	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	11.4900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
E7 Party floor between dwellings (in blocks of flats)	14.1900	0.0700	0.9933
P4 Party wall - Roof (insulation at ceiling level)	11.4900	0.1200	1.3788
E10 Eaves (insulation at ceiling level)	8.7100	0.0600	0.5226
E12 Gable (insulation at ceiling level)	5.4100	0.0600	0.3246

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.6278	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	32.3442	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	68.8609	68.6984	68.5391	67.7910	67.6510	66.9994	66.9994	66.8787	67.2504	67.6510	67.9342	68.2302	(39)
Average = Sum(39)m / 12 =												67.7903	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8610	0.8589	0.8570	0.8476	0.8458	0.8377	0.8377	0.8362	0.8408	0.8458	0.8494	0.8531	(40)
HLP (average)												0.8476	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
									Total per year (kWh/year) = Sum(64)m =			2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.1468	142.9840	129.1468	133.4517	129.1468	133.4517	129.1468	129.1468	133.4517	129.1468	133.4517	129.1468	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													

	556.1810	569.8542	545.5784	527.3650	501.3308	481.5479	463.5104	464.5816	478.5488	496.7781	526.3787	545.1830	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.6000	36.7938	0.6300	0.7000	0.7700	85.4595	(77)

Solar gains	85.4595	145.5692	199.1741	246.7864	276.4213	274.4224	264.5724	242.4635	215.6634	160.8850	102.3608	73.1355	(83)
Total gains	641.6405	715.4234	744.7525	774.1514	777.7521	755.9703	728.0828	707.0450	694.2122	657.6630	628.7395	618.3185	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.8622	63.0109	63.1573	63.8543	63.9864	64.6087	64.6087	64.7253	64.3676	63.9864	63.7197	63.4432	
alpha	5.1908	5.2007	5.2105	5.2570	5.2658	5.3072	5.3072	5.3150	5.2912	5.2658	5.2480	5.2295	
util living area	0.9780	0.9607	0.9331	0.8635	0.7401	0.5548	0.4029	0.4321	0.6399	0.8673	0.9571	0.9813	(86)
MIT	20.0941	20.2736	20.4812	20.7359	20.9068	20.9836	20.9975	20.9963	20.9654	20.7683	20.4044	20.0628	(87)
Th 2	20.2008	20.2025	20.2042	20.2123	20.2138	20.2208	20.2208	20.2221	20.2181	20.2138	20.2107	20.2076	(88)
util rest of house	0.9732	0.9525	0.9190	0.8362	0.6939	0.4919	0.3325	0.3605	0.5769	0.8357	0.9467	0.9772	(89)
MIT 2	19.1539	19.3792	19.6367	19.9454	20.1328	20.2102	20.2197	20.2204	20.1936	19.9887	19.5515	19.1197	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.4192	19.6316	19.8750	20.1685	20.3512	20.4284	20.4392	20.4394	20.4114	20.2087	19.7922	19.3859	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4192	19.6316	19.8750	20.1685	20.3512	20.4284	20.4392	20.4394	20.4114	20.2087	19.7922	19.3859	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9673	0.9454	0.9123	0.8345	0.7024	0.5089	0.3524	0.3807	0.5930	0.8355	0.9400	0.9718	(94)
Useful gains	620.6324	676.3481	679.4536	646.0502	546.2963	384.7439	256.5577	269.1432	411.6566	549.4528	591.0392	600.8572	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1041.1214	1012.0369	916.7120	763.9030	585.2653	390.5009	257.2236	270.1494	424.4467	650.0390	862.2332	1036.1345	(97)
Space heating kWh	312.8438	225.5829	176.5202	84.8540	28.9929	0.0000	0.0000	0.0000	0.0000	74.8362	195.2597	323.8463	(98a)
Space heating requirement - total per year (kWh/year)												1422.7360	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	312.8438	225.5829	176.5202	84.8540	28.9929	0.0000	0.0000	0.0000	0.0000	74.8362	195.2597	323.8463	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1422.7360	
Space heating per m2											(98c) / (4) =	17.7886	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	312.8438	225.5829	176.5202	84.8540	28.9929	0.0000	0.0000	0.0000	0.0000	74.8362	195.2597	323.8463	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	338.9423	244.4018	191.2462	91.9328	31.4116	0.0000	0.0000	0.0000	0.0000	81.0793	211.5489	350.8628	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.7666	84.3097	83.6257	82.3855	80.9179	79.8000	79.8000	79.8000	79.8000	82.1384	83.9715	84.8667	(217)
Fuel for water heating, kWh/month	269.3460	239.4166	256.5566	229.6368	227.0181	207.8751	205.6450	213.6686	215.8200	233.2496	241.8780	266.2079	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	26.8342	21.5274	19.3830	14.2008	10.9691	8.9619	10.0064	13.0067	16.8944	22.1664	25.0369	27.5800	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3597	-31.5987	-47.6203	-56.2064	-62.9289	-59.5773	-58.8595	-54.4329	-47.0022	-37.3178	-24.0087	-18.2981	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9169	-17.0101	-34.4870	-52.8069	-70.8246	-71.5366	-70.6859	-59.3742	-42.9070	-24.6402	-10.6698	-6.2334	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1541.4258	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2806.3184	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	216.5670	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3662.0081	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1541.4258	0.2100	323.6994	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2806.3184	0.2100	589.3269	(264)
Space and water heating			913.0263	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	216.5670	0.1443	31.2573	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	0.1336	-69.3640	
PV Unit electricity exported	-469.0927	0.1253	-58.7938	
Total			-128.1578	(269)
Total CO2, kg/year			828.0551	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.3500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1541.4258	1.1300	1741.8111	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2806.3184	1.1300	3171.1397	(278)
Space and water heating			4912.9508	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	216.5670	1.5338	332.1777	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	1.4937	-775.5387	
PV Unit electricity exported	-469.0927	0.4600	-215.8009	
Total			-991.3396	(283)
Total Primary energy kWh/year			4383.8897	(286)
Target Primary Energy Rate (TPER)			54.8100	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Southwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.50	**TER**	10.35
Environmental	99 A	**% DER < TER**			85.51
CO_2 Emissions (t/year)	0.1	**DFEE**	16.82	**TFEE**	23.60
Compliance Check	See BREL	**% DFEE < TFEE**			28.74
% DPER < TPER	62.80	**DPER**	20.39	**TPER**	54.81

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				4	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			15583.4798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.2856	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	612.2735	609.9558	591.8328	558.1588	524.7912	494.7014	477.0149	480.2399	497.5865	528.2765	565.2104	597.3217	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.6000	36.7938	0.6800	0.7000	0.7700	92.2420	(77)

Solar gains	92.2420	157.1223	214.9816	266.3726	298.3595	296.2019	285.5703	261.7066	232.7796	173.6536	110.4847	78.9399	(83)
Total gains	704.5156	767.0781	806.8144	824.5313	823.1507	790.9033	762.5851	741.9464	730.3660	701.9301	675.6951	676.2616	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area													
	0.9517	0.9218	0.8667	0.7692	0.6243	0.4564	0.3267	0.3509	0.5298	0.7743	0.9158	0.9605	(86)
MIT	20.5038	20.6308	20.7798	20.9074	20.9765	20.9969	20.9997	20.9995	20.9927	20.9175	20.6962	20.4559	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house													
	0.9429	0.9087	0.8463	0.7385	0.5840	0.4097	0.2773	0.3003	0.4806	0.7385	0.8996	0.9530	(89)
MIT 2	19.7695	19.9236	20.1000	20.2433	20.3136	20.3313	20.3332	20.3331	20.3282	20.2567	20.0055	19.7107	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.9767	20.1231	20.2919	20.4307	20.5006	20.5192	20.5212	20.5211	20.5157	20.4432	20.2004	19.9210	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9767	20.1231	20.2919	20.4307	20.5006	20.5192	20.5212	20.5211	20.5157	20.4432	20.2004	19.9210	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9376	0.9041	0.8450	0.7431	0.5943	0.4228	0.2913	0.3146	0.4942	0.7446	0.8961	0.9477	(94)
Useful gains	660.5204	693.5533	681.7475	612.7340	489.1621	334.3885	222.1243	233.3973	360.9454	522.6797	605.4576	640.8650	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	888.3738	862.6692	781.5619	653.4249	498.7170	335.4293	222.2103	233.5372	363.5686	557.7945	742.3761	890.8805	(97)
Space heating kWh													
	169.5229	113.6459	74.2619	29.2974	7.1088	0.0000	0.0000	0.0000	0.0000	26.1254	98.5813	186.0115	(98a)
Space heating requirement - total per year (kWh/year)												704.5552	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	169.5229	113.6459	74.2619	29.2974	7.1088	0.0000	0.0000	0.0000	0.0000	26.1254	98.5813	186.0115	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												704.5552	
Space heating per m2											(98c) / (4) =	8.8091	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	169.5229	113.6459	74.2619	29.2974	7.1088	0.0000	0.0000	0.0000	0.0000	26.1254	98.5813	186.0115 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	254.2844	170.4688	111.3928	43.9461	10.6633	0.0000	0.0000	0.0000	0.0000	39.1881	147.8720	279.0173
Space heating requirement												
	254.2844	170.4688	111.3928	43.9461	10.6633	0.0000	0.0000	0.0000	0.0000	39.1881	147.8720	279.0173 (307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement

	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948
Water heating fuel												
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948 (310)

Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679 (331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												

Space heating fuel - community heating	1056.8329	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	10.5683	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4364.6563	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1056.8329	4.4400	46.9234	(340a)
Space heating total			46.9234	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	206.9234	16.4900	34.1217	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	16.4900	-80.5593	
PV Unit electricity exported	-469.6869	5.5900	-26.2555	
Total			-106.8148	(352)
Total energy cost			249.1055	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7175 (357)
SAP value		88.3687
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1358.3894	0.1576	44.4257	(367)
Electrical energy for heat distribution (space & water)	10.5683	0.0000	7.3537	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			203.4517	(373)
Space and water heating			203.4517	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			114.9701	(383)
CO2 emissions per m2			1.4400	(384)
EI value			98.7673	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 79.9800						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate													
	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15583.4798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.2856	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539	(43)

Daily hot water use

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte 211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
								Total per year (kWh/year) = Sum(64)m =			2691.4183	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)

Heat gains from water heating, kWh/month

114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
327.4608 330.8588 322.2959 304.0665 281.0552 259.4278 244.9794 241.5813 250.1442 268.3736 291.3850 313.0124 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 (71)
Water heating gains (Table 5)
154.0336 151.5930 146.8914 136.5869 130.2751 123.6777 119.6256 122.9734 126.8986 134.2191 144.0972 152.7161 (72)
Total internal gains
612.2735 609.9558 591.8328 558.1588 524.7912 494.7014 477.0149 480.2399 497.5865 528.2765 565.2104 597.3217 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.6000	42.9509	0.6800	0.7000	0.7700	107.6778	(77)

Solar gains 107.6778 162.9933 220.2461 277.7620 301.6848 322.2950 304.4795 282.9087 252.2630 190.1443 127.0279 92.7078 (83)
Total gains 719.9514 772.9491 812.0789 835.9207 826.4760 816.9964 781.4944 763.1486 749.8494 718.4209 692.2383 690.0295 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9431	0.9138	0.8488	0.7436	0.5920	0.4014	0.2827	0.3043	0.4951	0.7350	0.8981	0.9535	(86)
MIT	20.5497	20.6600	20.8128	20.9255	20.9831	20.9986	20.9999	20.9998	20.9951	20.9407	20.7422	20.5016	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9330	0.8995	0.8262	0.7111	0.5505	0.3556	0.2344	0.2549	0.4465	0.6962	0.8793	0.9448	(89)
MIT 2	19.8258	19.9587	20.1380	20.2622	20.3197	20.3325	20.3333	20.3332	20.3301	20.2801	20.0596	19.7671	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	20.0301	20.1566	20.3284	20.4494	20.5069	20.5205	20.5214	20.5213	20.5177	20.4666	20.2523	19.9744	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0301	20.1566	20.3284	20.4494	20.5069	20.5205	20.5214	20.5213	20.5177	20.4666	20.2523	19.9744	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9277	0.8954	0.8261	0.7170	0.5615	0.3685	0.2481	0.2688	0.4601	0.7043	0.8768	0.9395	(94)
Useful gains	667.9261	692.0607	670.8204	599.3285	464.0477	301.0638	193.8534	205.1641	344.9792	505.9609	606.9423	648.2508	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	874.3964	847.5644	755.3000	631.8181	470.7382	301.5024	193.8833	205.2143	346.6814	530.7869	722.6496	876.9069	(97)
Space heating kWh	153.6139	104.4985	62.8528	23.3925	4.9777	0.0000	0.0000	0.0000	0.0000	18.4705	83.3093	170.1201	(98a)
Space heating requirement - total per year (kWh/year)												621.2353	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	153.6139	104.4985	62.8528	23.3925	4.9777	0.0000	0.0000	0.0000	0.0000	18.4705	83.3093	170.1201	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												621.2353	
Space heating per m2										(98c) / (4) =		7.7674	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement
153.6139 104.4985 62.8528 23.3925 4.9777 0.0000 0.0000 0.0000 0.0000 18.4705 83.3093 170.1201 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50
307a 230.4208 156.7477 94.2792 35.0888 7.4666 0.0000 0.0000 0.0000 0.0000 27.7058 124.9639 255.1801
Space heating requirement
230.4208 156.7477 94.2792 35.0888 7.4666 0.0000 0.0000 0.0000 0.0000 27.7058 124.9639 255.1801 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)

Water heating
Annual water heating requirement
266.9446 236.1786 250.9634 220.5542 213.7828 192.6005 189.9534 197.4446 199.5749 222.6078 236.8171 263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50
310a 400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948
Water heating fuel
400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948 (310)
Cooling System Energy Efficiency Ratio 0.0000 (314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (315)
Pumps and Fa 1.8679 1.6872 1.8679 1.8077 1.8679 1.8077 1.8679 1.8679 1.8077 1.8679 1.8077 1.8679 (331)
Lighting 25.6392 20.5688 18.5199 13.5685 10.4807 8.5628 9.5608 12.4275 16.1421 21.1793 23.9220 26.3518 (332)
Electricity generated by PVs (Appendix M) (negative quantity)
(333a)m -17.9904 -26.9468 -45.2798 -58.5762 -66.5604 -66.2871 -64.3781 -58.6940 -48.0761 -34.8334 -20.6614 -14.9764 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(334a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (334a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.0081	-13.0184	-31.9653	-58.9969	-82.6801	-94.8316	-90.1120	-72.5476	-46.2727	-22.1629	-8.3690	-4.5223	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year	
Space heating fuel - community heating	931.8529 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4037.1274 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	9.3185 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)	
mechanical ventilation fans (SFP = 0.0920)	21.9935 (330a)
Total electricity for the above, kWh/year	21.9935 (331)
Electricity for lighting (calculated in Appendix L)	206.9234 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4143.1502 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	931.8529	6.5500	61.0364	(340a)
Space heating total			61.0364	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	206.9234	28.4300	58.8283	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	28.4300	-148.7628	
PV Unit electricity exported	-531.4870	5.8100	-30.8794	
Total			-179.6422	(352)
Total energy cost			314.9071	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1325.0614	0.1581	39.2795	(367)
Electrical energy for heat distribution (space & water)	9.3185	0.0000	7.1607	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			198.1125	(373)
Space and water heating			198.1125	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	0.1322	-69.1719	
PV Unit electricity exported	-531.4870	0.1213	-64.4804	
Total			-133.6523	(380)
Total CO2, kg/year			97.3764	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1325.0614	1.5851	393.8997	(467)
Electrical energy for heat distribution (space & water)	9.3185	0.0000	76.1736	(472)
Overall CO2 factor for heat network			0.4241	(486)
Total CO2 associated with community systems			2107.4691	(473)
Space and water heating			2107.4691	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	1.4884	-778.8342	
PV Unit electricity exported	-531.4870	0.4450	-236.5330	
Total			-1015.3671	(480)
Total Primary energy kWh/year			1442.7598	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Southwest

Current energy efficiency rating:	B 88
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£65	£65	£0
Community scheme	£429	£429	£0
Space heating	£171	£171	£0
Water heating	£264	£264	£0
Lighting	£59	£59	£0
Generated (PV)	-£180	-£180	£0
Total cost of fuels	£314	£314	£0
Total cost of uses	£314	£314	£0
Delivered energy	52 kWh/m²	52 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	18 kWh/m²	18 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15583.4798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		194.8422 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.2856 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4625 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
									Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)

Water heating gains (Table 5)

154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)

Total internal gains

612.2735	609.9558	591.8328	558.1588	524.7912	494.7014	477.0149	480.2399	497.5865	528.2765	565.2104	597.3217	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.6000	36.7938	0.6800	0.7000	0.7700	92.2420	(77)

Solar gains	92.2420	157.1223	214.9816	266.3726	298.3595	296.2019	285.5703	261.7066	232.7796	173.6536	110.4847	78.9399	(83)
Total gains	704.5156	767.0781	806.8144	824.5313	823.1507	790.9033	762.5851	741.9464	730.3660	701.9301	675.6951	676.2616	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9517	0.9218	0.8667	0.7692	0.6243	0.4564	0.3267	0.3509	0.5298	0.7743	0.9158	0.9605	(86)
MIT	20.5038	20.6308	20.7798	20.9074	20.9765	20.9969	20.9997	20.9995	20.9927	20.9175	20.6962	20.4559	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9429	0.9087	0.8463	0.7385	0.5840	0.4097	0.2773	0.3003	0.4806	0.7385	0.8996	0.9530	(89)
MIT 2	19.7695	19.9236	20.1000	20.2433	20.3136	20.3313	20.3332	20.3331	20.3282	20.2567	20.0055	19.7107	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.9767	20.1231	20.2919	20.4307	20.5006	20.5192	20.5212	20.5211	20.5157	20.4432	20.2004	19.9210	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9767	20.1231	20.2919	20.4307	20.5006	20.5192	20.5212	20.5211	20.5157	20.4432	20.2004	19.9210	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9376	0.9041	0.8450	0.7431	0.5943	0.4228	0.2913	0.3146	0.4942	0.7446	0.8961	0.9477	(94)
Useful gains	660.5204	693.5533	681.7475	612.7340	489.1621	334.3885	222.1243	233.3973	360.9454	522.6797	605.4576	640.8650	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	888.3738	862.6692	781.5619	653.4249	498.7170	335.4293	222.2103	233.5372	363.5686	557.7945	742.3761	890.8805	(97)
Space heating kWh	169.5229	113.6459	74.2619	29.2974	7.1088	0.0000	0.0000	0.0000	0.0000	26.1254	98.5813	186.0115	(98a)
Space heating requirement - total per year (kWh/year)												704.5552	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	169.5229	113.6459	74.2619	29.2974	7.1088	0.0000	0.0000	0.0000	0.0000	26.1254	98.5813	186.0115	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												704.5552	
Space heating per m2											(98c) / (4) =	8.8091	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	169.5229	113.6459	74.2619	29.2974	7.1088	0.0000	0.0000	0.0000	0.0000	26.1254	98.5813	186.0115	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	254.2844	170.4688	111.3928	43.9461	10.6633	0.0000	0.0000	0.0000	0.0000	39.1881	147.8720	279.0173	
Space heating requirement	254.2844	170.4688	111.3928	43.9461	10.6633	0.0000	0.0000	0.0000	0.0000	39.1881	147.8720	279.0173	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1056.8329	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												10.5683	(313)
Space cooling fuel												0.0000	(321)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)

mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4364.6563	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1056.8329	4.4400	46.9234	(340a)
Space heating total			46.9234	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	206.9234	16.4900	34.1217	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	16.4900	-80.5593	
PV Unit electricity exported	-469.6869	5.5900	-26.2555	
Total			-106.8148	(352)
Total energy cost			249.1055	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7175	(357)
SAP value		88.3687	
SAP rating (Section 12)		88	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1358.3894	0.1576	44.4257	(367)
Electrical energy for heat distribution (space & water)	10.5683	0.0000	7.3537	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			203.4517	(373)
Space and water heating			203.4517	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			114.9701	(383)
CO2 emissions per m2			1.4400	(384)
EI value			98.7673	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor		39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800						(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =				195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)

Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15583.4798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		194.8422 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.2856 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4625 (42)

Hot water usage for mixer showers

65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)
Total storage loss	

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

Total per year (kWh/year) = Sum(64)m = 2691.4183 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)

Pumps, fans

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)

Water heating gains (Table 5)

154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)

Total internal gains

612.2735	609.9558	591.8328	558.1588	524.7912	494.7014	477.0149	480.2399	497.5865	528.2765	565.2104	597.3217	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.6000	42.9509	0.6800	0.7000	0.7700	107.6778	(77)

Solar gains	107.6778	162.9933	220.2461	277.7620	301.6848	322.2950	304.4795	282.9087	252.2630	190.1443	127.0279	92.7078	(83)
Total gains	719.9514	772.9491	812.0789	835.9207	826.4760	816.9964	781.4944	763.1486	749.8494	718.4209	692.2383	690.0295	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area													
	0.9431	0.9138	0.8488	0.7436	0.5920	0.4014	0.2827	0.3043	0.4951	0.7350	0.8981	0.9535	(86)
MIT	20.5497	20.6600	20.8128	20.9255	20.9831	20.9986	20.9999	20.9998	20.9951	20.9407	20.7422	20.5016	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house													
	0.9330	0.8995	0.8262	0.7111	0.5505	0.3556	0.2344	0.2549	0.4465	0.6962	0.8793	0.9448	(89)
MIT 2	19.8258	19.9587	20.1380	20.2622	20.3197	20.3325	20.3333	20.3332	20.3301	20.2801	20.0596	19.7671	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	20.0301	20.1566	20.3284	20.4494	20.5069	20.5205	20.5214	20.5213	20.5177	20.4666	20.2523	19.9744	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0301	20.1566	20.3284	20.4494	20.5069	20.5205	20.5214	20.5213	20.5177	20.4666	20.2523	19.9744	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9277	0.8954	0.8261	0.7170	0.5615	0.3685	0.2481	0.2688	0.4601	0.7043	0.8768	0.9395	(94)
Useful gains	667.9261	692.0607	670.8204	599.3285	464.0477	301.0638	193.8534	205.1641	344.9792	505.9609	606.9423	648.2508	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	874.3964	847.5644	755.3000	631.8181	470.7382	301.5024	193.8833	205.2143	346.6814	530.7869	722.6496	876.9069	(97)
Space heating kWh													
	153.6139	104.4985	62.8528	23.3925	4.9777	0.0000	0.0000	0.0000	0.0000	18.4705	83.3093	170.1201	(98a)

Space heating requirement - total per year (kWh/year) 621.2353

Solar heating kWh

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000

Space heating kWh

153.6139	104.4985	62.8528	23.3925	4.9777	0.0000	0.0000	0.0000	0.0000	18.4705	83.3093	170.1201	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 621.2353

Space heating per m2 (98c) / (4) = 7.7674 (99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump-Space and Water	1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.5000 (306)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

Space heating:

Space heating requirement

153.6139	104.4985	62.8528	23.3925	4.9777	0.0000	0.0000	0.0000	0.0000	18.4705	83.3093	170.1201	(98)

Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50

307a	230.4208	156.7477	94.2792	35.0888	7.4666	0.0000	0.0000	0.0000	0.0000	27.7058	124.9639	255.1801	
Space heating requirement													
	230.4208	156.7477	94.2792	35.0888	7.4666	0.0000	0.0000	0.0000	0.0000	27.7058	124.9639	255.1801	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)

Space heating fuel for secondary/supplementary system

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.9904	-26.9468	-45.2798	-58.5762	-66.5604	-66.2871	-64.3781	-58.6940	-48.0761	-34.8334	-20.6614	-14.9764	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.0081	-13.0184	-31.9653	-58.9969	-82.6801	-94.8316	-90.1120	-72.5476	-46.2727	-22.1629	-8.3690	-4.5223	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												931.8529	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												9.3185	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)
Total electricity for the above, kWh/year												21.9935	(331)
Electricity for lighting (calculated in Appendix L)												206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1054.7470	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4143.1502	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	931.8529	6.5500	61.0364	(340a)
Space heating total			61.0364	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	206.9234	28.4300	58.8283	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	28.4300	-148.7628	
PV Unit electricity exported	-531.4870	5.8100	-30.8794	
Total			-179.6422	(352)
Total energy cost			314.9071	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1325.0614	0.1581	39.2795	(367)
Electrical energy for heat distribution (space & water)	9.3185	0.0000	7.1607	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			198.1125	(373)
Space and water heating			198.1125	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	0.1322	-69.1719	
PV Unit electricity exported	-531.4870	0.1213	-64.4804	
Total			-133.6523	(380)
Total CO2, kg/year			97.3764	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1325.0614	1.5851	393.8997	(467)
Electrical energy for heat distribution (space & water)	9.3185	0.0000	76.1736	(472)
Overall CO2 factor for heat network			0.4241	(486)
Total CO2 associated with community systems			2107.4691	(473)
Space and water heating			2107.4691	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)

Energy saving/generation technologies				
PV Unit electricity used in dwelling		-523.2600	1.4884	-778.8342
PV Unit electricity exported		-531.4870	0.4450	-236.5330
Total				-1015.3671 (480)
Total Primary energy kWh/year				1442.7598 (483)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.46	**TER**	10.16
Environmental	99 A	**% DER < TER**			85.63
CO_2 Emissions (t/year)	0.09	**DFEE**	15.74	**TFEE**	22.51
Compliance Check	See BREL	**% DFEE < TFEE**			30.10
% DPER < TPER	63.01	**DPER**	19.89	**TPER**	53.78

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			15583.4798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.2856	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers													
	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths													
	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses													
	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m													
	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
											Total per year (kWh/year) = Sum(64)m =	2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	132.6117	146.8201	132.6117	137.0321	132.6117	137.0321	132.6117	132.6117	137.0321	132.6117	137.0321	132.6117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains													
	565.9813	580.0257	555.3786	537.2808	511.1311	494.4637	476.3107	477.3819	491.4645	506.5784	536.2944	554.9833	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.6000	46.7521	0.6800	0.7000	0.7700	117.2073	(78)

Solar gains	117.2073	191.9553	244.5170	276.3573	287.9814	277.1429	270.7855	262.9702	255.4269	207.0418	138.9306	101.2779	(83)
Total gains	683.1885	771.9810	799.8957	813.6381	799.1125	771.6066	747.0962	740.3521	746.8914	713.6202	675.2250	656.2612	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9576	0.9199	0.8703	0.7763	0.6407	0.4675	0.3335	0.3517	0.5186	0.7655	0.9160	0.9653	(86)
MIT	20.4745	20.6363	20.7742	20.9027	20.9730	20.9965	20.9996	20.9995	20.9934	20.9225	20.6957	20.4271	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9497	0.9066	0.8502	0.7458	0.5999	0.4198	0.2831	0.3009	0.4703	0.7294	0.8999	0.9586	(89)
MIT 2	19.7337	19.9301	20.0936	20.2384	20.3106	20.3311	20.3331	20.3331	20.3288	20.2616	20.0049	19.6752	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.9428	20.1294	20.2857	20.4259	20.4975	20.5189	20.5212	20.5211	20.5164	20.4481	20.1998	19.8874	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9428	20.1294	20.2857	20.4259	20.4975	20.5189	20.5212	20.5211	20.5164	20.4481	20.1998	19.8874	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9443	0.9021	0.8487	0.7502	0.6101	0.4332	0.2973	0.3152	0.4837	0.7358	0.8963	0.9534	(94)
Useful gains	645.1422	696.4213	678.8340	610.3612	487.5701	334.2235	222.1123	233.3954	361.2658	525.1112	605.1932	625.6718	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	886.4503	863.0237	781.2105	653.1506	498.5402	335.4111	222.2089	233.5369	363.6038	558.0746	742.3435	888.9771	(97)
Space heating kWh	179.5332	111.9568	76.1681	30.8084	8.1617	0.0000	0.0000	0.0000	0.0000	24.5248	98.7482	195.8991	(98a)
Space heating requirement - total per year (kWh/year)												725.8004	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	179.5332	111.9568	76.1681	30.8084	8.1617	0.0000	0.0000	0.0000	0.0000	24.5248	98.7482	195.8991	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												725.8004	
Space heating per m2											(98c) / (4) =	9.0748	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	179.5332	111.9568	76.1681	30.8084	8.1617	0.0000	0.0000	0.0000	0.0000	24.5248	98.7482	195.8991	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	269.2998	167.9352	114.2521	46.2126	12.2426	0.0000	0.0000	0.0000	0.0000	36.7871	148.1223	293.8487	
Space heating requirement													
	269.2998	167.9352	114.2521	46.2126	12.2426	0.0000	0.0000	0.0000	0.0000	36.7871	148.1223	293.8487	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1088.7006	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												10.8870	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)
Total electricity for the above, kWh/year												21.9935	(331)
Electricity for lighting (calculated in Appendix L)												206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4396.5240	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1366.8875	0.1577	45.7966	(367)
Electrical energy for heat distribution (space & water)	10.8870	0.0000	7.4051	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			204.8740	(373)
Space and water heating			204.8740	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			116.3924	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.4600	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1366.8875	1.5839	459.8486	(467)
Electrical energy for heat distribution (space & water)	10.8870	0.0000	78.6467	(472)
Overall CO2 factor for heat network			0.4245	(486)
Total CO2 associated with community systems			2175.8911	(473)
Space and water heating			2175.8911	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	1.4873	-726.6034	
PV Unit electricity exported	-469.6869	0.4449	-208.9838	
Total			-935.5872	(480)
Total Primary energy kWh/year			1590.9617	(483)
Dwelling Primary energy Rate (DPER)			19.8900	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type			7.6000	1.1450	8.7023			(27)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.1800	5.4450			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
500mm mineral wool	39.9900		39.9900	0.1100	4.3989			(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7164			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.7300	0.0500	0.3365
E3 Sill	5.8800	0.0500	0.2940
E4 Jamb	10.3200	0.0500	0.5160
E6 Intermediate floor within a dwelling	14.1900	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	11.4900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
E7 Party floor between dwellings (in blocks of flats)	14.1900	0.0700	0.9933
P4 Party wall - Roof (insulation at ceiling level)	11.4900	0.1200	1.3788
E10 Eaves (insulation at ceiling level)	8.7100	0.0600	0.5226
E12 Gable (insulation at ceiling level)	5.4100	0.0600	0.3246

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.6278	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	32.3442	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	68.8609	68.6984	68.5391	67.7910	67.6510	66.9994	66.9994	66.8787	67.2504	67.6510	67.9342	68.2302	(39)
Average = Sum(39)m / 12 =												67.7903	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8610	0.8589	0.8570	0.8476	0.8458	0.8377	0.8377	0.8362	0.8408	0.8458	0.8494	0.8531	(40)
HLP (average)												0.8476	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
									Total per year (kWh/year) = Sum(64)m =			2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.1468	142.9840	129.1468	133.4517	129.1468	133.4517	129.1468	129.1468	133.4517	129.1468	133.4517	129.1468	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													

	556.1810	569.8542	545.5784	527.3650	501.3308	481.5479	463.5104	464.5816	478.5488	496.7781	526.3787	545.1830 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.6000	46.7521	0.6300	0.7000	0.7700	108.5891	(78)

Solar gains	108.5891	177.8410	226.5378	256.0369	266.8063	256.7648	250.8748	243.6342	236.6455	191.8182	128.7151	93.8310 (83)
Total gains	664.7701	747.6951	772.1162	783.4020	768.1371	738.3127	714.3852	708.2158	715.1943	688.5962	655.0938	639.0140 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.8622	63.0109	63.1573	63.8543	63.9864	64.6087	64.6087	64.7253	64.3676	63.9864	63.7197	63.4432	
alpha	5.1908	5.2007	5.2105	5.2570	5.2658	5.3072	5.3072	5.3150	5.2912	5.2658	5.2480	5.2295	
util living area	0.9746	0.9536	0.9243	0.8589	0.7465	0.5667	0.4104	0.4315	0.6241	0.8493	0.9500	0.9786	(86)
MIT	20.1294	20.3182	20.5138	20.7435	20.9030	20.9819	20.9972	20.9964	20.9692	20.7934	20.4402	20.0950	(87)
Th 2	20.2008	20.2025	20.2042	20.2123	20.2138	20.2208	20.2208	20.2221	20.2181	20.2138	20.2107	20.2076	(88)
util rest of house	0.9691	0.9442	0.9089	0.8311	0.7005	0.5029	0.3389	0.3599	0.5618	0.8155	0.9382	0.9739	(89)
MIT 2	19.1980	19.4338	19.6753	19.9538	20.1292	20.2090	20.2196	20.2204	20.1965	20.0154	19.5948	19.1602	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.4608	19.6834	19.9120	20.1767	20.3476	20.4271	20.4391	20.4394	20.4145	20.2349	19.8333	19.4240	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4608	19.6834	19.9120	20.1767	20.3476	20.4271	20.4391	20.4394	20.4145	20.2349	19.8333	19.4240	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9628	0.9369	0.9025	0.8297	0.7087	0.5202	0.3590	0.3800	0.5779	0.8165	0.9315	0.9681	(94)
Useful gains	640.0670	700.5162	696.8262	650.0020	544.4016	384.0451	256.4855	269.1521	413.2873	562.2154	610.2297	618.6463	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1043.9865	1015.5947	919.2435	764.4551	585.0155	390.4133	257.2144	270.1505	424.6536	651.8114	865.0280	1038.7346	(97)
Space heating kWh	300.5161	211.7328	165.4785	82.4062	30.2167	0.0000	0.0000	0.0000	0.0000	66.6594	183.4548	312.5457	(98a)
Space heating requirement - total per year (kWh/year)												1353.0102	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	300.5161	211.7328	165.4785	82.4062	30.2167	0.0000	0.0000	0.0000	0.0000	66.6594	183.4548	312.5457	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1353.0102	
Space heating per m2											(98c) / (4) =	16.9169	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	300.5161	211.7328	165.4785	82.4062	30.2167	0.0000	0.0000	0.0000	0.0000	66.6594	183.4548	312.5457	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	325.5863	229.3963	179.2833	89.2809	32.7375	0.0000	0.0000	0.0000	0.0000	72.2204	198.7592	338.6194	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.6769	84.1671	83.4844	82.3319	80.9590	79.8000	79.8000	79.8000	79.8000	81.9437	83.8323	84.7879	(217)
Fuel for water heating, kWh/month	269.6312	239.8220	256.9909	229.7863	226.9028	207.8751	205.6450	213.6686	215.8200	233.8037	242.2796	266.4554	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	26.8342	21.5274	19.3830	14.2008	10.9691	8.9619	10.0064	13.0067	16.8944	22.1664	25.0369	27.5800	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3597	-31.5987	-47.6203	-56.2064	-62.9289	-59.5773	-58.8595	-54.4329	-47.0022	-37.3178	-24.0087	-18.2981	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9169	-17.0101	-34.4870	-52.8069	-70.8246	-71.5366	-70.6859	-59.3742	-42.9070	-24.6402	-10.6698	-6.2334	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1465.8832	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2808.6807	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	216.5670	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3588.8279	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1465.8832	0.2100	307.8355	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2808.6807	0.2100	589.8229	(264)
Space and water heating			897.6584	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	216.5670	0.1443	31.2573	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	0.1336	-69.3640	
PV Unit electricity exported	-469.0927	0.1253	-58.7938	
Total			-128.1578	(269)
Total CO2, kg/year			812.6872	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.1600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1465.8832	1.1300	1656.4480	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2808.6807	1.1300	3173.8092	(278)
Space and water heating			4830.2572	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	216.5670	1.5338	332.1777	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	1.4937	-775.5387	
PV Unit electricity exported	-469.0927	0.4600	-215.8009	
Total			-991.3396	(283)
Total Primary energy kWh/year			4301.1961	(286)
Target Primary Energy Rate (TPER)			53.7800	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.46	**TER**	10.16
Environmental	99 A	**% DER < TER**			85.63
CO_2 Emissions (t/year)	0.09	**DFEE**	15.74	**TFEE**	22.51
Compliance Check	See BREL	**% DFEE < TFEE**			30.10
% DPER < TPER	63.01	**DPER**	19.89	**TPER**	53.78

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3031	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2122	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2705	0.2652	0.2599	0.2334	0.2281	0.2016	0.2016	0.1963	0.2122	0.2281	0.2387	0.2493	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5366	0.5352	0.5338	0.5272	0.5260	0.5203	0.5203	0.5193	0.5225	0.5260	0.5285	0.5311	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15583.4798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.2856	(36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.6979	34.6061	34.5160	34.0930	34.0139	33.6455	33.6455	33.5772	33.7874	34.0139	34.1740	34.3414	(38)
Heat transfer coeff	59.0343	58.9424	58.8524	58.4294	58.3502	57.9818	57.9818	57.9136	58.1237	58.3502	58.5103	58.6777	(39)
Average = Sum(39)m / 12 =												58.4290	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7381	0.7370	0.7358	0.7305	0.7296	0.7250	0.7250	0.7241	0.7267	0.7296	0.7316	0.7337	(40)
HLP (average)												0.7305	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.6117	146.8201	132.6117	137.0321	132.6117	137.0321	132.6117	132.6117	137.0321	132.6117	137.0321	132.6117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587	(72)
Total internal gains	460.3995	475.6643	453.8350	442.5318	420.3791	407.9331	392.6658	391.8132	403.5720	413.9765	437.2071	450.3260	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.6000	46.7521	0.6800	0.7000	0.7700	117.2073	(78)

Solar gains	117.2073	191.9553	244.5170	276.3573	287.9814	277.1429	270.7855	262.9702	255.4269	207.0418	138.9306	101.2779	(83)
Total gains	577.6068	667.6196	698.3520	718.8891	708.3605	685.0760	663.4513	654.7834	658.9989	621.0183	576.1377	551.6039	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.3259	73.4402	73.5526	74.0851	74.1855	74.6569	74.6569	74.7449	74.4746	74.1855	73.9825	73.7715	
alpha	5.8884	5.8960	5.9035	5.9390	5.9457	5.9771	5.9771	5.9830	5.9650	5.9457	5.9322	5.9181	
util living area	0.9818	0.9591	0.9258	0.8487	0.7225	0.5352	0.3838	0.4057	0.5959	0.8460	0.9585	0.9856	(86)
MIT	20.2521	20.4487	20.6304	20.8266	20.9447	20.9921	20.9991	20.9987	20.9850	20.8542	20.5330	20.2096	(87)

Th 2	20.3073	20.3083	20.3093	20.3139	20.3148	20.3188	20.3188	20.3196	20.3173	20.3148	20.3130	20.3112	(88)
util rest of house	0.9778	0.9510	0.9114	0.8219	0.6801	0.4807	0.3247	0.3463	0.5414	0.8142	0.9488	0.9824	(89)
MIT 2	19.6284	19.8201	19.9944	20.1778	20.2774	20.3148	20.3185	20.3191	20.3090	20.2053	19.9080	19.5899	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.8044	19.9975	20.1739	20.3609	20.4657	20.5059	20.5106	20.5109	20.4998	20.3884	20.0844	19.7648	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8044	19.9975	20.1739	20.3609	20.4657	20.5059	20.5106	20.5109	20.4998	20.3884	20.0844	19.7648	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9744	0.9468	0.9083	0.8238	0.6897	0.4959	0.3414	0.3631	0.5562	0.8179	0.9451	0.9793	(94)
Useful gains	562.8174	632.0868	634.3214	592.2488	488.5887	339.7012	226.4983	237.7203	366.5321	507.9132	544.5057	540.2057	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	915.2924	889.8817	804.7425	669.6550	511.4800	342.4369	226.7422	238.0767	371.9799	571.1543	759.7212	913.3066	(97)
Space heating kWh	262.2413	173.2382	126.7934	55.7325	17.0312	0.0000	0.0000	0.0000	0.0000	47.0514	154.9551	277.5871	(98a)
Space heating requirement - total per year (kWh/year)												1114.6301	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	262.2413	173.2382	126.7934	55.7325	17.0312	0.0000	0.0000	0.0000	0.0000	47.0514	154.9551	277.5871	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1114.6301	
Space heating per m2											(98c) / (4) =	13.9364	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	545.0293	429.0656	440.1434	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9502	0.9801	0.9766	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	517.8935	420.5276	429.8334	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	733.5982	711.4870	704.1375	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	155.3074	216.4738	204.0823	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	38.8268	54.1184	51.0206	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												143.9659	(107)
Energy for space heating												13.9364	(99)
Energy for space cooling												1.8000	(108)
Total												15.7364	(109)
Fabric Energy Efficiency (DFEE)												15.7	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		3 * 10 =	30.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1531 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.4031 (18)
Number of sides sheltered			4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type			7.6000	1.1450	8.7023			(27)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.1800	5.4450			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
500mm mineral wool	39.9900		39.9900	0.1100	4.3989			(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7164			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 194.8422 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.7300	0.0500	0.3365
E3 Sill	5.8800	0.0500	0.2940
E4 Jamb	10.3200	0.0500	0.5160
E6 Intermediate floor within a dwelling	14.1900	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	11.4900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
E7 Party floor between dwellings (in blocks of flats)	14.1900	0.0700	0.9933
P4 Party wall - Roof (insulation at ceiling level)	11.4900	0.1200	1.3788
E10 Eaves (insulation at ceiling level)	8.7100	0.0600	0.5226
E12 Gable (insulation at ceiling level)	5.4100	0.0600	0.3246

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.6278 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.3442 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	68.8609	68.6984	68.5391	67.7910	67.6510	66.9994	66.9994	66.8787	67.2504	67.6510	67.9342	68.2302	(39)
Average = Sum(39)m / 12 =												67.7903	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8610	0.8589	0.8570	0.8476	0.8458	0.8377	0.8377	0.8362	0.8408	0.8458	0.8494	0.8531	(40)
HLP (average)												0.8476	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4625 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day) 62.4583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1418	66.2726	64.2319	61.6918	59.4258	57.0709	56.5816	58.6182	60.7070	63.1254	65.6879	68.0462	(44)
Energy conte	107.9200	94.3713	98.7220	84.4530	79.9985	70.1753	68.4305	72.5816	74.8578	85.6605	93.5844	106.5439	(45)
Energy content (annual)										Total = Sum(45)m =		1037.2989	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	91.7320	80.2156	83.9137	71.7850	67.9988	59.6490	58.1659	61.6943	63.6291	72.8114	79.5468	90.5623	(64)
										Total per year (kWh/year) = Sum(64)m =		881.7040	(64)
12Total per year (kWh/year)												882	(64)
Electric shower(s)	52.4605	46.7428	51.0413	48.7081	49.6221	47.3347	48.9125	49.6221	48.7081	51.0413	50.0815	52.4605	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		596.7355	(64a)
Heat gains from water heating, kWh/month	36.0481	31.7396	33.7387	30.1233	29.4052	26.7459	26.7696	27.8291	28.0843	30.9632	32.4071	35.7557	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	129.1468	142.9840	129.1468	133.4517	129.1468	133.4517	129.1468	129.1468	133.4517	129.1468	133.4517	129.1468 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993 (71)

Water heating gains (Table 5)

	48.4518	47.2315	45.3478	41.8379	39.5231	37.1471	35.9807	37.4047	39.0060	41.6172	45.0098	48.0587 (72)

Total internal gains

	456.9346	471.8282	450.3701	438.9514	416.9142	404.3527	389.2009	388.3482	399.9916	410.5116	433.6267	446.8611 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.6000	46.7521	0.6300	0.7000	0.7700	108.5891	(78)

Solar gains	108.5891	177.8410	226.5378	256.0369	266.8063	256.7648	250.8748	243.6342	236.6455	191.8182	128.7151	93.8310 (83)
Total gains	565.5237	649.6691	676.9079	694.9883	683.7205	661.1174	640.0757	631.9825	636.6371	602.3297	562.3418	540.6921 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.8622	63.0109	63.1573	63.8543	63.9864	64.6087	64.6087	64.7253	64.3676	63.9864	63.7197	63.4432	
alpha	5.1908	5.2007	5.2105	5.2570	5.2658	5.3072	5.3072	5.3150	5.2912	5.2658	5.2480	5.2295	
util living area	0.9871	0.9731	0.9525	0.9010	0.8035	0.6241	0.4565	0.4813	0.6859	0.8980	0.9723	0.9895	(86)
MIT	19.9739	20.1779	20.3942	20.6624	20.8612	20.9718	20.9954	20.9939	20.9524	20.7169	20.3088	19.9381	(87)
Th 2	20.2008	20.2025	20.2042	20.2123	20.2138	20.2208	20.2208	20.2221	20.2181	20.2138	20.2107	20.2076	(88)
util rest of house	0.9841	0.9671	0.9417	0.8785	0.7607	0.5569	0.3776	0.4025	0.6220	0.8708	0.9650	0.9871	(89)
MIT 2	19.2671	19.4687	19.6804	19.9403	20.1166	20.2061	20.2192	20.2199	20.1912	19.9947	19.6057	19.2373	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	19.4666	19.6689	19.8818	20.1441	20.3267	20.4222	20.4383	20.4383	20.4060	20.1985	19.8041	19.4351	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4666	19.6689	19.8818	20.1441	20.3267	20.4222	20.4383	20.4383	20.4060	20.1985	19.8041	19.4351	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9806	0.9622	0.9366	0.8763	0.7673	0.5748	0.3999	0.4247	0.6380	0.8702	0.9605	0.9840	(94)
Useful gains	554.5395	625.1213	633.9752	609.0297	524.5977	379.9945	255.9419	268.3842	406.1931	524.1655	540.1200	532.0423	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1044.3841	1014.5963	917.1756	762.2477	583.6032	390.0814	257.1628	270.0786	424.0794	649.3495	863.0402	1039.4914	(97)
Space heating kWh	364.4444	261.7272	210.7011	110.3169	43.9002	0.0000	0.0000	0.0000	0.0000	93.1369	232.5026	377.5421	(98a)
Space heating requirement - total per year (kWh/year)												1694.2713	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	364.4444	261.7272	210.7011	110.3169	43.9002	0.0000	0.0000	0.0000	0.0000	93.1369	232.5026	377.5421	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1694.2713	
Space heating per m2											(98c) / (4) =	21.1837	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	629.7941	495.7954	508.2782	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8870	0.9438	0.9364	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	558.6483	467.9087	475.9703	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	709.4764	687.8872	681.1112	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	108.5962	163.6640	152.6248	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	27.1491	40.9160	38.1562	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												106.2213	(107)
Energy for space heating												21.1837	(99)
Energy for space cooling												1.3281	(108)
Total												22.5118	(109)
Fabric Energy Efficiency (TFEE)												22.5	(109)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.46	**TER**	10.16
Environmental	99 A	**% DER < TER**			85.63
CO_2 Emissions (t/year)	0.09	**DFEE**	15.74	**TFEE**	22.51
Compliance Check	See BREL	**% DFEE < TFEE**			30.10
% DPER < TPER	63.01	**DPER**	19.89	**TPER**	53.78

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			15583.4798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.2856	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers													
	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths													
	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses													
	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m													
	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
											Total per year (kWh/year) = Sum(64)m =	2691.4183	(64)
12Total per year (kWh/year)												2691	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	132.6117	146.8201	132.6117	137.0321	132.6117	137.0321	132.6117	132.6117	137.0321	132.6117	137.0321	132.6117	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)													
	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains													
	565.9813	580.0257	555.3786	537.2808	511.1311	494.4637	476.3107	477.3819	491.4645	506.5784	536.2944	554.9833	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.6000	46.7521	0.6800	0.7000	0.7700	117.2073	(78)

Solar gains	117.2073	191.9553	244.5170	276.3573	287.9814	277.1429	270.7855	262.9702	255.4269	207.0418	138.9306	101.2779	(83)
Total gains	683.1885	771.9810	799.8957	813.6381	799.1125	771.6066	747.0962	740.3521	746.8914	713.6202	675.2250	656.2612	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9576	0.9199	0.8703	0.7763	0.6407	0.4675	0.3335	0.3517	0.5186	0.7655	0.9160	0.9653	(86)
MIT	20.4745	20.6363	20.7742	20.9027	20.9730	20.9965	20.9996	20.9995	20.9934	20.9225	20.6957	20.4271	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9497	0.9066	0.8502	0.7458	0.5999	0.4198	0.2831	0.3009	0.4703	0.7294	0.8999	0.9586	(89)
MIT 2	19.7337	19.9301	20.0936	20.2384	20.3106	20.3311	20.3331	20.3331	20.3288	20.2616	20.0049	19.6752	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.9428	20.1294	20.2857	20.4259	20.4975	20.5189	20.5212	20.5211	20.5164	20.4481	20.1998	19.8874	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9428	20.1294	20.2857	20.4259	20.4975	20.5189	20.5212	20.5211	20.5164	20.4481	20.1998	19.8874	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9443	0.9021	0.8487	0.7502	0.6101	0.4332	0.2973	0.3152	0.4837	0.7358	0.8963	0.9534	(94)
Useful gains	645.1422	696.4213	678.8340	610.3612	487.5701	334.2235	222.1123	233.3954	361.2658	525.1112	605.1932	625.6718	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	886.4503	863.0237	781.2105	653.1506	498.5402	335.4111	222.2089	233.5369	363.6038	558.0746	742.3435	888.9771	(97)
Space heating kWh	179.5332	111.9568	76.1681	30.8084	8.1617	0.0000	0.0000	0.0000	0.0000	24.5248	98.7482	195.8991	(98a)
Space heating requirement - total per year (kWh/year)												725.8004	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	179.5332	111.9568	76.1681	30.8084	8.1617	0.0000	0.0000	0.0000	0.0000	24.5248	98.7482	195.8991	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												725.8004	
Space heating per m2											(98c) / (4) =	9.0748	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	179.5332	111.9568	76.1681	30.8084	8.1617	0.0000	0.0000	0.0000	0.0000	24.5248	98.7482	195.8991	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	269.2998	167.9352	114.2521	46.2126	12.2426	0.0000	0.0000	0.0000	0.0000	36.7871	148.1223	293.8487	
Space heating requirement													
	269.2998	167.9352	114.2521	46.2126	12.2426	0.0000	0.0000	0.0000	0.0000	36.7871	148.1223	293.8487	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1088.7006	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												10.8870	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)
Total electricity for the above, kWh/year												21.9935	(331)
Electricity for lighting (calculated in Appendix L)												206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4396.5240	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1366.8875	0.1577	45.7966	(367)
Electrical energy for heat distribution (space & water)	10.8870	0.0000	7.4051	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			204.8740	(373)
Space and water heating			204.8740	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			116.3924	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.4600	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1366.8875	1.5839	459.8486	(467)
Electrical energy for heat distribution (space & water)	10.8870	0.0000	78.6467	(472)
Overall CO2 factor for heat network			0.4245	(486)
Total CO2 associated with community systems			2175.8911	(473)
Space and water heating			2175.8911	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	1.4873	-726.6034	
PV Unit electricity exported	-469.6869	0.4449	-208.9838	
Total			-935.5872	(480)
Total Primary energy kWh/year			1590.9617	(483)
Dwelling Primary energy Rate (DPER)			19.8900	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b) x	2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c) x	2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1531 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4031 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2822 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3598	0.3527	0.3457	0.3104	0.3033	0.2681	0.2681	0.2610	0.2822	0.3033	0.3174	0.3315	(22b)
Effective ac	0.5647	0.5622	0.5597	0.5482	0.5460	0.5359	0.5359	0.5341	0.5398	0.5460	0.5504	0.5550	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.7900	1.0000	1.7900			(26)
TER Opening Type			7.6000	1.1450	8.7023			(27)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.1800	5.4450			(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1800	5.3802			(29a)
500mm mineral wool	39.9900		39.9900	0.1100	4.3989			(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7164			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.7300	0.0500	0.3365
E3 Sill	5.8800	0.0500	0.2940
E4 Jamb	10.3200	0.0500	0.5160
E6 Intermediate floor within a dwelling	14.1900	0.0000	0.0000
E18 Party wall between dwellings	5.8000	0.0600	0.3480
P2 Party wall - Intermediate floor within a dwelling	11.4900	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.4900	0.0000	0.0000
E16 Corner (normal)	17.4000	0.0900	1.5660
E25 Staggered party wall between dwellings	5.8000	0.0600	0.3480
E7 Party floor between dwellings (in blocks of flats)	14.1900	0.0700	0.9933
P4 Party wall - Roof (insulation at ceiling level)	11.4900	0.1200	1.3788
E10 Eaves (insulation at ceiling level)	8.7100	0.0600	0.5226
E12 Gable (insulation at ceiling level)	5.4100	0.0600	0.3246

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.6278	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	32.3442	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5167	36.3542	36.1949	35.4468	35.3068	34.6552	34.6552	34.5345	34.9062	35.3068	35.5900	35.8860	(38)
Heat transfer coeff	68.8609	68.6984	68.5391	67.7910	67.6510	66.9994	66.9994	66.8787	67.2504	67.6510	67.9342	68.2302	(39)
Average = Sum(39)m / 12 =												67.7903	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8610	0.8589	0.8570	0.8476	0.8458	0.8377	0.8377	0.8362	0.8408	0.8458	0.8494	0.8531	(40)
HLP (average)												0.8476	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.2627	228.3369	242.2815	212.1523	205.1009	184.1986	181.2715	188.7627	191.1731	213.9259	228.4152	255.3146	(62)
WWHRS	-29.9473	-26.4856	-27.7342	-22.9650	-21.4026	-18.3143	-17.1668	-18.2551	-18.9487	-22.3384	-25.3067	-29.3927	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
									Total per year (kWh/year) = Sum(64)m =			2310.9385	(64)
12Total per year (kWh/year)												2311	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	107.6555	95.5971	102.3417	91.6211	89.9792	82.3265	82.0559	84.5467	84.6455	92.9135	97.0285	106.6752	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	123.1241	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.1468	142.9840	129.1468	133.4517	129.1468	133.4517	129.1468	129.1468	133.4517	129.1468	133.4517	129.1468	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.3987	221.6754	215.9383	203.7246	188.3070	173.8166	164.1362	161.8595	167.5966	179.8103	195.2279	209.7183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	35.3124	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	144.6982	142.2576	137.5560	127.2515	120.9398	114.3423	110.2902	113.6380	117.5632	124.8837	134.7618	143.3807	(72)
Total internal gains													

	556.1810	569.8542	545.5784	527.3650	501.3308	481.5479	463.5104	464.5816	478.5488	496.7781	526.3787	545.1830 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.6000	46.7521	0.6300	0.7000	0.7700	108.5891	(78)

Solar gains	108.5891	177.8410	226.5378	256.0369	266.8063	256.7648	250.8748	243.6342	236.6455	191.8182	128.7151	93.8310 (83)
Total gains	664.7701	747.6951	772.1162	783.4020	768.1371	738.3127	714.3852	708.2158	715.1943	688.5962	655.0938	639.0140 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.8622	63.0109	63.1573	63.8543	63.9864	64.6087	64.6087	64.7253	64.3676	63.9864	63.7197	63.4432	
alpha	5.1908	5.2007	5.2105	5.2570	5.2658	5.3072	5.3072	5.3150	5.2912	5.2658	5.2480	5.2295	
util living area	0.9746	0.9536	0.9243	0.8589	0.7465	0.5667	0.4104	0.4315	0.6241	0.8493	0.9500	0.9786	(86)
MIT	20.1294	20.3182	20.5138	20.7435	20.9030	20.9819	20.9972	20.9964	20.9692	20.7934	20.4402	20.0950	(87)
Th 2	20.2008	20.2025	20.2042	20.2123	20.2138	20.2208	20.2208	20.2221	20.2181	20.2138	20.2107	20.2076	(88)
util rest of house	0.9691	0.9442	0.9089	0.8311	0.7005	0.5029	0.3389	0.3599	0.5618	0.8155	0.9382	0.9739	(89)
MIT 2	19.1980	19.4338	19.6753	19.9538	20.1292	20.2090	20.2196	20.2204	20.1965	20.0154	19.5948	19.1602	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	19.4608	19.6834	19.9120	20.1767	20.3476	20.4271	20.4391	20.4394	20.4145	20.2349	19.8333	19.4240	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4608	19.6834	19.9120	20.1767	20.3476	20.4271	20.4391	20.4394	20.4145	20.2349	19.8333	19.4240	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9628	0.9369	0.9025	0.8297	0.7087	0.5202	0.3590	0.3800	0.5779	0.8165	0.9315	0.9681	(94)
Useful gains	640.0670	700.5162	696.8262	650.0020	544.4016	384.0451	256.4855	269.1521	413.2873	562.2154	610.2297	618.6463	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1043.9865	1015.5947	919.2435	764.4551	585.0155	390.4133	257.2144	270.1505	424.6536	651.8114	865.0280	1038.7346	(97)
Space heating kWh	300.5161	211.7328	165.4785	82.4062	30.2167	0.0000	0.0000	0.0000	0.0000	66.6594	183.4548	312.5457	(98a)
Space heating requirement - total per year (kWh/year)												1353.0102	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	300.5161	211.7328	165.4785	82.4062	30.2167	0.0000	0.0000	0.0000	0.0000	66.6594	183.4548	312.5457	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1353.0102	
Space heating per m2											(98c) / (4) =	16.9169	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	300.5161	211.7328	165.4785	82.4062	30.2167	0.0000	0.0000	0.0000	0.0000	66.6594	183.4548	312.5457	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	325.5863	229.3963	179.2833	89.2809	32.7375	0.0000	0.0000	0.0000	0.0000	72.2204	198.7592	338.6194	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	228.3154	201.8513	214.5473	189.1873	183.6984	165.8843	164.1047	170.5075	172.2244	191.5875	203.1085	225.9219	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.6769	84.1671	83.4844	82.3319	80.9590	79.8000	79.8000	79.8000	79.8000	81.9437	83.8323	84.7879	(217)
Fuel for water heating, kWh/month	269.6312	239.8220	256.9909	229.7863	226.9028	207.8751	205.6450	213.6686	215.8200	233.8037	242.2796	266.4554	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	26.8342	21.5274	19.3830	14.2008	10.9691	8.9619	10.0064	13.0067	16.8944	22.1664	25.0369	27.5800	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.3597	-31.5987	-47.6203	-56.2064	-62.9289	-59.5773	-58.8595	-54.4329	-47.0022	-37.3178	-24.0087	-18.2981	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.9169	-17.0101	-34.4870	-52.8069	-70.8246	-71.5366	-70.6859	-59.3742	-42.9070	-24.6402	-10.6698	-6.2334	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1465.8832	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2808.6807	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	216.5670	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-988.3030	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3588.8279	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1465.8832	0.2100	307.8355	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2808.6807	0.2100	589.8229	(264)
Space and water heating			897.6584	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	216.5670	0.1443	31.2573	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	0.1336	-69.3640	
PV Unit electricity exported	-469.0927	0.1253	-58.7938	
Total			-128.1578	(269)
Total CO2, kg/year			812.6872	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.1600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1465.8832	1.1300	1656.4480	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2808.6807	1.1300	3173.8092	(278)
Space and water heating			4830.2572	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	216.5670	1.5338	332.1777	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-519.2103	1.4937	-775.5387	
PV Unit electricity exported	-469.0927	0.4600	-215.8009	
Total			-991.3396	(283)
Total Primary energy kWh/year			4301.1961	(286)
Target Primary Energy Rate (TPER)			53.7800	(287)

Full SAP Calculation Printout

Property Reference	Maisonette Duplex TF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - West	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.46	**TER**	10.16
Environmental	99 A	**% DER < TER**			85.63
CO_2 Emissions (t/year)	0.09	**DFEE**	15.74	**TFEE**	22.51
Compliance Check	See BREL	**% DFEE < TFEE**			30.10
% DPER < TPER	63.01	**DPER**	19.89	**TPER**	53.78

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			15583.4798	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												3.2856	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4625	(42)
Hot water usage for mixer showers	65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)
Hot water usage for baths	28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)
Hot water usage for other uses	39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)
Average daily hot water use (litres/day)												122.8539	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)											Total = Sum(45)m =	2040.5785	
Distribution loss (46)m = 0.15 x (45)m	31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
										Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)
Water heating gains (Table 5)	154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)
Total internal gains	612.2735	609.9558	591.8328	558.1588	524.7912	494.7014	477.0149	480.2399	497.5865	528.2765	565.2104	597.3217	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.6000	46.7521	0.6800	0.7000	0.7700	117.2073	(78)

Solar gains	117.2073	191.9553	244.5170	276.3573	287.9814	277.1429	270.7855	262.9702	255.4269	207.0418	138.9306	101.2779	(83)
Total gains	729.4808	801.9111	836.3499	834.5161	812.7726	771.8443	747.8004	743.2101	753.0134	735.3183	704.1410	698.5996	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area													
	0.9443	0.9080	0.8513	0.7628	0.6313	0.4674	0.3332	0.3504	0.5146	0.7493	0.9023	0.9546	(86)
MIT	20.5368	20.6687	20.8027	20.9116	20.9750	20.9965	20.9996	20.9995	20.9937	20.9310	20.7260	20.4871	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house													
	0.9344	0.8934	0.8297	0.7318	0.5908	0.4197	0.2828	0.2998	0.4666	0.7127	0.8846	0.9462	(89)
MIT 2	19.8096	19.9683	20.1257	20.2475	20.3123	20.3311	20.3331	20.3331	20.3290	20.2699	20.0401	19.7489	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	20.0148	20.1659	20.3167	20.4349	20.4993	20.5189	20.5212	20.5211	20.5166	20.4564	20.2336	19.9572	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0148	20.1659	20.3167	20.4349	20.4993	20.5189	20.5212	20.5211	20.5166	20.4564	20.2336	19.9572	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9291	0.8894	0.8292	0.7367	0.6010	0.4330	0.2970	0.3140	0.4799	0.7197	0.8817	0.9408	(94)
Useful gains	677.7933	713.2215	693.4706	614.8062	488.5042	334.2257	222.1129	233.3988	361.3743	529.2318	620.8085	657.2657	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	890.5306	865.0945	782.9697	653.6638	498.6440	335.4114	222.2090	233.5373	363.6157	558.5472	744.2612	892.9333	(97)
Space heating kWh													
	158.2765	102.0587	66.5873	27.9775	7.5440	0.0000	0.0000	0.0000	0.0000	21.8107	88.8859	175.3367	(98a)
Space heating requirement - total per year (kWh/year)												648.4773	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	158.2765	102.0587	66.5873	27.9775	7.5440	0.0000	0.0000	0.0000	0.0000	21.8107	88.8859	175.3367	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												648.4773	
Space heating per m2											(98c) / (4) =	8.1080	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	158.2765	102.0587	66.5873	27.9775	7.5440	0.0000	0.0000	0.0000	0.0000	21.8107	88.8859	175.3367	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	237.4148	153.0880	99.8810	41.9662	11.3160	0.0000	0.0000	0.0000	0.0000	32.7160	133.3289	263.0050	
Space heating requirement													
	237.4148	153.0880	99.8810	41.9662	11.3160	0.0000	0.0000	0.0000	0.0000	32.7160	133.3289	263.0050	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system		

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	972.7159	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	9.7272	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4280.5393	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	972.7159	4.4400	43.1886	(340a)
Space heating total			43.1886	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	206.9234	16.4900	34.1217	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	16.4900	-80.5593	
PV Unit electricity exported	-469.6869	5.5900	-26.2555	
Total			-106.8148	(352)
Total energy cost			245.3707	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7068 (357)
SAP value		88.5431
SAP rating (Section 12)		89 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1335.9582	0.1577	40.9123	(367)
Electrical energy for heat distribution (space & water)	9.7272	0.0000	7.2219	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			199.8066	(373)
Space and water heating			199.8066	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			111.3249	(383)
CO2 emissions per m2			1.3900	(384)
EI value			98.8064	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 79.9800						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate													
	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15583.4798	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	194.8422	(35)
Thermal bridges (User defined value 0.030 * total exposed area)	3.2856	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 24.3364	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4625	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539	(43)

Daily hot water use

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte 211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
								Total per year (kWh/year) = Sum(64)m =			2691.4183	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)

Heat gains from water heating, kWh/month

114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
327.4608 330.8588 322.2959 304.0665 281.0552 259.4278 244.9794 241.5813 250.1442 268.3736 291.3850 313.0124 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 52.2374 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 -98.4993 (71)
Water heating gains (Table 5)
154.0336 151.5930 146.8914 136.5869 130.2751 123.6777 119.6256 122.9734 126.8986 134.2191 144.0972 152.7161 (72)
Total internal gains
612.2735 609.9558 591.8328 558.1588 524.7912 494.7014 477.0149 480.2399 497.5865 528.2765 565.2104 597.3217 (73)

---
6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.6000	54.0600	0.6800	0.7000	0.7700	135.5283	(78)

Solar gains 135.5283 196.7251 246.5997 283.2363 286.6865 297.3898 284.4995 279.5155 272.2024 223.6506 158.1068 117.9016 (83)
Total gains 747.8018 806.6809 838.4325 841.3951 811.4778 792.0911 761.5143 759.7553 769.7889 751.9271 723.3171 715.2233 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9339	0.8996	0.8342	0.7400	0.6019	0.4138	0.2901	0.3057	0.4828	0.7097	0.8819	0.9460	(86)
MIT	20.5845	20.6949	20.8310	20.9274	20.9816	20.9984	20.9998	20.9998	20.9957	20.9508	20.7713	20.5352	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9225	0.8839	0.8107	0.7075	0.5600	0.3667	0.2406	0.2560	0.4352	0.6707	0.8613	0.9363	(89)
MIT 2	19.8677	19.9996	20.1581	20.2642	20.3184	20.3324	20.3332	20.3332	20.3305	20.2896	20.0927	19.8080	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	20.0700	20.1958	20.3480	20.4513	20.5056	20.5203	20.5214	20.5213	20.5182	20.4762	20.2842	20.0132	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0700	20.1958	20.3480	20.4513	20.5056	20.5203	20.5214	20.5213	20.5182	20.4762	20.2842	20.0132	(93)

---
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9175	0.8803	0.8112	0.7134	0.5710	0.3800	0.2546	0.2700	0.4485	0.6793	0.8597	0.9310	(94)
Useful gains	686.0920	710.1613	680.1417	600.2743	463.3520	300.9724	193.8480	205.1626	345.2259	510.7920	621.8238	665.8613	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	876.6576	849.7880	756.4101	631.9262	470.6614	301.4923	193.8827	205.2142	346.7085	531.3347	724.4606	879.1067	(97)
Space heating kWh	141.7807	93.8291	56.7437	22.7893	5.4382	0.0000	0.0000	0.0000	0.0000	15.2838	73.8985	158.6546	(98a)
Space heating requirement - total per year (kWh/year)												568.4180	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	141.7807	93.8291	56.7437	22.7893	5.4382	0.0000	0.0000	0.0000	0.0000	15.2838	73.8985	158.6546	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												568.4180	
Space heating per m2										(98c) / (4) =		7.1070	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating 1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.5000 (306)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:
Space heating requirement
141.7807 93.8291 56.7437 22.7893 5.4382 0.0000 0.0000 0.0000 0.0000 15.2838 73.8985 158.6546 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50
307a 212.6711 140.7437 85.1156 34.1840 8.1572 0.0000 0.0000 0.0000 0.0000 22.9257 110.8478 237.9818
Space heating requirement
212.6711 140.7437 85.1156 34.1840 8.1572 0.0000 0.0000 0.0000 0.0000 22.9257 110.8478 237.9818 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)

Water heating
Annual water heating requirement
266.9446 236.1786 250.9634 220.5542 213.7828 192.6005 189.9534 197.4446 199.5749 222.6078 236.8171 263.9965 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50
310a 400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948
Water heating fuel
400.4169 354.2679 376.4450 330.8313 320.6742 288.9007 284.9301 296.1668 299.3624 333.9117 355.2256 395.9948 (310)
Cooling System Energy Efficiency Ratio 0.0000 (314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (315)
Pumps and Fa 1.8679 1.6872 1.8679 1.8077 1.8679 1.8077 1.8679 1.8679 1.8077 1.8679 1.8077 1.8679 (331)
Lighting 25.6392 20.5688 18.5199 13.5685 10.4807 8.5628 9.5608 12.4275 16.1421 21.1793 23.9220 26.3518 (332)
Electricity generated by PVs (Appendix M) (negative quantity)
(333a)m -17.9904 -26.9468 -45.2798 -58.5762 -66.5604 -66.2871 -64.3781 -58.6940 -48.0761 -34.8334 -20.6614 -14.9764 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(334a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (334a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.0081	-13.0184	-31.9653	-58.9969	-82.6801	-94.8316	-90.1120	-72.5476	-46.2727	-22.1629	-8.3690	-4.5223	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	852.6270	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4037.1274	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	8.5263	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)		
mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4063.9243	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	852.6270	6.5500	55.8471	(340a)
Space heating total			55.8471	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	206.9234	28.4300	58.8283	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	28.4300	-148.7628	
PV Unit electricity exported	-531.4870	5.8100	-30.8794	
Total			-179.6422	(352)
Total energy cost			309.7178	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1303.9345	0.1581	35.9518	(367)
Electrical energy for heat distribution (space & water)	8.5263	0.0000	7.0359	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			194.6600	(373)
Space and water heating			194.6600	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	0.1322	-69.1719	
PV Unit electricity exported	-531.4870	0.1213	-64.4804	
Total			-133.6523	(380)
Total CO2, kg/year			93.9239	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1303.9345	1.5853	360.4535	(467)
Electrical energy for heat distribution (space & water)	8.5263	0.0000	74.9193	(472)
Overall CO2 factor for heat network			0.4239	(486)
Total CO2 associated with community systems			2072.7686	(473)
Space and water heating			2072.7686	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	1.4884	-778.8342	
PV Unit electricity exported	-531.4870	0.4450	-236.5330	
Total			-1015.3671	(480)
Total Primary energy kWh/year			1408.0593	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - West

Current energy efficiency rating:	B 89
Current environmental impact rating:	A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 89
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£65	£65	£0
Community scheme	£424	£424	£0
Space heating	£166	£166	£0
Water heating	£264	£264	£0
Lighting	£59	£59	£0
Generated (PV)	-£180	-£180	£0
Total cost of fuels	£309	£309	£0
Total cost of uses	£309	£309	£0
Delivered energy	51 kWh/m²	51 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	18 kWh/m²	18 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900 (1b)	x	2.4500 (2b)	=	97.9755	(1b) - (3b)
First floor	39.9900 (1c)	x	2.4500 (2c)	=	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	195.9510	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15583.4798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		194.8422 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.2856 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4625 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
									Total per year (kWh/year) = Sum(64)m =		2691.4183	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	(71)

Water heating gains (Table 5)

154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161	(72)

Total internal gains

612.2735	609.9558	591.8328	558.1588	524.7912	494.7014	477.0149	480.2399	497.5865	528.2765	565.2104	597.3217	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.6000	46.7521	0.6800	0.7000	0.7700	117.2073	(78)

Solar gains	117.2073	191.9553	244.5170	276.3573	287.9814	277.1429	270.7855	262.9702	255.4269	207.0418	138.9306	101.2779	(83)
Total gains	729.4808	801.9111	836.3499	834.5161	812.7726	771.8443	747.8004	743.2101	753.0134	735.3183	704.1410	698.5996	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area	0.9443	0.9080	0.8513	0.7628	0.6313	0.4674	0.3332	0.3504	0.5146	0.7493	0.9023	0.9546	(86)
MIT	20.5368	20.6687	20.8027	20.9116	20.9750	20.9965	20.9996	20.9995	20.9937	20.9310	20.7260	20.4871	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house	0.9344	0.8934	0.8297	0.7318	0.5908	0.4197	0.2828	0.2998	0.4666	0.7127	0.8846	0.9462	(89)
MIT 2	19.8096	19.9683	20.1257	20.2475	20.3123	20.3311	20.3331	20.3331	20.3290	20.2699	20.0401	19.7489	(90)
Living area fraction									fLA = Living area / (4) =			0.2822	(91)
MIT	20.0148	20.1659	20.3167	20.4349	20.4993	20.5189	20.5212	20.5211	20.5166	20.4564	20.2336	19.9572	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0148	20.1659	20.3167	20.4349	20.4993	20.5189	20.5212	20.5211	20.5166	20.4564	20.2336	19.9572	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9291	0.8894	0.8292	0.7367	0.6010	0.4330	0.2970	0.3140	0.4799	0.7197	0.8817	0.9408	(94)
Useful gains	677.7933	713.2215	693.4706	614.8062	488.5042	334.2257	222.1129	233.3988	361.3743	529.2318	620.8085	657.2657	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	890.5306	865.0945	782.9697	653.6638	498.6440	335.4114	222.2090	233.5373	363.6157	558.5472	744.2612	892.9333	(97)
Space heating kWh	158.2765	102.0587	66.5873	27.9775	7.5440	0.0000	0.0000	0.0000	0.0000	21.8107	88.8859	175.3367	(98a)
Space heating requirement - total per year (kWh/year)												648.4773	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	158.2765	102.0587	66.5873	27.9775	7.5440	0.0000	0.0000	0.0000	0.0000	21.8107	88.8859	175.3367	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												648.4773	
Space heating per m2										(98c) / (4) =		8.1080	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	158.2765	102.0587	66.5873	27.9775	7.5440	0.0000	0.0000	0.0000	0.0000	21.8107	88.8859	175.3367	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	237.4148	153.0880	99.8810	41.9662	11.3160	0.0000	0.0000	0.0000	0.0000	32.7160	133.3289	263.0050	
Space heating requirement	237.4148	153.0880	99.8810	41.9662	11.3160	0.0000	0.0000	0.0000	0.0000	32.7160	133.3289	263.0050	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.0474	-25.0970	-43.0063	-55.7143	-65.1662	-62.5370	-61.3341	-54.9934	-44.3063	-31.3041	-17.5971	-12.4309	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.4513	-11.4813	-28.9891	-53.1497	-78.8246	-82.6150	-80.4068	-62.7490	-39.1561	-18.1928	-6.3530	-3.3181	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												972.7159	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												9.7272	(313)
Space cooling fuel												0.0000	(321)

Electricity for pumps and fans:
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)

mechanical ventilation fans (SFP = 0.0920)	21.9935	(330a)
Total electricity for the above, kWh/year	21.9935	(331)
Electricity for lighting (calculated in Appendix L)	206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4280.5393	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	972.7159	4.4400	43.1886	(340a)
Space heating total			43.1886	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	4.4400	179.2485	(342a)
Water heating total			179.2485	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	16.4900	3.6267	(349)
Energy for lighting	206.9234	16.4900	34.1217	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	16.4900	-80.5593	
PV Unit electricity exported	-469.6869	5.5900	-26.2555	
Total			-106.8148	(352)
Total energy cost			245.3707	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7068	(357)
SAP value		88.5431	
SAP rating (Section 12)		89	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1335.9582	0.1577	40.9123	(367)
Electrical energy for heat distribution (space & water)	9.7272	0.0000	7.2219	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			199.8066	(373)
Space and water heating			199.8066	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-488.5340	0.1319	-64.4352	
PV Unit electricity exported	-469.6869	0.1213	-56.9627	
Total			-121.3978	(380)
Total CO2, kg/year			111.3249	(383)
CO2 emissions per m2			1.3900	(384)
EI value			98.8064	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	39.9900	(1b)	x 2.4500	(2b) =	97.9755	(1b) - (3b)
First floor	39.9900	(1c)	x 2.4500	(2c) =	97.9755	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.9800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		195.9510	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)

Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1103	0.1050	0.1024	0.0971	0.0971	0.0840	0.0840	0.0814	0.0840	0.0919	0.0892	0.0997	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.6000	0.7752	5.8915			(27)
Door to Stairwell Shelt.			1.7900	0.2900	0.5191			(26)
100mm FullFill Cavity	39.6400	9.3900	30.2500	0.2300	6.9575	50.0000	1512.5000	(29a)
Wall to Stairwell shelt.	29.8900		29.8900	0.1500	4.4835	150.0000	4483.4999	(29a)
500mm mineral wool	39.9900		39.9900	0.0800	3.1992	10.0000	399.9000	(30)
Total net area of external elements Aum(A, m2)			109.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0508			(33)
Main dwelling								
Party Wall			56.3000	0.0000	0.0000	70.0000	3940.9999	(32)
Party Floor			39.9900			70.0000	2799.3000	(32d)
Timber partitions			151.9500			9.0000	1367.5500	(32c)
Internal Floor 1			39.9900			18.0000	719.8200	(32d)
Internal Ceiling 1			39.9900			9.0000	359.9100	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15583.4798 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		194.8422 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		3.2856 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.3364 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	32.3319	(38)
Heat transfer coeff	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	56.6683	(39)
Average = Sum(39)m / 12 =												56.6683	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	0.7085	(40)
HLP (average)												0.7085	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4625 (42)

Hot water usage for mixer showers

65.5074	64.5230	63.0884	60.3437	58.3182	56.0593	54.7754	56.1991	57.7597	60.1850	62.9887	65.2564	(42a)

Hot water usage for baths

28.2936	27.8734	27.2816	26.1906	25.3736	24.4678	23.9784	24.5660	25.2058	26.1751	27.2886	28.1979	(42b)

Hot water usage for other uses

39.8483	38.3992	36.9502	35.5012	34.0522	32.6031	32.6031	34.0522	35.5012	36.9502	38.3992	39.8483	(42c)

Average daily hot water use (litres/day)	122.8539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6493	130.7956	127.3203	122.0355	117.7440	113.1302	111.3570	114.8173	118.4667	123.3104	128.6766	133.3026	(44)
Energy conte	211.6678	186.2512	195.6866	167.0605	158.5060	139.1068	134.6766	142.1678	146.0813	167.3310	183.3234	208.7197	(45)
Energy content (annual)										Total = Sum(45)m =		2040.5785	

Distribution loss (46)m = 0.15 x (45)m

31.7502	27.9377	29.3530	25.0591	23.7759	20.8660	20.2015	21.3252	21.9122	25.0996	27.4985	31.3080	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)
Total storage loss	

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss

Total heat required for water heating calculated for each month

266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

											Total per year (kWh/year) = Sum(64)m =	2691.4183	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000		(64a)
Heat gains from water heating, kWh/month													
114.6010	101.8705	109.2872	98.3426	96.9247	89.0480	89.0014	91.4922	91.3670	99.8590	103.7500	113.6207		(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	147.7489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
29.2921	26.0170	21.1585	16.0183	11.9739	10.1089	10.9230	14.1981	19.0567	24.1968	28.2412	30.1063		(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
327.4608	330.8588	322.2959	304.0665	281.0552	259.4278	244.9794	241.5813	250.1442	268.3736	291.3850	313.0124		(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374	52.2374		(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)													
-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993	-98.4993		(71)
Water heating gains (Table 5)													
154.0336	151.5930	146.8914	136.5869	130.2751	123.6777	119.6256	122.9734	126.8986	134.2191	144.0972	152.7161		(72)
Total internal gains													
612.2735	609.9558	591.8328	558.1588	524.7912	494.7014	477.0149	480.2399	497.5865	528.2765	565.2104	597.3217		(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.6000	54.0600	0.6800	0.7000	0.7700	135.5283	(78)

Solar gains	135.5283	196.7251	246.5997	283.2363	286.6865	297.3898	284.4995	279.5155	272.2024	223.6506	158.1068	117.9016	(83)
Total gains	747.8018	806.6809	838.4325	841.3951	811.4778	792.0911	761.5143	759.7553	769.7889	751.9271	723.3171	715.2233	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	76.3874	
alpha	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	6.0925	
util living area													
0.9339	0.8996	0.8342	0.7400	0.6019	0.4138	0.2901	0.3057	0.4828	0.7097	0.8819	0.9460		(86)
MIT	20.5845	20.6949	20.8310	20.9274	20.9816	20.9984	20.9998	20.9998	20.9957	20.9508	20.7713	20.5352	(87)
Th 2	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	20.3333	(88)
util rest of house													
0.9225	0.8839	0.8107	0.7075	0.5600	0.3667	0.2406	0.2560	0.4352	0.6707	0.8613	0.9363		(89)
MIT 2	19.8677	19.9996	20.1581	20.2642	20.3184	20.3324	20.3332	20.3332	20.3305	20.2896	20.0927	19.8080	(90)
Living area fraction										fLA = Living area / (4) =		0.2822	(91)
MIT	20.0700	20.1958	20.3480	20.4513	20.5056	20.5203	20.5214	20.5213	20.5182	20.4762	20.2842	20.0132	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0700	20.1958	20.3480	20.4513	20.5056	20.5203	20.5214	20.5213	20.5182	20.4762	20.2842	20.0132	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9175	0.8803	0.8112	0.7134	0.5710	0.3800	0.2546	0.2700	0.4485	0.6793	0.8597	0.9310	(94)
Useful gains	686.0920	710.1613	680.1417	600.2743	463.3520	300.9724	193.8480	205.1626	345.2259	510.7920	621.8238	665.8613	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
876.6576	849.7880	756.4101	631.9262	470.6614	301.4923	193.8827	205.2142	346.7085	531.3347	724.4606	879.1067		(97)
Space heating kWh													
141.7807	93.8291	56.7437	22.7893	5.4382	0.0000	0.0000	0.0000	0.0000	15.2838	73.8985	158.6546		(98a)
Space heating requirement - total per year (kWh/year)												568.4180	
Solar heating kWh													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
141.7807	93.8291	56.7437	22.7893	5.4382	0.0000	0.0000	0.0000	0.0000	15.2838	73.8985	158.6546		(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												568.4180	
Space heating per m2											(98c) / (4) =	7.1070	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
141.7807	93.8291	56.7437	22.7893	5.4382	0.0000	0.0000	0.0000	0.0000	15.2838	73.8985	158.6546		(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a 212.6711	140.7437	85.1156	34.1840	8.1572	0.0000	0.0000	0.0000	0.0000	22.9257	110.8478	237.9818		
Space heating requirement													
212.6711	140.7437	85.1156	34.1840	8.1572	0.0000	0.0000	0.0000	0.0000	22.9257	110.8478	237.9818		(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	266.9446	236.1786	250.9634	220.5542	213.7828	192.6005	189.9534	197.4446	199.5749	222.6078	236.8171	263.9965	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	
Water heating fuel													
	400.4169	354.2679	376.4450	330.8313	320.6742	288.9007	284.9301	296.1668	299.3624	333.9117	355.2256	395.9948	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	1.8679	1.6872	1.8679	1.8077	1.8679	1.8077	1.8679	1.8679	1.8077	1.8679	1.8077	1.8679	(331)
Lighting	25.6392	20.5688	18.5199	13.5685	10.4807	8.5628	9.5608	12.4275	16.1421	21.1793	23.9220	26.3518	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-17.9904	-26.9468	-45.2798	-58.5762	-66.5604	-66.2871	-64.3781	-58.6940	-48.0761	-34.8334	-20.6614	-14.9764	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-6.0081	-13.0184	-31.9653	-58.9969	-82.6801	-94.8316	-90.1120	-72.5476	-46.2727	-22.1629	-8.3690	-4.5223	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												852.6270	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4037.1274	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												8.5263	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 2.6680, total flow = 29.0000, SFP = 0.0920)													
mechanical ventilation fans (SFP = 0.0920)												21.9935	(330a)
Total electricity for the above, kWh/year												21.9935	(331)
Electricity for lighting (calculated in Appendix L)												206.9234	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1054.7470	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4063.9243	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	852.6270	6.5500	55.8471	(340a)
Space heating total			55.8471	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4037.1274	6.5500	264.4318	(342a)
Water heating total			264.4318	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	21.9935	28.4300	6.2528	(349)
Energy for lighting	206.9234	28.4300	58.8283	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	28.4300	-148.7628	
PV Unit electricity exported	-531.4870	5.8100	-30.8794	
Total			-179.6422	(352)
Total energy cost			309.7178	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1303.9345	0.1581	35.9518	(367)
Electrical energy for heat distribution (space & water)	8.5263	0.0000	7.0359	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			194.6600	(373)
Space and water heating			194.6600	(376)
Pumps, fans and electric keep-hot	21.9935	0.1387	3.0508	(378)
Energy for lighting	206.9234	0.1443	29.8654	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.2600	0.1322	-69.1719	
PV Unit electricity exported	-531.4870	0.1213	-64.4804	
Total			-133.6523	(380)
Total CO2, kg/year			93.9239	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1303.9345	1.5853	360.4535	(467)
Electrical energy for heat distribution (space & water)	8.5263	0.0000	74.9193	(472)
Overall CO2 factor for heat network			0.4239	(486)
Total CO2 associated with community systems			2072.7686	(473)
Space and water heating			2072.7686	(476)
Pumps, fans and electric keep-hot	21.9935	1.5128	33.2718	(478)
Energy for lighting	206.9234	1.5338	317.3860	(479)

Energy saving/generation technologies			
PV Unit electricity used in dwelling	-523.2600	1.4884	-778.8342
PV Unit electricity exported	-531.4870	0.4450	-236.5330
Total			-1015.3671 (480)
Total Primary energy kWh/year			1408.0593 (483)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	83 B	**DER**	3.05	**TER**	9.93
Environmental	97 A	**% DER < TER**			69.28
CO_2 Emissions (t/year)	0.25	**DFEE**	19.61	**TFEE**	23.82
Compliance Check	See BREL	**% DFEE < TFEE**			17.65
% DPER < TPER	38.38	**DPER**	32.31	**TPER**	52.44

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)									(28)...(30) + (32) + (32a)...(32e) =			17650.3300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												203.5794	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												2.7933	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss										(33) + (36) + (36a) =		27.3548	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778	(42)
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
12Total per year (kWh/year)												2752	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	652.0784	730.2946	789.6905	869.3922	912.9689	904.3786	866.5575	814.6416	757.3995	678.0557	637.1713	628.5612	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	
alpha	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	
util living area	0.9792	0.9585	0.9131	0.7944	0.6214	0.4401	0.3167	0.3520	0.5611	0.8423	0.9566	0.9831	(86)
MIT	20.3560	20.5138	20.7068	20.8972	20.9792	20.9978	20.9998	20.9996	20.9911	20.8757	20.5885	20.3132	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house	0.9747	0.9501	0.8968	0.7638	0.5803	0.3942	0.2681	0.3004	0.5089	0.8097	0.9463	0.9794	(89)
MIT 2	19.5774	19.7734	20.0073	20.2235	20.3063	20.3221	20.3233	20.3232	20.3174	20.2052	19.8684	19.5237	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8209	20.0050	20.2261	20.4342	20.5168	20.5334	20.5349	20.5348	20.5281	20.4149	20.0937	19.7707	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8209	20.0050	20.2261	20.4342	20.5168	20.5334	20.5349	20.5348	20.5281	20.4149	20.0937	19.7707	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9706	0.9456	0.8943	0.7690	0.5922	0.4085	0.2833	0.3166	0.5248	0.8144	0.9423	0.9756	(94)
Useful gains	632.9262	690.5459	706.2003	668.5908	540.6690	369.4323	245.4840	257.8883	397.5186	552.2070	600.4044	613.2422	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	968.5573	942.6040	856.5525	719.7730	550.1974	370.2664	245.5515	258.0238	401.1349	612.4828	810.8472	971.6605	(97)
Space heating kWh	249.7095	169.3831	111.8620	36.8511	7.0892	0.0000	0.0000	0.0000	0.0000	44.8452	151.5189	266.6632	(98a)
Space heating requirement - total per year (kWh/year)												1037.9222	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	249.7095	169.3831	111.8620	36.8511	7.0892	0.0000	0.0000	0.0000	0.0000	44.8452	151.5189	266.6632	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1037.9222	
Space heating per m2											(98c) / (4) =	11.9714	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	249.7095	169.3831	111.8620	36.8511	7.0892	0.0000	0.0000	0.0000	0.0000	44.8452	151.5189	266.6632	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	374.5643	254.0746	167.7930	55.2767	10.6338	0.0000	0.0000	0.0000	0.0000	67.2678	227.2783	399.9948	
Space heating requirement	374.5643	254.0746	167.7930	55.2767	10.6338	0.0000	0.0000	0.0000	0.0000	67.2678	227.2783	399.9948	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1556.8833	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												15.5688	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5934.2050	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1515.8358	0.1576	65.4275	(367)
Electrical energy for heat distribution (space & water)	15.5688	0.0000	8.2692	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			228.7810	(373)
Space and water heating			228.7810	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Total CO2, kg/year			264.6496	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.0500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1515.8358	1.5834	657.3707	(467)
Electrical energy for heat distribution (space & water)	15.5688	0.0000	87.4306	(472)
Overall CO2 factor for heat network			0.4255	(486)
Total CO2 associated with community systems			2418.9139	(473)
Space and water heating			2418.9139	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Total Primary energy kWh/year			2801.3927	(483)
Dwelling Primary energy Rate (DPER)			32.3100	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
Heatloss Floor 1			43.3500	0.1300	5.6355			(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1247			(33)

Main dwelling

Party Wall	79.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E5 Ground floor (normal)	6.7700	0.1600	1.0832
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P1 Party wall - Ground floor	19.4300	0.0800	1.5544
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0424 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 31.1671 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	71.4535	71.2501	71.0507	70.1143	69.9391	69.1235	69.1235	68.9725	69.4377	69.9391	70.2935	70.6641	(39)
Average = Sum(39)m / 12 =												70.1135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8241	0.8218	0.8195	0.8087	0.8067	0.7973	0.7973	0.7955	0.8009	0.8067	0.8108	0.8150	(40)
HLP (average)												0.8087	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
West					9.2400	19.6403		0.6300	0.7000	0.7700		55.4614	(80)
Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)
Total gains	634.2986	701.5715	746.4857	809.2850	840.7342	827.5835	792.9978	750.1384	705.1835	645.1554	616.5661	612.8145	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3015	70.5022	70.7000	71.6442	71.8237	72.6712	72.6712	72.8303	72.3424	71.8237	71.4616	71.0868	
alpha	5.6868	5.7001	5.7133	5.7763	5.7882	5.8447	5.8447	5.8554	5.8228	5.7882	5.7641	5.7391	
util living area	0.9869	0.9755	0.9506	0.8718	0.7256	0.5281	0.3827	0.4214	0.6547	0.8987	0.9728	0.9890	(86)
MIT	20.1338	20.2930	20.5099	20.7811	20.9380	20.9918	20.9989	20.9982	20.9732	20.7737	20.4221	20.1108	(87)
Th 2	20.2325	20.2345	20.2365	20.2458	20.2475	20.2557	20.2557	20.2572	20.2526	20.2475	20.2440	20.2403	(88)
util rest of house	0.9838	0.9698	0.9391	0.8450	0.6794	0.4693	0.3184	0.3541	0.5925	0.8711	0.9654	0.9863	(89)
MIT 2	19.2244	19.4263	19.6971	20.0263	20.1952	20.2506	20.2553	20.2564	20.2340	20.0258	19.5980	19.2015	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.5089	19.6974	19.9513	20.2624	20.4275	20.4824	20.4879	20.4884	20.4653	20.2597	19.8558	19.4860	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5089	19.6974	19.9513	20.2624	20.4275	20.4824	20.4879	20.4884	20.4653	20.2597	19.8558	19.4860	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9800	0.9649	0.9341	0.8456	0.6908	0.4874	0.3385	0.3752	0.6107	0.8716	0.9608	0.9829	(94)
Useful gains	621.5918	676.9382	697.2896	684.3671	580.8200	403.3397	268.4262	281.4173	430.6569	562.3167	592.4069	602.3346	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1086.7269	1054.3197	955.7277	796.6638	610.3965	406.6140	268.7448	281.9902	441.9886	675.5921	896.6507	1080.1680	(97)
Space heating kWh	346.0605	253.6004	192.2779	80.8537	22.0049	0.0000	0.0000	0.0000	0.0000	84.2769	219.0556	355.5081	(98a)
Space heating requirement - total per year (kWh/year)												1553.6380	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	346.0605	253.6004	192.2779	80.8537	22.0049	0.0000	0.0000	0.0000	0.0000	84.2769	219.0556	355.5081	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1553.6380	
Space heating per m2											(98c) / (4) =	17.9197	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	346.0605	253.6004	192.2779	80.8537	22.0049	0.0000	0.0000	0.0000	0.0000	84.2769	219.0556	355.5081	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	374.9301	274.7566	208.3185	87.5988	23.8406	0.0000	0.0000	0.0000	0.0000	91.3076	237.3300	385.1659	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9387	84.5209	83.7641	82.2575	80.6576	79.8000	79.8000	79.8000	79.8000	82.3096	84.1786	85.0212	(217)
Fuel for water heating, kWh/month	275.1175	244.3994	262.0528	235.1664	232.7696	212.3443	209.9929	218.2535	220.5242	237.9658	246.8257	271.9522	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.0522	-34.0491	-51.2340	-60.3739	-67.5059	-63.8722	-63.0931	-58.3837	-50.4758	-40.1585	-25.8892	-19.7533	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.6843	-18.6438	-37.7720	-57.7989	-77.4856	-78.2579	-77.3368	-64.9856	-46.9877	-27.0053	-11.7029	-6.8394	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1683.2481	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2867.3643	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1071.3411	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3789.6495	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1683.2481	0.2100	353.4821	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2867.3643	0.2100	602.1465	(264)
Space and water heating			955.6286	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	0.1336	-74.5440	
PV Unit electricity exported	-513.5003	0.1254	-64.3679	
Total			-138.9120	(269)
Total CO2, kg/year			861.0306	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.9300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1683.2481	1.1300	1902.0704	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2867.3643	1.1300	3240.1217	(278)
Space and water heating			5142.1920	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	1.4938	-833.3127	
PV Unit electricity exported	-513.5003	0.4601	-236.2611	
Total			-1069.5738	(283)
Total Primary energy kWh/year			4546.8779	(286)
Target Primary Energy Rate (TPER)			52.4400	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	83 B	**DER**	3.05	**TER**	9.93
Environmental	97 A	**% DER < TER**			69.28
CO_2 Emissions (t/year)	0.25	**DFEE**	19.61	**TFEE**	23.82
Compliance Check	See BREL	**% DFEE < TFEE**			17.65
% DPER < TPER	38.38	**DPER**	32.31	**TPER**	52.44

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2257	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2878	0.2821	0.2765	0.2483	0.2426	0.2144	0.2144	0.2088	0.2257	0.2426	0.2539	0.2652	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5414	0.5398	0.5382	0.5308	0.5294	0.5230	0.5230	0.5218	0.5255	0.5294	0.5322	0.5352	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =	18083.8300			(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K					208.5794			(35)

Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9510	37.8383	37.7278	37.2089	37.1118	36.6599	36.6599	36.5762	36.8339	37.1118	37.3082	37.5135	(38)
Heat transfer coeff	65.3058	65.1931	65.0826	64.5637	64.4666	64.0147	64.0147	63.9310	64.1888	64.4666	64.6630	64.8684	(39)
Average = Sum(39)m / 12 =												64.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7532	0.7519	0.7507	0.7447	0.7436	0.7383	0.7383	0.7374	0.7404	0.7436	0.7458	0.7482	(40)
HLP (average)												0.7447	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
									Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)											908	(64)

Electric shower(s)

54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 614.3496 (64a)

Heat gains from water heating, kWh/month

37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	545.1343	624.6069	686.9038	773.6007	821.2924	817.0482	782.1979	728.3014	668.6668	584.4747	536.9133	522.5689	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.9194	77.0524	77.1832	77.8035	77.9207	78.4708	78.4708	78.5736	78.2580	77.9207	77.6840	77.4381	
alpha	6.1280	6.1368	6.1455	6.1869	6.1947	6.2314	6.2314	6.2382	6.2172	6.1947	6.1789	6.1625	
util living area	0.9928	0.9828	0.9569	0.8650	0.6987	0.4980	0.3597	0.4030	0.6442	0.9127	0.9829	0.9944	(86)

MIT	20.1474	20.3236	20.5553	20.8258	20.9600	20.9957	20.9995	20.9990	20.9811	20.7869	20.4232	20.1142	(87)
Th 2	20.2940	20.2952	20.2963	20.3015	20.3025	20.3071	20.3071	20.3079	20.3053	20.3025	20.3005	20.2985	(88)
util rest of house	0.9910	0.9787	0.9469	0.8386	0.6548	0.4455	0.3033	0.3428	0.5858	0.8884	0.9781	0.9929	(89)
MIT 2	19.5115	19.6862	19.9120	20.1657	20.2764	20.3050	20.3069	20.3076	20.2951	20.1373	19.7900	19.4822	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.7104	19.8856	20.1132	20.3722	20.4902	20.5210	20.5236	20.5239	20.5097	20.3405	19.9880	19.6799	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7104	19.8856	20.1132	20.3722	20.4902	20.5210	20.5236	20.5239	20.5097	20.3405	19.9880	19.6799	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9892	0.9758	0.9439	0.8415	0.6669	0.4618	0.3209	0.3616	0.6034	0.8899	0.9754	0.9914	(94)
Useful gains	539.2247	609.5155	648.3454	650.9535	547.7288	377.3310	251.0226	263.3471	403.4594	520.1241	523.7266	518.0501	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1006.3914	976.9551	885.9846	740.6854	566.6755	379.0332	251.1663	263.6444	411.4276	627.9374	833.3797	1004.1547	(97)
Space heating kWh	347.5720	246.9194	176.8036	64.6070	14.0964	0.0000	0.0000	0.0000	0.0000	80.2131	222.9502	361.6619	(98a)
Space heating requirement - total per year (kWh/year)												1514.8235	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	347.5720	246.9194	176.8036	64.6070	14.0964	0.0000	0.0000	0.0000	0.0000	80.2131	222.9502	361.6619	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1514.8235	
Space heating per m2											(98c) / (4) =	17.4720	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	601.7381	473.7088	485.8756	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9701	0.9885	0.9812	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	583.7487	468.2440	476.7501	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	890.8770	853.1757	792.9430	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	221.1324	286.3892	235.2475	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	55.2831	71.5973	58.8119	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												185.6923	(107)
Energy for space heating												17.4720	(99)
Energy for space cooling												2.1418	(108)
Total												19.6138	(109)
Fabric Energy Efficiency (DFEE)												19.6	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
Heatloss Floor 1			43.3500	0.1300	5.6355			(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1247			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	6.2700	0.0500	0.3135
E2 Other lintels (including other steel lintels)	2.5200	0.0500	0.1260
E3 Sill	20.7200	0.0500	1.0360
E4 Jamb	13.5400	0.0000	0.0000
E6 Intermediate floor within a dwelling	6.7700	0.1600	1.0832
E5 Ground floor (normal)	22.0000	0.0600	1.3200
E18 Party wall between dwellings	12.6600	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	19.4300	0.0800	1.5544
P1 Party wall - Ground floor	6.7700	0.0200	0.1354
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0700	0.4739
E7 Party floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0424 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.1671 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	71.4535	71.2501	71.0507	70.1143	69.9391	69.1235	69.1235	68.9725	69.4377	69.9391	70.2935	70.6641	(39)
Average = Sum(39)m / 12 =												70.1135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8241	0.8218	0.8195	0.8087	0.8067	0.7973	0.7973	0.7955	0.8009	0.8067	0.8108	0.8150	(40)
HLP (average)												0.8087	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122 (71)

Water heating gains (Table 5)

	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778 (72)

Total internal gains

	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(80)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088 (83)
Total gains	533.6898	602.2192	650.0344	719.8289	755.3931	749.5884	717.9735	673.1335	625.7862	557.9097	522.6435	513.1575 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3015	70.5022	70.7000	71.6442	71.8237	72.6712	72.6712	72.8303	72.3424	71.8237	71.4616	71.0868	
alpha	5.6868	5.7001	5.7133	5.7763	5.7882	5.8447	5.8447	5.8554	5.8228	5.7882	5.7641	5.7391	
util living area	0.9943	0.9878	0.9722	0.9127	0.7821	0.5788	0.4220	0.4683	0.7204	0.9399	0.9872	0.9954	(86)
MIT	19.9881	20.1562	20.3911	20.7067	20.9086	20.9869	20.9982	20.9968	20.9566	20.6888	20.2937	19.9650	(87)
Th 2	20.2325	20.2345	20.2365	20.2458	20.2475	20.2557	20.2557	20.2572	20.2526	20.2475	20.2440	20.2403	(88)
util rest of house	0.9928	0.9847	0.9650	0.8915	0.7378	0.5159	0.3514	0.3942	0.6574	0.9205	0.9834	0.9942	(89)
MIT 2	19.3031	19.4712	19.7034	20.0101	20.1855	20.2492	20.2551	20.2561	20.2282	20.0005	19.6160	19.2865	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.5174	19.6854	19.9185	20.2280	20.4117	20.4800	20.4876	20.4878	20.4560	20.2158	19.8280	19.4988	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5174	19.6854	19.9185	20.2280	20.4117	20.4800	20.4876	20.4878	20.4560	20.2158	19.8280	19.4988	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9910	0.9819	0.9614	0.8909	0.7480	0.5352	0.3735	0.4174	0.6753	0.9196	0.9807	0.9927	(94)
Useful gains	528.9006	591.3161	624.9258	641.3079	565.0433	401.1637	268.1836	280.9411	422.5869	513.0475	512.5746	509.3875	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1087.3358	1053.4647	953.3951	794.2554	609.2891	406.4436	268.7227	281.9472	441.3491	672.5188	894.6974	1081.0736	(97)
Space heating kWh	415.4757	310.5639	244.3812	110.1222	32.9189	0.0000	0.0000	0.0000	0.0000	118.6466	275.1285	425.3345	(98a)
Space heating requirement - total per year (kWh/year)												1932.5715	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	415.4757	310.5639	244.3812	110.1222	32.9189	0.0000	0.0000	0.0000	0.0000	118.6466	275.1285	425.3345	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1932.5715	
Space heating per m2										(98c) / (4) =		22.2903	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	649.7609	511.5139	524.1907	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9306	0.9687	0.9544	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	604.6778	495.5119	500.2837	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	812.0280	778.1082	728.4611	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	149.2922	210.2516	169.7640	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	37.3230	52.5629	42.4410	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												132.3270	(107)
Energy for space heating												22.2903	(99)
Energy for space cooling												1.5263	(108)
Total												23.8166	(109)
Fabric Energy Efficiency (TFEE)												23.8	(109)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	83 B	**DER**	3.05	**TER**	9.93
Environmental	97 A	**% DER < TER**			69.28
CO_2 Emissions (t/year)	0.25	**DFEE**	19.61	**TFEE**	23.82
Compliance Check	See BREL	**% DFEE < TFEE**			17.65
% DPER < TPER	38.38	**DPER**	32.31	**TPER**	52.44

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)									(28)...(30) + (32) + (32a)...(32e) =			17650.3300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												203.5794	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												2.7933	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss										(33) + (36) + (36a) =		27.3548	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778	(42)
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
12Total per year (kWh/year)												2752	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	652.0784	730.2946	789.6905	869.3922	912.9689	904.3786	866.5575	814.6416	757.3995	678.0557	637.1713	628.5612	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	
alpha	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	
util living area	0.9792	0.9585	0.9131	0.7944	0.6214	0.4401	0.3167	0.3520	0.5611	0.8423	0.9566	0.9831	(86)
MIT	20.3560	20.5138	20.7068	20.8972	20.9792	20.9978	20.9998	20.9996	20.9911	20.8757	20.5885	20.3132	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house	0.9747	0.9501	0.8968	0.7638	0.5803	0.3942	0.2681	0.3004	0.5089	0.8097	0.9463	0.9794	(89)
MIT 2	19.5774	19.7734	20.0073	20.2235	20.3063	20.3221	20.3233	20.3232	20.3174	20.2052	19.8684	19.5237	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8209	20.0050	20.2261	20.4342	20.5168	20.5334	20.5349	20.5348	20.5281	20.4149	20.0937	19.7707	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8209	20.0050	20.2261	20.4342	20.5168	20.5334	20.5349	20.5348	20.5281	20.4149	20.0937	19.7707	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9706	0.9456	0.8943	0.7690	0.5922	0.4085	0.2833	0.3166	0.5248	0.8144	0.9423	0.9756	(94)
Useful gains	632.9262	690.5459	706.2003	668.5908	540.6690	369.4323	245.4840	257.8883	397.5186	552.2070	600.4044	613.2422	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	968.5573	942.6040	856.5525	719.7730	550.1974	370.2664	245.5515	258.0238	401.1349	612.4828	810.8472	971.6605	(97)
Space heating kWh	249.7095	169.3831	111.8620	36.8511	7.0892	0.0000	0.0000	0.0000	0.0000	44.8452	151.5189	266.6632	(98a)
Space heating requirement - total per year (kWh/year)												1037.9222	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	249.7095	169.3831	111.8620	36.8511	7.0892	0.0000	0.0000	0.0000	0.0000	44.8452	151.5189	266.6632	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1037.9222	
Space heating per m2											(98c) / (4) =	11.9714	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	249.7095	169.3831	111.8620	36.8511	7.0892	0.0000	0.0000	0.0000	0.0000	44.8452	151.5189	266.6632	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	374.5643	254.0746	167.7930	55.2767	10.6338	0.0000	0.0000	0.0000	0.0000	67.2678	227.2783	399.9948	
Space heating requirement	374.5643	254.0746	167.7930	55.2767	10.6338	0.0000	0.0000	0.0000	0.0000	67.2678	227.2783	399.9948	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1556.8833	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												15.5688	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5934.2050	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1515.8358	0.1576	65.4275	(367)
Electrical energy for heat distribution (space & water)	15.5688	0.0000	8.2692	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			228.7810	(373)
Space and water heating			228.7810	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Total CO2, kg/year			264.6496	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.0500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1515.8358	1.5834	657.3707	(467)
Electrical energy for heat distribution (space & water)	15.5688	0.0000	87.4306	(472)
Overall CO2 factor for heat network			0.4255	(486)
Total CO2 associated with community systems			2418.9139	(473)
Space and water heating			2418.9139	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Total Primary energy kWh/year			2801.3927	(483)
Dwelling Primary energy Rate (DPER)			32.3100	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
Heatloss Floor 1			43.3500	0.1300	5.6355			(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1247			(33)

Main dwelling

Party Wall	79.3600	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E5 Ground floor (normal)	6.7700	0.1600	1.0832
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P1 Party wall - Ground floor	19.4300	0.0800	1.5544
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0424 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 31.1671 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	71.4535	71.2501	71.0507	70.1143	69.9391	69.1235	69.1235	68.9725	69.4377	69.9391	70.2935	70.6641	(39)
Average = Sum(39)m / 12 =												70.1135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8241	0.8218	0.8195	0.8087	0.8067	0.7973	0.7973	0.7955	0.8009	0.8067	0.8108	0.8150	(40)
HLP (average)												0.8087	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
									Total per year (kWh/year) = Sum(64)m =			2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
West					9.2400	19.6403		0.6300	0.7000	0.7700		55.4614	(80)
Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)
Total gains	634.2986	701.5715	746.4857	809.2850	840.7342	827.5835	792.9978	750.1384	705.1835	645.1554	616.5661	612.8145	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3015	70.5022	70.7000	71.6442	71.8237	72.6712	72.6712	72.8303	72.3424	71.8237	71.4616	71.0868	
alpha	5.6868	5.7001	5.7133	5.7763	5.7882	5.8447	5.8447	5.8554	5.8228	5.7882	5.7641	5.7391	
util living area	0.9869	0.9755	0.9506	0.8718	0.7256	0.5281	0.3827	0.4214	0.6547	0.8987	0.9728	0.9890	(86)
MIT	20.1338	20.2930	20.5099	20.7811	20.9380	20.9918	20.9989	20.9982	20.9732	20.7737	20.4221	20.1108	(87)
Th 2	20.2325	20.2345	20.2365	20.2458	20.2475	20.2557	20.2557	20.2572	20.2526	20.2475	20.2440	20.2403	(88)
util rest of house	0.9838	0.9698	0.9391	0.8450	0.6794	0.4693	0.3184	0.3541	0.5925	0.8711	0.9654	0.9863	(89)
MIT 2	19.2244	19.4263	19.6971	20.0263	20.1952	20.2506	20.2553	20.2564	20.2340	20.0258	19.5980	19.2015	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.5089	19.6974	19.9513	20.2624	20.4275	20.4824	20.4879	20.4884	20.4653	20.2597	19.8558	19.4860	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5089	19.6974	19.9513	20.2624	20.4275	20.4824	20.4879	20.4884	20.4653	20.2597	19.8558	19.4860	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9800	0.9649	0.9341	0.8456	0.6908	0.4874	0.3385	0.3752	0.6107	0.8716	0.9608	0.9829	(94)
Useful gains	621.5918	676.9382	697.2896	684.3671	580.8200	403.3397	268.4262	281.4173	430.6569	562.3167	592.4069	602.3346	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1086.7269	1054.3197	955.7277	796.6638	610.3965	406.6140	268.7448	281.9902	441.9886	675.5921	896.6507	1080.1680	(97)
Space heating kWh	346.0605	253.6004	192.2779	80.8537	22.0049	0.0000	0.0000	0.0000	0.0000	84.2769	219.0556	355.5081	(98a)
Space heating requirement - total per year (kWh/year)												1553.6380	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	346.0605	253.6004	192.2779	80.8537	22.0049	0.0000	0.0000	0.0000	0.0000	84.2769	219.0556	355.5081	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1553.6380	
Space heating per m2											(98c) / (4) =	17.9197	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	346.0605	253.6004	192.2779	80.8537	22.0049	0.0000	0.0000	0.0000	0.0000	84.2769	219.0556	355.5081	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	374.9301	274.7566	208.3185	87.5988	23.8406	0.0000	0.0000	0.0000	0.0000	91.3076	237.3300	385.1659	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9387	84.5209	83.7641	82.2575	80.6576	79.8000	79.8000	79.8000	79.8000	82.3096	84.1786	85.0212	(217)
Fuel for water heating, kWh/month	275.1175	244.3994	262.0528	235.1664	232.7696	212.3443	209.9929	218.2535	220.5242	237.9658	246.8257	271.9522	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.0522	-34.0491	-51.2340	-60.3739	-67.5059	-63.8722	-63.0931	-58.3837	-50.4758	-40.1585	-25.8892	-19.7533	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.6843	-18.6438	-37.7720	-57.7989	-77.4856	-78.2579	-77.3368	-64.9856	-46.9877	-27.0053	-11.7029	-6.8394	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1683.2481	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2867.3643	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1071.3411	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3789.6495	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1683.2481	0.2100	353.4821	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2867.3643	0.2100	602.1465	(264)
Space and water heating			955.6286	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	0.1336	-74.5440	
PV Unit electricity exported	-513.5003	0.1254	-64.3679	
Total			-138.9120	(269)
Total CO2, kg/year			861.0306	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.9300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1683.2481	1.1300	1902.0704	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2867.3643	1.1300	3240.1217	(278)
Space and water heating			5142.1920	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	1.4938	-833.3127	
PV Unit electricity exported	-513.5003	0.4601	-236.2611	
Total			-1069.5738	(283)
Total Primary energy kWh/year			4546.8779	(286)
Target Primary Energy Rate (TPER)			52.4400	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Clean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	83 B	**DER**	3.05	**TER**	9.93
Environmental	97 A	**% DER < TER**			69.28
CO_2 Emissions (t/year)	0.25	**DFEE**	19.61	**TFEE**	23.82
Compliance Check	See BREL	**% DFEE < TFEE**			17.65
% DPER < TPER	38.38	**DPER**	32.31	**TPER**	52.44

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	706.5297	768.1759	833.8294	897.3119	933.0604	910.4848	872.9142	823.2320	769.6084	706.4837	673.4276	678.8029	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area													
	0.9712	0.9505	0.8969	0.7797	0.6102	0.4373	0.3144	0.3484	0.5533	0.8250	0.9472	0.9769	(86)
MIT	20.4434	20.5707	20.7545	20.9133	20.9828	20.9981	20.9998	20.9996	20.9925	20.8965	20.6410	20.3976	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house													
	0.9651	0.9407	0.8785	0.7482	0.5693	0.3917	0.2661	0.2973	0.5014	0.7906	0.9350	0.9719	(89)
MIT 2	19.6853	19.8421	20.0623	20.2402	20.3094	20.3223	20.3233	20.3233	20.3184	20.2266	19.9311	19.6283	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9224	20.0700	20.2788	20.4507	20.5201	20.5337	20.5349	20.5348	20.5293	20.4362	20.1532	19.8689	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9224	20.0700	20.2788	20.4507	20.5201	20.5337	20.5349	20.5348	20.5293	20.4362	20.1532	19.8689	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9609	0.9365	0.8772	0.7544	0.5813	0.4059	0.2812	0.3133	0.5173	0.7966	0.9316	0.9679	(94)
Useful gains	678.9085	719.4095	731.3969	676.9021	542.3988	369.5665	245.4983	257.9174	398.1471	562.8187	627.3317	656.9944	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	974.8915	946.6594	859.8430	720.8045	550.4004	370.2822	245.5532	258.0272	401.2087	613.8092	814.5609	977.7911	(97)
Space heating kWh	220.2114	152.7119	95.5639	31.6097	5.9532	0.0000	0.0000	0.0000	0.0000	37.9370	134.8051	238.6728	(98a)
Space heating requirement - total per year (kWh/year)												917.4649	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	220.2114	152.7119	95.5639	31.6097	5.9532	0.0000	0.0000	0.0000	0.0000	37.9370	134.8051	238.6728	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												917.4649	
Space heating per m2											(98c) / (4) =	10.5821	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	220.2114	152.7119	95.5639	31.6097	5.9532	0.0000	0.0000	0.0000	0.0000	37.9370	134.8051	238.6728	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	330.3170	229.0679	143.3458	47.4146	8.9298	0.0000	0.0000	0.0000	0.0000	56.9055	202.2076	358.0092	
Space heating requirement													
	330.3170	229.0679	143.3458	47.4146	8.9298	0.0000	0.0000	0.0000	0.0000	56.9055	202.2076	358.0092	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1376.1973	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												13.7620	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5753.5190	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1376.1973	4.4400	61.1032	(340a)
Space heating total			61.1032	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Total energy cost			377.5596	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0321 (357)
SAP value		83.2704
SAP rating (Section 12)		83 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1467.6529	0.1577	57.8697	(367)
Electrical energy for heat distribution (space & water)	13.7620	0.0000	7.9858	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			220.9398	(373)
Space and water heating			220.9398	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Total CO2, kg/year			256.8085	(383)
CO2 emissions per m2			2.9600	(384)
EI value			97.3871	(384a)
EI rating			97	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation		0.5000 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778	(42)
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
									Total per year (kWh/year) = Sum(64)m =			2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)

Water heating gains (Table 5)

	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702 (72)
Total internal gains												
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827 (73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	23.7835	0.7600	0.7000	0.7700	65.5876	(80)
West	1.7600	23.7835	0.7600	0.7000	0.7700	15.4324	(80)

Solar gains	81.0200	140.8292	228.1692	335.8028	395.8111	434.4066	405.9044	355.9037	279.8628	176.2264	99.5150	67.0100 (83)
Total gains	720.6439	778.1231	846.4545	918.7565	943.6137	950.5115	903.3528	856.6161	798.7845	727.4075	689.5188	690.7928 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area	0.9657	0.9434	0.8775	0.7484	0.5741	0.3803	0.2694	0.2986	0.5119	0.7847	0.9343	0.9726	(86)
MIT	20.4879	20.6061	20.7954	20.9335	20.9883	20.9992	20.9999	20.9999	20.9954	20.9265	20.6900	20.4405	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house	0.9585	0.9323	0.8564	0.7149	0.5324	0.3361	0.2227	0.2494	0.4609	0.7460	0.9195	0.9667	(89)
MIT 2	19.7406	19.8853	20.1096	20.2611	20.3143	20.3230	20.3234	20.3234	20.3204	20.2573	19.9899	19.6820	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9743	20.1108	20.3241	20.4714	20.5251	20.5345	20.5350	20.5350	20.5316	20.4666	20.2089	19.9193	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9743	20.1108	20.3241	20.4714	20.5251	20.5345	20.5350	20.5350	20.5316	20.4666	20.2089	19.9193	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9542	0.9284	0.8564	0.7225	0.5450	0.3499	0.2373	0.2648	0.4767	0.7545	0.9167	0.9625	(94)
Useful gains	687.6309	722.3789	724.9117	663.7583	514.2262	332.6205	214.3390	226.7993	380.7829	548.8609	632.0886	664.9114	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	959.4096	930.4829	831.4699	697.1320	519.5167	332.8923	214.3562	226.8346	382.6299	584.5089	793.0766	962.2142	(97)
Space heating kWh	202.2034	139.8458	79.2793	24.0291	3.9361	0.0000	0.0000	0.0000	0.0000	26.5221	115.9113	221.1932	(98a)
Space heating requirement - total per year (kWh/year)												812.9203	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	202.2034	139.8458	79.2793	24.0291	3.9361	0.0000	0.0000	0.0000	0.0000	26.5221	115.9113	221.1932	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												812.9203	
Space heating per m2											(98c) / (4) =	9.3762	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	202.2034	139.8458	79.2793	24.0291	3.9361	0.0000	0.0000	0.0000	0.0000	26.5221	115.9113	221.1932	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	303.3050	209.7688	118.9189	36.0436	5.9042	0.0000	0.0000	0.0000	0.0000	39.7831	173.8669	331.7899	
Space heating requirement													
	303.3050	209.7688	118.9189	36.0436	5.9042	0.0000	0.0000	0.0000	0.0000	39.7831	173.8669	331.7899	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year

Space heating fuel - community heating	1219.3805	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4127.5010	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	12.1938	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5596.7022	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1219.3805	6.5500	79.8694	(340a)
Space heating total			79.8694	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Total energy cost			525.2448	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1425.8351	0.1582	51.4336	(367)
Electrical energy for heat distribution (space & water)	12.1938	0.0000	7.7444	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			214.2623	(373)
Space and water heating			214.2623	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Total CO2, kg/year			250.1310	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1425.8351	1.5855	515.5619	(467)
Electrical energy for heat distribution (space & water)	12.1938	0.0000	82.1128	(472)
Overall CO2 factor for heat network			0.4249	(486)
Total CO2 associated with community systems			2271.7872	(473)
Space and water heating			2271.7872	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Total Primary energy kWh/year			2654.2660	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Be Clean

Current energy efficiency rating: B 83
Current environmental impact rating: A 97

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: B 83
Potential environmental impact rating: A 97

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)

Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£71	£71	£0
Community scheme	£454	£454	£0
Space heating	£193	£193	£0
Water heating	£270	£270	£0
Lighting	£62	£62	£0
Total cost of fuels	£525	£525	£0
Total cost of uses	£525	£525	£0
Delivered energy	65 kWh/m²	65 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	3 kg/m²	3 kg/m²	0 kg/m²
Primary energy	31 kWh/m²	31 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		18083.8300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							208.5794	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							2.7933	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		27.3548	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778	(42)
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	706.5297	768.1759	833.8294	897.3119	933.0604	910.4848	872.9142	823.2320	769.6084	706.4837	673.4276	678.8029	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	

util living area													
	0.9712	0.9505	0.8969	0.7797	0.6102	0.4373	0.3144	0.3484	0.5533	0.8250	0.9472	0.9769	(86)
MIT	20.4434	20.5707	20.7545	20.9133	20.9828	20.9981	20.9998	20.9996	20.9925	20.8965	20.6410	20.3976	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house													
	0.9651	0.9407	0.8785	0.7482	0.5693	0.3917	0.2661	0.2973	0.5014	0.7906	0.9350	0.9719	(89)
MIT 2	19.6853	19.8421	20.0623	20.2402	20.3094	20.3223	20.3233	20.3233	20.3184	20.2266	19.9311	19.6283	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9224	20.0700	20.2788	20.4507	20.5201	20.5337	20.5349	20.5348	20.5293	20.4362	20.1532	19.8689	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9224	20.0700	20.2788	20.4507	20.5201	20.5337	20.5349	20.5348	20.5293	20.4362	20.1532	19.8689	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9609	0.9365	0.8772	0.7544	0.5813	0.4059	0.2812	0.3133	0.5173	0.7966	0.9316	0.9679	(94)
Useful gains	678.9085	719.4095	731.3969	676.9021	542.3988	369.5665	245.4983	257.9174	398.1471	562.8187	627.3317	656.9944	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	974.8915	946.6594	859.8430	720.8045	550.4004	370.2822	245.5532	258.0272	401.2087	613.8092	814.5609	977.7911	(97)
Space heating kWh													
	220.2114	152.7119	95.5639	31.6097	5.9532	0.0000	0.0000	0.0000	0.0000	37.9370	134.8051	238.6728	(98a)
Space heating requirement - total per year (kWh/year)												917.4649	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	220.2114	152.7119	95.5639	31.6097	5.9532	0.0000	0.0000	0.0000	0.0000	37.9370	134.8051	238.6728	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												917.4649	
Space heating per m2											(98c) / (4) =	10.5821	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	220.2114	152.7119	95.5639	31.6097	5.9532	0.0000	0.0000	0.0000	0.0000	37.9370	134.8051	238.6728	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	330.3170	229.0679	143.3458	47.4146	8.9298	0.0000	0.0000	0.0000	0.0000	56.9055	202.2076	358.0092	
Space heating requirement													
	330.3170	229.0679	143.3458	47.4146	8.9298	0.0000	0.0000	0.0000	0.0000	56.9055	202.2076	358.0092	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1376.1973	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												13.7620	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												5753.5190	(338)

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating from Heat pump	1376.1973	4.4400	61.1032	(340a)
Space heating total			61.1032	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Total energy cost			377.5596	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0321	(357)
SAP value		83.2704	
SAP rating (Section 12)		83	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1467.6529	0.1577	57.8697	(367)
Electrical energy for heat distribution (space & water)	13.7620	0.0000	7.9858	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			220.9398	(373)
Space and water heating			220.9398	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Total CO2, kg/year			256.8085	(383)
CO2 emissions per m2			2.9600	(384)
EI value			97.3871	(384a)
EI rating			97	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5778 (42)
Hot water usage for mixer showers	67.4410 66.4275 64.9507 62.1249 60.0396 57.7140 56.3922 57.8579 59.4646 61.9615 64.8480	67.1826 (42a)
Hot water usage for baths	29.1251 28.6925 28.0834 26.9603 26.1193 25.1868 24.6831 25.2880 25.9466 26.9444 28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293 39.5373 38.0453 36.5534 35.0614 33.5694 33.5694 35.0614 36.5534 38.0453 39.5373	41.0293 (42c)
Average daily hot water use (litres/day)		126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
									Total per year (kWh/year) = Sum(64)m =			2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	23.7835	0.7600	0.7000	0.7700	65.5876	(80)
West	1.7600	23.7835	0.7600	0.7000	0.7700	15.4324	(80)

Solar gains	81.0200	140.8292	228.1692	335.8028	395.8111	434.4066	405.9044	355.9037	279.8628	176.2264	99.5150	67.0100	(83)
Total gains	720.6439	778.1231	846.4545	918.7565	943.6137	950.5115	903.3528	856.6161	798.7845	727.4075	689.5188	690.7928	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area	0.9657	0.9434	0.8775	0.7484	0.5741	0.3803	0.2694	0.2986	0.5119	0.7847	0.9343	0.9726	(86)
MIT	20.4879	20.6061	20.7954	20.9335	20.9883	20.9992	20.9999	20.9999	20.9954	20.9265	20.6900	20.4405	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house	0.9585	0.9323	0.8564	0.7149	0.5324	0.3361	0.2227	0.2494	0.4609	0.7460	0.9195	0.9667	(89)
MIT 2	19.7406	19.8853	20.1096	20.2611	20.3143	20.3230	20.3234	20.3234	20.3204	20.2573	19.9899	19.6820	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9743	20.1108	20.3241	20.4714	20.5251	20.5345	20.5350	20.5350	20.5316	20.4666	20.2089	19.9193	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9743	20.1108	20.3241	20.4714	20.5251	20.5345	20.5350	20.5350	20.5316	20.4666	20.2089	19.9193	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9542	0.9284	0.8564	0.7225	0.5450	0.3499	0.2373	0.2648	0.4767	0.7545	0.9167	0.9625	(94)
Useful gains	687.6309	722.3789	724.9117	663.7583	514.2262	332.6205	214.3390	226.7993	380.7829	548.8609	632.0886	664.9114	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	959.4096	930.4829	831.4699	697.1320	519.5167	332.8923	214.3562	226.8346	382.6299	584.5089	793.0766	962.2142	(97)
Space heating kWh	202.2034	139.8458	79.2793	24.0291	3.9361	0.0000	0.0000	0.0000	0.0000	26.5221	115.9113	221.1932	(98a)
Space heating requirement - total per year (kWh/year)												812.9203	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	202.2034	139.8458	79.2793	24.0291	3.9361	0.0000	0.0000	0.0000	0.0000	26.5221	115.9113	221.1932	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												812.9203	
Space heating per m2										(98c) / (4) =		9.3762	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	202.2034	139.8458	79.2793	24.0291	3.9361	0.0000	0.0000	0.0000	0.0000	26.5221	115.9113	221.1932	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	303.3050	209.7688	118.9189	36.0436	5.9042	0.0000	0.0000	0.0000	0.0000	39.7831	173.8669	331.7899	
Space heating requirement	303.3050	209.7688	118.9189	36.0436	5.9042	0.0000	0.0000	0.0000	0.0000	39.7831	173.8669	331.7899	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1219.3805	(307)
Space heating fuel - secondary												0.0000	(309)

Water heating fuel - community heating	4127.5010	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	12.1938	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5596.7022	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1219.3805	6.5500	79.8694	(340a)
Space heating total			79.8694	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Total energy cost			525.2448	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1425.8351	0.1582	51.4336	(367)
Electrical energy for heat distribution (space & water)	12.1938	0.0000	7.7444	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			214.2623	(373)
Space and water heating			214.2623	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Total CO2, kg/year			250.1310	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1425.8351	1.5855	515.5619	(467)
Electrical energy for heat distribution (space & water)	12.1938	0.0000	82.1128	(472)
Overall CO2 factor for heat network			0.4249	(486)
Total CO2 associated with community systems			2271.7872	(473)
Space and water heating			2271.7872	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Total Primary energy kWh/year			2654.2660	(483)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.65	**TER**	9.93
Environmental	99 A	**% DER < TER**			83.38
CO_2 Emissions (t/year)	0.12	**DFEE**	19.61	**TFEE**	23.82
Compliance Check	See BREL	**% DFEE < TFEE**			17.65
% DPER < TPER	59.18	**DPER**	21.41	**TPER**	52.44

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17650.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 203.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674 (64)
12Total per year (kWh/year)												2752 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201 (83)
Total gains	652.0784	730.2946	789.6905	869.3922	912.9689	904.3786	866.5575	814.6416	757.3995	678.0557	637.1713	628.5612 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	
alpha	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	
util living area	0.9792	0.9585	0.9131	0.7944	0.6214	0.4401	0.3167	0.3520	0.5611	0.8423	0.9566	0.9831	(86)
MIT	20.3560	20.5138	20.7068	20.8972	20.9792	20.9978	20.9998	20.9996	20.9911	20.8757	20.5885	20.3132	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house	0.9747	0.9501	0.8968	0.7638	0.5803	0.3942	0.2681	0.3004	0.5089	0.8097	0.9463	0.9794	(89)
MIT 2	19.5774	19.7734	20.0073	20.2235	20.3063	20.3221	20.3233	20.3232	20.3174	20.2052	19.8684	19.5237	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8209	20.0050	20.2261	20.4342	20.5168	20.5334	20.5349	20.5348	20.5281	20.4149	20.0937	19.7707	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8209	20.0050	20.2261	20.4342	20.5168	20.5334	20.5349	20.5348	20.5281	20.4149	20.0937	19.7707	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9706	0.9456	0.8943	0.7690	0.5922	0.4085	0.2833	0.3166	0.5248	0.8144	0.9423	0.9756	(94)
Useful gains	632.9262	690.5459	706.2003	668.5908	540.6690	369.4323	245.4840	257.8883	397.5186	552.2070	600.4044	613.2422	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	968.5573	942.6040	856.5525	719.7730	550.1974	370.2664	245.5515	258.0238	401.1349	612.4828	810.8472	971.6605	(97)
Space heating kWh	249.7095	169.3831	111.8620	36.8511	7.0892	0.0000	0.0000	0.0000	0.0000	44.8452	151.5189	266.6632	(98a)
Space heating requirement - total per year (kWh/year)												1037.9222	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	249.7095	169.3831	111.8620	36.8511	7.0892	0.0000	0.0000	0.0000	0.0000	44.8452	151.5189	266.6632	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1037.9222	
Space heating per m2											(98c) / (4) =	11.9714	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	249.7095	169.3831	111.8620	36.8511	7.0892	0.0000	0.0000	0.0000	0.0000	44.8452	151.5189	266.6632	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	374.5643	254.0746	167.7930	55.2767	10.6338	0.0000	0.0000	0.0000	0.0000	67.2678	227.2783	399.9948	
Space heating requirement	374.5643	254.0746	167.7930	55.2767	10.6338	0.0000	0.0000	0.0000	0.0000	67.2678	227.2783	399.9948	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1556.8833	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												15.5688	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4975.9841	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1515.8358	0.1576	65.4275	(367)
Electrical energy for heat distribution (space & water)	15.5688	0.0000	8.2692	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			228.7810	(373)
Space and water heating			228.7810	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			143.2061	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1515.8358	1.5834	657.3707	(467)
Electrical energy for heat distribution (space & water)	15.5688	0.0000	87.4306	(472)
Overall CO2 factor for heat network			0.4255	(486)
Total CO2 associated with community systems			2418.9139	(473)
Space and water heating			2418.9139	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1855.9706	(483)
Dwelling Primary energy Rate (DPER)			21.4100	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
Heatloss Floor 1			43.3500	0.1300	5.6355			(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1247			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E5 Ground floor (normal)	6.7700	0.1600	1.0832
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P1 Party wall - Ground floor	19.4300	0.0800	1.5544
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0424 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.1671 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	71.4535	71.2501	71.0507	70.1143	69.9391	69.1235	69.1235	68.9725	69.4377	69.9391	70.2935	70.6641	(39)
Average = Sum(39)m / 12 =												70.1135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8241	0.8218	0.8195	0.8087	0.8067	0.7973	0.7973	0.7955	0.8009	0.8067	0.8108	0.8150	(40)
HLP (average)												0.8087	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
										Total per year (kWh/year) = Sum(64)m =		2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(80)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)
Total gains	634.2986	701.5715	746.4857	809.2850	840.7342	827.5835	792.9978	750.1384	705.1835	645.1554	616.5661	612.8145	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3015	70.5022	70.7000	71.6442	71.8237	72.6712	72.6712	72.8303	72.3424	71.8237	71.4616	71.0868	
alpha	5.6868	5.7001	5.7133	5.7763	5.7882	5.8447	5.8447	5.8554	5.8228	5.7882	5.7641	5.7391	
util living area	0.9869	0.9755	0.9506	0.8718	0.7256	0.5281	0.3827	0.4214	0.6547	0.8987	0.9728	0.9890	(86)
MIT	20.1338	20.2930	20.5099	20.7811	20.9380	20.9918	20.9989	20.9982	20.9732	20.7737	20.4221	20.1108	(87)
Th 2	20.2325	20.2345	20.2365	20.2458	20.2475	20.2557	20.2557	20.2572	20.2526	20.2475	20.2440	20.2403	(88)
util rest of house	0.9838	0.9698	0.9391	0.8450	0.6794	0.4693	0.3184	0.3541	0.5925	0.8711	0.9654	0.9863	(89)
MIT 2	19.2244	19.4263	19.6971	20.0263	20.1952	20.2506	20.2553	20.2564	20.2340	20.0258	19.5980	19.2015	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.5089	19.6974	19.9513	20.2624	20.4275	20.4824	20.4879	20.4884	20.4653	20.2597	19.8558	19.4860	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5089	19.6974	19.9513	20.2624	20.4275	20.4824	20.4879	20.4884	20.4653	20.2597	19.8558	19.4860	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9800	0.9649	0.9341	0.8456	0.6908	0.4874	0.3385	0.3752	0.6107	0.8716	0.9608	0.9829	(94)
Useful gains	621.5918	676.9382	697.2896	684.3671	580.8200	403.3397	268.4262	281.4173	430.6569	562.3167	592.4069	602.3346	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1086.7269	1054.3197	955.7277	796.6638	610.3965	406.6140	268.7448	281.9902	441.9886	675.5921	896.6507	1080.1680	(97)
Space heating kWh	346.0605	253.6004	192.2779	80.8537	22.0049	0.0000	0.0000	0.0000	0.0000	84.2769	219.0556	355.5081	(98a)
Space heating requirement - total per year (kWh/year)												1553.6380	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	346.0605	253.6004	192.2779	80.8537	22.0049	0.0000	0.0000	0.0000	0.0000	84.2769	219.0556	355.5081	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1553.6380	
Space heating per m2											(98c) / (4) =	17.9197	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	346.0605	253.6004	192.2779	80.8537	22.0049	0.0000	0.0000	0.0000	0.0000	84.2769	219.0556	355.5081	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	374.9301	274.7566	208.3185	87.5988	23.8406	0.0000	0.0000	0.0000	0.0000	91.3076	237.3300	385.1659	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9387	84.5209	83.7641	82.2575	80.6576	79.8000	79.8000	79.8000	79.8000	82.3096	84.1786	85.0212	(217)
Fuel for water heating, kWh/month	275.1175	244.3994	262.0528	235.1664	232.7696	212.3443	209.9929	218.2535	220.5242	237.9658	246.8257	271.9522	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.0522	-34.0491	-51.2340	-60.3739	-67.5059	-63.8722	-63.0931	-58.3837	-50.4758	-40.1585	-25.8892	-19.7533	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.6843	-18.6438	-37.7720	-57.7989	-77.4856	-78.2579	-77.3368	-64.9856	-46.9877	-27.0053	-11.7029	-6.8394	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1683.2481	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2867.3643	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1071.3411	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3789.6495	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1683.2481	0.2100	353.4821	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2867.3643	0.2100	602.1465	(264)
Space and water heating			955.6286	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	0.1336	-74.5440	
PV Unit electricity exported	-513.5003	0.1254	-64.3679	
Total			-138.9120	(269)
Total CO2, kg/year			861.0306	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.9300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1683.2481	1.1300	1902.0704	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2867.3643	1.1300	3240.1217	(278)
Space and water heating			5142.1920	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	1.4938	-833.3127	
PV Unit electricity exported	-513.5003	0.4601	-236.2611	
Total			-1069.5738	(283)
Total Primary energy kWh/year			4546.8779	(286)
Target Primary Energy Rate (TPER)			52.4400	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.65	**TER**	9.93
Environmental	99 A	**% DER < TER**			83.38
CO_2 Emissions (t/year)	0.12	**DFEE**	19.61	**TFEE**	23.82
Compliance Check	See BREL	**% DFEE < TFEE**			17.65
% DPER < TPER	59.18	**DPER**	21.41	**TPER**	52.44

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2257	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2878	0.2821	0.2765	0.2483	0.2426	0.2144	0.2144	0.2088	0.2257	0.2426	0.2539	0.2652	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5414	0.5398	0.5382	0.5308	0.5294	0.5230	0.5230	0.5218	0.5255	0.5294	0.5322	0.5352	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		18083.8300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							208.5794	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9510	37.8383	37.7278	37.2089	37.1118	36.6599	36.6599	36.5762	36.8339	37.1118	37.3082	37.5135	(38)
Heat transfer coeff	65.3058	65.1931	65.0826	64.5637	64.4666	64.0147	64.0147	63.9310	64.1888	64.4666	64.6630	64.8684	(39)
Average = Sum(39)m / 12 =												64.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7532	0.7519	0.7507	0.7447	0.7436	0.7383	0.7383	0.7374	0.7404	0.7436	0.7458	0.7482	(40)
HLP (average)												0.7447	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
									Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)											908	(64)

Electric shower(s)

54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 614.3496 (64a)

Heat gains from water heating, kWh/month

37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	545.1343	624.6069	686.9038	773.6007	821.2924	817.0482	782.1979	728.3014	668.6668	584.4747	536.9133	522.5689	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.9194	77.0524	77.1832	77.8035	77.9207	78.4708	78.4708	78.5736	78.2580	77.9207	77.6840	77.4381	
alpha	6.1280	6.1368	6.1455	6.1869	6.1947	6.2314	6.2314	6.2382	6.2172	6.1947	6.1789	6.1625	
util living area	0.9928	0.9828	0.9569	0.8650	0.6987	0.4980	0.3597	0.4030	0.6442	0.9127	0.9829	0.9944	(86)

MIT	20.1474	20.3236	20.5553	20.8258	20.9600	20.9957	20.9995	20.9990	20.9811	20.7869	20.4232	20.1142	(87)
Th 2	20.2940	20.2952	20.2963	20.3015	20.3025	20.3071	20.3071	20.3079	20.3053	20.3025	20.3005	20.2985	(88)
util rest of house	0.9910	0.9787	0.9469	0.8386	0.6548	0.4455	0.3033	0.3428	0.5858	0.8884	0.9781	0.9929	(89)
MIT 2	19.5115	19.6862	19.9120	20.1657	20.2764	20.3050	20.3069	20.3076	20.2951	20.1373	19.7900	19.4822	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.7104	19.8856	20.1132	20.3722	20.4902	20.5210	20.5236	20.5239	20.5097	20.3405	19.9880	19.6799	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7104	19.8856	20.1132	20.3722	20.4902	20.5210	20.5236	20.5239	20.5097	20.3405	19.9880	19.6799	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9892	0.9758	0.9439	0.8415	0.6669	0.4618	0.3209	0.3616	0.6034	0.8899	0.9754	0.9914	(94)
Useful gains	539.2247	609.5155	648.3454	650.9535	547.7288	377.3310	251.0226	263.3471	403.4594	520.1241	523.7266	518.0501	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1006.3914	976.9551	885.9846	740.6854	566.6755	379.0332	251.1663	263.6444	411.4276	627.9374	833.3797	1004.1547	(97)
Space heating kWh	347.5720	246.9194	176.8036	64.6070	14.0964	0.0000	0.0000	0.0000	0.0000	80.2131	222.9502	361.6619	(98a)
Space heating requirement - total per year (kWh/year)												1514.8235	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	347.5720	246.9194	176.8036	64.6070	14.0964	0.0000	0.0000	0.0000	0.0000	80.2131	222.9502	361.6619	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1514.8235	
Space heating per m2											(98c) / (4) =	17.4720	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	601.7381	473.7088	485.8756	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9701	0.9885	0.9812	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	583.7487	468.2440	476.7501	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	890.8770	853.1757	792.9430	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	221.1324	286.3892	235.2475	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	55.2831	71.5973	58.8119	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												185.6923	(107)
Energy for space heating												17.4720	(99)
Energy for space cooling												2.1418	(108)
Total												19.6138	(109)
Fabric Energy Efficiency (DFEE)												19.6	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
Heatloss Floor 1			43.3500	0.1300	5.6355			(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1247			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	6.2700	0.0500	0.3135
E2 Other lintels (including other steel lintels)	2.5200	0.0500	0.1260
E3 Sill	20.7200	0.0500	1.0360
E4 Jamb	13.5400	0.0000	0.0000
E6 Intermediate floor within a dwelling	6.7700	0.1600	1.0832
E5 Ground floor (normal)	22.0000	0.0600	1.3200
E18 Party wall between dwellings	12.6600	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	19.4300	0.0800	1.5544
P1 Party wall - Ground floor	6.7700	0.0200	0.1354
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0700	0.4739
E7 Party floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0424 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.1671 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	71.4535	71.2501	71.0507	70.1143	69.9391	69.1235	69.1235	68.9725	69.4377	69.9391	70.2935	70.6641	(39)
Average = Sum(39)m / 12 =												70.1135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8241	0.8218	0.8195	0.8087	0.8067	0.7973	0.7973	0.7955	0.8009	0.8067	0.8108	0.8150	(40)
HLP (average)												0.8087	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122 (71)

Water heating gains (Table 5)

	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778 (72)

Total internal gains

	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(80)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088 (83)
Total gains	533.6898	602.2192	650.0344	719.8289	755.3931	749.5884	717.9735	673.1335	625.7862	557.9097	522.6435	513.1575 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3015	70.5022	70.7000	71.6442	71.8237	72.6712	72.6712	72.8303	72.3424	71.8237	71.4616	71.0868	
alpha	5.6868	5.7001	5.7133	5.7763	5.7882	5.8447	5.8447	5.8554	5.8228	5.7882	5.7641	5.7391	
util living area	0.9943	0.9878	0.9722	0.9127	0.7821	0.5788	0.4220	0.4683	0.7204	0.9399	0.9872	0.9954	(86)
MIT	19.9881	20.1562	20.3911	20.7067	20.9086	20.9869	20.9982	20.9968	20.9566	20.6888	20.2937	19.9650	(87)
Th 2	20.2325	20.2345	20.2365	20.2458	20.2475	20.2557	20.2557	20.2572	20.2526	20.2475	20.2440	20.2403	(88)
util rest of house	0.9928	0.9847	0.9650	0.8915	0.7378	0.5159	0.3514	0.3942	0.6574	0.9205	0.9834	0.9942	(89)
MIT 2	19.3031	19.4712	19.7034	20.0101	20.1855	20.2492	20.2551	20.2561	20.2282	20.0005	19.6160	19.2865	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.5174	19.6854	19.9185	20.2280	20.4117	20.4800	20.4876	20.4878	20.4560	20.2158	19.8280	19.4988	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5174	19.6854	19.9185	20.2280	20.4117	20.4800	20.4876	20.4878	20.4560	20.2158	19.8280	19.4988	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9910	0.9819	0.9614	0.8909	0.7480	0.5352	0.3735	0.4174	0.6753	0.9196	0.9807	0.9927	(94)
Useful gains	528.9006	591.3161	624.9258	641.3079	565.0433	401.1637	268.1836	280.9411	422.5869	513.0475	512.5746	509.3875	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1087.3358	1053.4647	953.3951	794.2554	609.2891	406.4436	268.7227	281.9472	441.3491	672.5188	894.6974	1081.0736	(97)
Space heating kWh	415.4757	310.5639	244.3812	110.1222	32.9189	0.0000	0.0000	0.0000	0.0000	118.6466	275.1285	425.3345	(98a)
Space heating requirement - total per year (kWh/year)												1932.5715	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	415.4757	310.5639	244.3812	110.1222	32.9189	0.0000	0.0000	0.0000	0.0000	118.6466	275.1285	425.3345	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1932.5715	
Space heating per m2										(98c) / (4) =		22.2903	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	649.7609	511.5139	524.1907	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9306	0.9687	0.9544	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	604.6778	495.5119	500.2837	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	812.0280	778.1082	728.4611	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	149.2922	210.2516	169.7640	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	37.3230	52.5629	42.4410	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												132.3270	(107)
Energy for space heating												22.2903	(99)
Energy for space cooling												1.5263	(108)
Total												23.8166	(109)
Fabric Energy Efficiency (TFEE)												23.8	(109)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.65	**TER**	9.93
Environmental	99 A	**% DER < TER**			83.38
CO_2 Emissions (t/year)	0.12	**DFEE**	19.61	**TFEE**	23.82
Compliance Check	See BREL	**% DFEE < TFEE**			17.65
% DPER < TPER	59.18	**DPER**	21.41	**TPER**	52.44

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17650.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 203.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674 (64)
12Total per year (kWh/year)												2752 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201 (83)
Total gains	652.0784	730.2946	789.6905	869.3922	912.9689	904.3786	866.5575	814.6416	757.3995	678.0557	637.1713	628.5612 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	
alpha	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	
util living area	0.9792	0.9585	0.9131	0.7944	0.6214	0.4401	0.3167	0.3520	0.5611	0.8423	0.9566	0.9831	(86)
MIT	20.3560	20.5138	20.7068	20.8972	20.9792	20.9978	20.9998	20.9996	20.9911	20.8757	20.5885	20.3132	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house	0.9747	0.9501	0.8968	0.7638	0.5803	0.3942	0.2681	0.3004	0.5089	0.8097	0.9463	0.9794	(89)
MIT 2	19.5774	19.7734	20.0073	20.2235	20.3063	20.3221	20.3233	20.3232	20.3174	20.2052	19.8684	19.5237	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8209	20.0050	20.2261	20.4342	20.5168	20.5334	20.5349	20.5348	20.5281	20.4149	20.0937	19.7707	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8209	20.0050	20.2261	20.4342	20.5168	20.5334	20.5349	20.5348	20.5281	20.4149	20.0937	19.7707	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9706	0.9456	0.8943	0.7690	0.5922	0.4085	0.2833	0.3166	0.5248	0.8144	0.9423	0.9756	(94)
Useful gains	632.9262	690.5459	706.2003	668.5908	540.6690	369.4323	245.4840	257.8883	397.5186	552.2070	600.4044	613.2422	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	968.5573	942.6040	856.5525	719.7730	550.1974	370.2664	245.5515	258.0238	401.1349	612.4828	810.8472	971.6605	(97)
Space heating kWh	249.7095	169.3831	111.8620	36.8511	7.0892	0.0000	0.0000	0.0000	0.0000	44.8452	151.5189	266.6632	(98a)
Space heating requirement - total per year (kWh/year)												1037.9222	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	249.7095	169.3831	111.8620	36.8511	7.0892	0.0000	0.0000	0.0000	0.0000	44.8452	151.5189	266.6632	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1037.9222	
Space heating per m2											(98c) / (4) =	11.9714	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	249.7095	169.3831	111.8620	36.8511	7.0892	0.0000	0.0000	0.0000	0.0000	44.8452	151.5189	266.6632	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	374.5643	254.0746	167.7930	55.2767	10.6338	0.0000	0.0000	0.0000	0.0000	67.2678	227.2783	399.9948	
Space heating requirement	374.5643	254.0746	167.7930	55.2767	10.6338	0.0000	0.0000	0.0000	0.0000	67.2678	227.2783	399.9948	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1556.8833	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												15.5688	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4975.9841	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1515.8358	0.1576	65.4275	(367)
Electrical energy for heat distribution (space & water)	15.5688	0.0000	8.2692	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			228.7810	(373)
Space and water heating			228.7810	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			143.2061	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1515.8358	1.5834	657.3707	(467)
Electrical energy for heat distribution (space & water)	15.5688	0.0000	87.4306	(472)
Overall CO2 factor for heat network			0.4255	(486)
Total CO2 associated with community systems			2418.9139	(473)
Space and water heating			2418.9139	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1855.9706	(483)
Dwelling Primary energy Rate (DPER)			21.4100	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
Heatloss Floor 1			43.3500	0.1300	5.6355			(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1247			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E5 Ground floor (normal)	6.7700	0.1600	1.0832
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P1 Party wall - Ground floor	19.4300	0.0800	1.5544
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0424 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.1671 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	71.4535	71.2501	71.0507	70.1143	69.9391	69.1235	69.1235	68.9725	69.4377	69.9391	70.2935	70.6641	(39)
Average = Sum(39)m / 12 =												70.1135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8241	0.8218	0.8195	0.8087	0.8067	0.7973	0.7973	0.7955	0.8009	0.8067	0.8108	0.8150	(40)
HLP (average)												0.8087	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
										Total per year (kWh/year) = Sum(64)m =		2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(80)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)
Total gains	634.2986	701.5715	746.4857	809.2850	840.7342	827.5835	792.9978	750.1384	705.1835	645.1554	616.5661	612.8145	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3015	70.5022	70.7000	71.6442	71.8237	72.6712	72.6712	72.8303	72.3424	71.8237	71.4616	71.0868	
alpha	5.6868	5.7001	5.7133	5.7763	5.7882	5.8447	5.8447	5.8554	5.8228	5.7882	5.7641	5.7391	
util living area	0.9869	0.9755	0.9506	0.8718	0.7256	0.5281	0.3827	0.4214	0.6547	0.8987	0.9728	0.9890	(86)
MIT	20.1338	20.2930	20.5099	20.7811	20.9380	20.9918	20.9989	20.9982	20.9732	20.7737	20.4221	20.1108	(87)
Th 2	20.2325	20.2345	20.2365	20.2458	20.2475	20.2557	20.2557	20.2572	20.2526	20.2475	20.2440	20.2403	(88)
util rest of house	0.9838	0.9698	0.9391	0.8450	0.6794	0.4693	0.3184	0.3541	0.5925	0.8711	0.9654	0.9863	(89)
MIT 2	19.2244	19.4263	19.6971	20.0263	20.1952	20.2506	20.2553	20.2564	20.2340	20.0258	19.5980	19.2015	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.5089	19.6974	19.9513	20.2624	20.4275	20.4824	20.4879	20.4884	20.4653	20.2597	19.8558	19.4860	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5089	19.6974	19.9513	20.2624	20.4275	20.4824	20.4879	20.4884	20.4653	20.2597	19.8558	19.4860	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9800	0.9649	0.9341	0.8456	0.6908	0.4874	0.3385	0.3752	0.6107	0.8716	0.9608	0.9829	(94)
Useful gains	621.5918	676.9382	697.2896	684.3671	580.8200	403.3397	268.4262	281.4173	430.6569	562.3167	592.4069	602.3346	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1086.7269	1054.3197	955.7277	796.6638	610.3965	406.6140	268.7448	281.9902	441.9886	675.5921	896.6507	1080.1680	(97)
Space heating kWh	346.0605	253.6004	192.2779	80.8537	22.0049	0.0000	0.0000	0.0000	0.0000	84.2769	219.0556	355.5081	(98a)
Space heating requirement - total per year (kWh/year)												1553.6380	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	346.0605	253.6004	192.2779	80.8537	22.0049	0.0000	0.0000	0.0000	0.0000	84.2769	219.0556	355.5081	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1553.6380	
Space heating per m2											(98c) / (4) =	17.9197	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	346.0605	253.6004	192.2779	80.8537	22.0049	0.0000	0.0000	0.0000	0.0000	84.2769	219.0556	355.5081	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	374.9301	274.7566	208.3185	87.5988	23.8406	0.0000	0.0000	0.0000	0.0000	91.3076	237.3300	385.1659	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9387	84.5209	83.7641	82.2575	80.6576	79.8000	79.8000	79.8000	79.8000	82.3096	84.1786	85.0212	(217)
Fuel for water heating, kWh/month	275.1175	244.3994	262.0528	235.1664	232.7696	212.3443	209.9929	218.2535	220.5242	237.9658	246.8257	271.9522	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.0522	-34.0491	-51.2340	-60.3739	-67.5059	-63.8722	-63.0931	-58.3837	-50.4758	-40.1585	-25.8892	-19.7533	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.6843	-18.6438	-37.7720	-57.7989	-77.4856	-78.2579	-77.3368	-64.9856	-46.9877	-27.0053	-11.7029	-6.8394	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1683.2481	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2867.3643	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1071.3411	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3789.6495	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1683.2481	0.2100	353.4821	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2867.3643	0.2100	602.1465	(264)
Space and water heating			955.6286	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	0.1336	-74.5440	
PV Unit electricity exported	-513.5003	0.1254	-64.3679	
Total			-138.9120	(269)
Total CO2, kg/year			861.0306	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.9300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1683.2481	1.1300	1902.0704	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2867.3643	1.1300	3240.1217	(278)
Space and water heating			5142.1920	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	1.4938	-833.3127	
PV Unit electricity exported	-513.5003	0.4601	-236.2611	
Total			-1069.5738	(283)
Total Primary energy kWh/year			4546.8779	(286)
Target Primary Energy Rate (TPER)			52.4400	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Green	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.65	**TER**	9.93
Environmental	99 A	**% DER < TER**			83.38
CO_2 Emissions (t/year)	0.12	**DFEE**	19.61	**TFEE**	23.82
Compliance Check	See BREL	**% DFEE < TFEE**			17.65
% DPER < TPER	59.18	**DPER**	21.41	**TPER**	52.44

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201 (83)
Total gains	706.5297	768.1759	833.8294	897.3119	933.0604	910.4848	872.9142	823.2320	769.6084	706.4837	673.4276	678.8029 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area	0.9712	0.9505	0.8969	0.7797	0.6102	0.4373	0.3144	0.3484	0.5533	0.8250	0.9472	0.9769	(86)
MIT	20.4434	20.5707	20.7545	20.9133	20.9828	20.9981	20.9998	20.9996	20.9925	20.8965	20.6410	20.3976	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house	0.9651	0.9407	0.8785	0.7482	0.5693	0.3917	0.2661	0.2973	0.5014	0.7906	0.9350	0.9719	(89)
MIT 2	19.6853	19.8421	20.0623	20.2402	20.3094	20.3223	20.3233	20.3233	20.3184	20.2266	19.9311	19.6283	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9224	20.0700	20.2788	20.4507	20.5201	20.5337	20.5349	20.5348	20.5293	20.4362	20.1532	19.8689	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9224	20.0700	20.2788	20.4507	20.5201	20.5337	20.5349	20.5348	20.5293	20.4362	20.1532	19.8689	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9609	0.9365	0.8772	0.7544	0.5813	0.4059	0.2812	0.3133	0.5173	0.7966	0.9316	0.9679	(94)
Useful gains	678.9085	719.4095	731.3969	676.9021	542.3988	369.5665	245.4983	257.9174	398.1471	562.8187	627.3317	656.9944	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	974.8915	946.6594	859.8430	720.8045	550.4004	370.2822	245.5532	258.0272	401.2087	613.8092	814.5609	977.7911	(97)
Space heating kWh	220.2114	152.7119	95.5639	31.6097	5.9532	0.0000	0.0000	0.0000	0.0000	37.9370	134.8051	238.6728	(98a)
Space heating requirement - total per year (kWh/year)												917.4649	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	220.2114	152.7119	95.5639	31.6097	5.9532	0.0000	0.0000	0.0000	0.0000	37.9370	134.8051	238.6728	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												917.4649	
Space heating per m2											(98c) / (4) =	10.5821	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	220.2114	152.7119	95.5639	31.6097	5.9532	0.0000	0.0000	0.0000	0.0000	37.9370	134.8051	238.6728	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	330.3170	229.0679	143.3458	47.4146	8.9298	0.0000	0.0000	0.0000	0.0000	56.9055	202.2076	358.0092	
Space heating requirement	330.3170	229.0679	143.3458	47.4146	8.9298	0.0000	0.0000	0.0000	0.0000	56.9055	202.2076	358.0092	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1376.1973	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												13.7620	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4795.2981	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1376.1973	4.4400	61.1032	(340a)
Space heating total			61.1032	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			269.6942	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7372 (357)
SAP value		88.0499
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1467.6529	0.1577	57.8697	(367)
Electrical energy for heat distribution (space & water)	13.7620	0.0000	7.9858	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			220.9398	(373)
Space and water heating			220.9398	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			135.3649	(383)
CO2 emissions per m2			1.5600	(384)
EI value			98.6227	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)

Average = Sum(39)m / 12 = 62.4033

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)

Total per year (kWh/year) = Sum(64)m = 2751.6674 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	23.7835	0.7600	0.7000	0.7700	65.5876	(80)
West	1.7600	23.7835	0.7600	0.7000	0.7700	15.4324	(80)

Solar gains	81.0200	140.8292	228.1692	335.8028	395.8111	434.4066	405.9044	355.9037	279.8628	176.2264	99.5150	67.0100	(83)
Total gains	720.6439	778.1231	846.4545	918.7565	943.6137	950.5115	903.3528	856.6161	798.7845	727.4075	689.5188	690.7928	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area													
	0.9657	0.9434	0.8775	0.7484	0.5741	0.3803	0.2694	0.2986	0.5119	0.7847	0.9343	0.9726	(86)
MIT	20.4879	20.6061	20.7954	20.9335	20.9883	20.9992	20.9999	20.9999	20.9954	20.9265	20.6900	20.4405	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house													
	0.9585	0.9323	0.8564	0.7149	0.5324	0.3361	0.2227	0.2494	0.4609	0.7460	0.9195	0.9667	(89)
MIT 2	19.7406	19.8853	20.1096	20.2611	20.3143	20.3230	20.3234	20.3234	20.3204	20.2573	19.9899	19.6820	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9743	20.1108	20.3241	20.4714	20.5251	20.5345	20.5350	20.5350	20.5316	20.4666	20.2089	19.9193	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9743	20.1108	20.3241	20.4714	20.5251	20.5345	20.5350	20.5350	20.5316	20.4666	20.2089	19.9193	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9542	0.9284	0.8564	0.7225	0.5450	0.3499	0.2373	0.2648	0.4767	0.7545	0.9167	0.9625	(94)
Useful gains	687.6309	722.3789	724.9117	663.7583	514.2262	332.6205	214.3390	226.7993	380.7829	548.8609	632.0886	664.9114	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	959.4096	930.4829	831.4699	697.1320	519.5167	332.8923	214.3562	226.8346	382.6299	584.5089	793.0766	962.2142	(97)
Space heating kWh													
	202.2034	139.8458	79.2793	24.0291	3.9361	0.0000	0.0000	0.0000	0.0000	26.5221	115.9113	221.1932	(98a)
Space heating requirement - total per year (kWh/year)												812.9203	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	202.2034	139.8458	79.2793	24.0291	3.9361	0.0000	0.0000	0.0000	0.0000	26.5221	115.9113	221.1932	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												812.9203	
Space heating per m2											(98c) / (4) =	9.3762	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	202.2034	139.8458	79.2793	24.0291	3.9361	0.0000	0.0000	0.0000	0.0000	26.5221	115.9113	221.1932	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	303.3050	209.7688	118.9189	36.0436	5.9042	0.0000	0.0000	0.0000	0.0000	39.7831	173.8669	331.7899	
Space heating requirement													
	303.3050	209.7688	118.9189	36.0436	5.9042	0.0000	0.0000	0.0000	0.0000	39.7831	173.8669	331.7899	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)

Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year	
Space heating fuel - community heating	1219.3805 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	12.1938 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)	
mechanical ventilation fans (SFP = 0.1292)	33.4924 (330a)
Total electricity for the above, kWh/year	33.4924 (331)
Electricity for lighting (calculated in Appendix L)	216.3282 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4541.9552 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1219.3805	6.5500	79.8694	(340a)
Space heating total			79.8694	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			343.1745	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1425.8351	0.1582	51.4336	(367)
Electrical energy for heat distribution (space & water)	12.1938	0.0000	7.7444	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			214.2623	(373)
Space and water heating			214.2623	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			116.4294	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1425.8351	1.5855	515.5619	(467)
Electrical energy for heat distribution (space & water)	12.1938	0.0000	82.1128	(472)
Overall CO2 factor for heat network			0.4249	(486)
Total CO2 associated with community systems			2271.7872	(473)
Space and water heating			2271.7872	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1627.9520	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Be Green

Current energy efficiency rating: B 88
Current environmental impact rating: A 99

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£71	£71	£0
Community scheme	£454	£454	£0
Space heating	£193	£193	£0
Water heating	£270	£270	£0
Lighting	£62	£62	£0
Generated (PV)	-£182	-£182	£0
Total cost of fuels	£343	£343	£0
Total cost of uses	£343	£343	£0
Delivered energy	52 kWh/m²	52 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	19 kWh/m²	19 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5778 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day)	126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	

Distribution loss (46)m = 0.15 x (45)m

32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss / Combi loss

Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS / PV diverter / Solar input / FGHRS

Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
									Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	706.5297	768.1759	833.8294	897.3119	933.0604	910.4848	872.9142	823.2320	769.6084	706.4837	673.4276	678.8029	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area	0.9712	0.9505	0.8969	0.7797	0.6102	0.4373	0.3144	0.3484	0.5533	0.8250	0.9472	0.9769	(86)
MIT	20.4434	20.5707	20.7545	20.9133	20.9828	20.9981	20.9998	20.9996	20.9925	20.8965	20.6410	20.3976	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house	0.9651	0.9407	0.8785	0.7482	0.5693	0.3917	0.2661	0.2973	0.5014	0.7906	0.9350	0.9719	(89)
MIT 2	19.6853	19.8421	20.0623	20.2402	20.3094	20.3223	20.3233	20.3233	20.3184	20.2266	19.9311	19.6283	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.9224	20.0700	20.2788	20.4507	20.5201	20.5337	20.5349	20.5348	20.5293	20.4362	20.1532	19.8689	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9224	20.0700	20.2788	20.4507	20.5201	20.5337	20.5349	20.5348	20.5293	20.4362	20.1532	19.8689	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9609	0.9365	0.8772	0.7544	0.5813	0.4059	0.2812	0.3133	0.5173	0.7966	0.9316	0.9679	(94)
Useful gains	678.9085	719.4095	731.3969	676.9021	542.3988	369.5665	245.4983	257.9174	398.1471	562.8187	627.3317	656.9944	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	974.8915	946.6594	859.8430	720.8045	550.4004	370.2822	245.5532	258.0272	401.2087	613.8092	814.5609	977.7911	(97)
Space heating kWh	220.2114	152.7119	95.5639	31.6097	5.9532	0.0000	0.0000	0.0000	0.0000	37.9370	134.8051	238.6728	(98a)
Space heating requirement - total per year (kWh/year)												917.4649	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	220.2114	152.7119	95.5639	31.6097	5.9532	0.0000	0.0000	0.0000	0.0000	37.9370	134.8051	238.6728	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												917.4649	
Space heating per m2										(98c) / (4) =		10.5821	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement

220.2114	152.7119	95.5639	31.6097	5.9532	0.0000	0.0000	0.0000	0.0000	37.9370	134.8051	238.6728	(98)

Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50

307a 330.3170	229.0679	143.3458	47.4146	8.9298	0.0000	0.0000	0.0000	0.0000	56.9055	202.2076	358.0092	
Space heating requirement												
330.3170	229.0679	143.3458	47.4146	8.9298	0.0000	0.0000	0.0000	0.0000	56.9055	202.2076	358.0092	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)

Space heating fuel for secondary/supplementary system

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)

Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50

310a 409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel												
409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)

Cooling System Energy Efficiency Ratio	0.0000 (314)

Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446 (331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496 (332)

Electricity generated by PVs (Appendix M) (negative quantity)

(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176 (333a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)

Electricity generated by PVs (Appendix M) (negative quantity)

(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314 (333b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year

Space heating fuel - community heating	1376.1973 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)

Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	13.7620	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4795.2981	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1376.1973	4.4400	61.1032	(340a)
Space heating total			61.1032	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			269.6942	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.7372	(357)
SAP value	88.0499	
SAP rating (Section 12)	88	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1467.6529	0.1577	57.8697	(367)
Electrical energy for heat distribution (space & water)	13.7620	0.0000	7.9858	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			220.9398	(373)
Space and water heating			220.9398	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			135.3649	(383)
CO2 emissions per m2			1.5600	(384)
EI value			98.6227	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 86.7000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5778	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	23.7835	0.7600	0.7000	0.7700	65.5876	(80)
West	1.7600	23.7835	0.7600	0.7000	0.7700	15.4324	(80)

Solar gains	81.0200	140.8292	228.1692	335.8028	395.8111	434.4066	405.9044	355.9037	279.8628	176.2264	99.5150	67.0100	(83)
Total gains	720.6439	778.1231	846.4545	918.7565	943.6137	950.5115	903.3528	856.6161	798.7845	727.4075	689.5188	690.7928	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area													
	0.9657	0.9434	0.8775	0.7484	0.5741	0.3803	0.2694	0.2986	0.5119	0.7847	0.9343	0.9726	(86)
MIT	20.4879	20.6061	20.7954	20.9335	20.9883	20.9992	20.9999	20.9999	20.9954	20.9265	20.6900	20.4405	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house													
	0.9585	0.9323	0.8564	0.7149	0.5324	0.3361	0.2227	0.2494	0.4609	0.7460	0.9195	0.9667	(89)
MIT 2	19.7406	19.8853	20.1096	20.2611	20.3143	20.3230	20.3234	20.3234	20.3204	20.2573	19.9899	19.6820	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9743	20.1108	20.3241	20.4714	20.5251	20.5345	20.5350	20.5350	20.5316	20.4666	20.2089	19.9193	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9743	20.1108	20.3241	20.4714	20.5251	20.5345	20.5350	20.5350	20.5316	20.4666	20.2089	19.9193	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9542	0.9284	0.8564	0.7225	0.5450	0.3499	0.2373	0.2648	0.4767	0.7545	0.9167	0.9625	(94)
Useful gains	687.6309	722.3789	724.9117	663.7583	514.2262	332.6205	214.3390	226.7993	380.7829	548.8609	632.0886	664.9114	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	959.4096	930.4829	831.4699	697.1320	519.5167	332.8923	214.3562	226.8346	382.6299	584.5089	793.0766	962.2142	(97)
Space heating kWh													
	202.2034	139.8458	79.2793	24.0291	3.9361	0.0000	0.0000	0.0000	0.0000	26.5221	115.9113	221.1932	(98a)
Space heating requirement - total per year (kWh/year)												812.9203	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	202.2034	139.8458	79.2793	24.0291	3.9361	0.0000	0.0000	0.0000	0.0000	26.5221	115.9113	221.1932	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												812.9203	
Space heating per m2											(98c) / (4) =	9.3762	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement													
	202.2034	139.8458	79.2793	24.0291	3.9361	0.0000	0.0000	0.0000	0.0000	26.5221	115.9113	221.1932	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	303.3050	209.7688	118.9189	36.0436	5.9042	0.0000	0.0000	0.0000	0.0000	39.7831	173.8669	331.7899	
Space heating requirement													
	303.3050	209.7688	118.9189	36.0436	5.9042	0.0000	0.0000	0.0000	0.0000	39.7831	173.8669	331.7899	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1219.3805	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												12.1938	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1054.7470	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4541.9552	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1219.3805	6.5500	79.8694	(340a)
Space heating total			79.8694	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			343.1745	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1425.8351	0.1582	51.4336	(367)
Electrical energy for heat distribution (space & water)	12.1938	0.0000	7.7444	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			214.2623	(373)
Space and water heating			214.2623	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			116.4294	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)

Space and Water heating from Heat pump	1425.8351	1.5855	515.5619	(467)
Electrical energy for heat distribution (space & water)	12.1938	0.0000	82.1128	(472)
Overall CO2 factor for heat network			0.4249	(486)
Total CO2 associated with community systems			2271.7872	(473)
Space and water heating			2271.7872	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1627.9520	(483)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	9.95	**TER**	10.33
Environmental	92 A	**% DER < TER**			3.68
CO_2 Emissions (t/year)	0.81	**DFEE**	19.61	**TFEE**	23.82
Compliance Check	See BREL	**% DFEE < TFEE**			17.65
% DPER < TPER	-3.43	**DPER**	56.47	**TPER**	54.60

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17650.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 203.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2796	12.8855	14.2401	13.7256	14.1482	13.6565	14.0893	14.1078	13.6737	14.1700	13.7658	14.2723	(61)
Total heat required for water heating calculated for each month	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
										Total per year (kWh/year) = Sum(64)m =		2267.8420	(64)
12Total per year (kWh/year)												2268	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	76.0275	66.9783	70.5469	60.6190	57.7963	51.0327	49.6244	52.1934	53.4246	60.8228	66.1962	75.0165	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	102.1874	99.6702	94.8210	84.1931	77.6833	70.8788	66.6995	70.1525	74.2008	81.7511	91.9392	100.8286	(72)
Total internal gains	533.5334	547.7688	522.4940	503.3624	476.0278	455.3032	436.3887	437.4252	452.0232	471.0771	502.0899	521.8995	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	600.4392	678.6509	738.0381	817.7206	861.2856	849.6831	811.8544	759.9447	702.7099	626.3797	585.5137	576.9196	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675
alpha	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378

util living area													
	0.9861	0.9702	0.9329	0.8252	0.6540	0.4678	0.3379	0.3772	0.6012	0.8766	0.9703	0.9890	(86)
MIT	20.2819	20.4474	20.6548	20.8719	20.9727	20.9969	20.9997	20.9993	20.9871	20.8406	20.5224	20.2376	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house													
	0.9830	0.9638	0.9193	0.7963	0.6119	0.4192	0.2861	0.3220	0.5465	0.8478	0.9627	0.9865	(89)
MIT 2	19.4845	19.6919	19.9464	20.1971	20.3007	20.3215	20.3233	20.3231	20.3145	20.1683	19.7880	19.4285	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.7340	19.9282	20.1680	20.4082	20.5109	20.5328	20.5348	20.5346	20.5249	20.3786	20.0177	19.6816	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.5840	19.7782	20.0180	20.2582	20.3609	20.3828	20.3848	20.3846	20.3749	20.2286	19.8677	19.5316	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9786	0.9575	0.9123	0.7934	0.6143	0.4235	0.2908	0.3270	0.5507	0.8433	0.9565	0.9826	(94)
Useful gains	587.5839	649.8192	673.3289	648.7510	529.0743	359.8689	236.1114	248.4975	386.9901	528.2116	560.0520	566.8993	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	953.7697	928.4514	843.5681	708.7891	540.4673	360.8648	236.1871	248.6550	391.5732	600.8566	796.7476	956.7438	(97)
Space heating kWh	272.4423	187.2409	126.6580	43.2274	8.4764	0.0000	0.0000	0.0000	0.0000	54.0478	170.4208	290.0444	(98a)
Space heating requirement - total per year (kWh/year)												1152.5579	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	272.4423	187.2409	126.6580	43.2274	8.4764	0.0000	0.0000	0.0000	0.0000	54.0478	170.4208	290.0444	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1152.5579	
Space heating per m2											(98c) / (4) =	13.2936	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	272.4423	187.2409	126.6580	43.2274	8.4764	0.0000	0.0000	0.0000	0.0000	54.0478	170.4208	290.0444	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	306.1149	210.3830	142.3124	48.5701	9.5240	0.0000	0.0000	0.0000	0.0000	60.7279	191.4841	325.8925	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.2096	88.1041	87.9213	87.6160	87.3761	87.3000	87.3000	87.3000	87.3000	87.6764	88.0687	88.2416	(217)
Fuel for water heating, kWh/month	263.2332	232.2659	245.3379	211.9688	202.9548	179.6911	174.9625	183.8181	187.9361	212.6475	229.9362	259.6901	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.1487	9.1665	10.1487	9.8213	10.1487	9.8213	10.1487	10.1487	9.8213	10.1487	9.8213	10.1487	(231)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1295.0089	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2584.4422	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	119.4924	(231)
Electricity for lighting (calculated in Appendix L)	216.3282	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)

Total delivered energy for all uses 4215.2718 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1295.0089	0.2100	271.9519	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2584.4422	0.2100	542.7329	(264)
Space and water heating			814.6847	(265)
Pumps, fans and electric keep-hot	119.4924	0.1387	16.5751	(267)
Energy for lighting	216.3282	0.1443	31.2229	(268)
Total CO2, kg/year			862.4827	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.9500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1295.0089	1.1300	1463.3601	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2584.4422	1.1300	2920.4197	(278)
Space and water heating			4383.7798	(279)
Pumps, fans and electric keep-hot	119.4924	1.5128	180.7681	(281)
Energy for lighting	216.3282	1.5338	331.8115	(282)
Total Primary energy kWh/year			4896.3594	(286)
Dwelling Primary energy Rate (DPER)			56.4700	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
Heatloss Floor 1			43.3500	0.1300	5.6355			(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1247			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E5 Ground floor (normal)	6.7700	0.1600	1.0832
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P1 Party wall - Ground floor	19.4300	0.0800	1.5544
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0424 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 31.1671 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	71.4535	71.2501	71.0507	70.1143	69.9391	69.1235	69.1235	68.9725	69.4377	69.9391	70.2935	70.6641	(39)
Average = Sum(39)m / 12 =												70.1135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8241	0.8218	0.8195	0.8087	0.8067	0.7973	0.7973	0.7955	0.8009	0.8067	0.8108	0.8150	(40)
HLP (average)												0.8087	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)											Total = Sum(45)m =	2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	268.8764	237.7777	252.4231	221.3080	214.1447	192.5289	189.6118	197.3242	199.7096	223.2306	238.0513	265.8413	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	238.0452	210.5103	223.8702	197.6651	192.1104	173.6740	171.9383	178.5303	180.2015	200.2327	211.9975	235.5810	(64)
										Total per year (kWh/year) = Sum(64)m =		2414.3567	(64)
12Total per year (kWh/year)												2414	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	85.1973	75.2638	79.7266	69.5164	66.9990	59.9474	58.8418	61.4062	62.3349	70.0200	75.0836	84.1881	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	114.5125	111.9997	107.1594	96.5506	90.0524	83.2602	79.0885	82.5352	86.5763	94.1130	104.2827	113.1561	(72)
Total internal gains	545.8584	560.0984	534.8323	515.7198	488.3970	467.6846	448.7777	449.8079	464.3987	483.4390	514.4334	534.2270	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(80)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)

Total gains	601.3198	668.5927	713.5070	776.3062	807.7554	794.6048	760.0190	717.1596	672.2047	612.1767	583.5873	579.8358	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3015	70.5022	70.7000	71.6442	71.8237	72.6712	72.6712	72.8303	72.3424	71.8237	71.4616	71.0868	
alpha	5.6868	5.7001	5.7133	5.7763	5.7882	5.8447	5.8447	5.8554	5.8228	5.7882	5.7641	5.7391	
util living area													
	0.9898	0.9802	0.9588	0.8875	0.7471	0.5485	0.3990	0.4403	0.6811	0.9154	0.9787	0.9916	(86)
MIT	20.0867	20.2487	20.4709	20.7557	20.9280	20.9900	20.9987	20.9977	20.9673	20.7440	20.3783	20.0632	(87)
Th 2	20.2325	20.2345	20.2365	20.2458	20.2475	20.2557	20.2557	20.2572	20.2526	20.2475	20.2440	20.2403	(88)
util rest of house													
	0.9873	0.9755	0.9488	0.8626	0.7014	0.4880	0.3321	0.3703	0.6182	0.8908	0.9727	0.9895	(89)
MIT 2	19.1650	19.3711	19.6500	19.9984	20.1860	20.2494	20.2552	20.2562	20.2296	19.9930	19.5438	19.1412	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.4533	19.6456	19.9068	20.2353	20.4181	20.4811	20.4877	20.4882	20.4604	20.2279	19.8048	19.4296	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4533	19.6456	19.9068	20.2353	20.4181	20.4811	20.4877	20.4882	20.4604	20.2279	19.8048	19.4296	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9840	0.9709	0.9438	0.8623	0.7122	0.5066	0.3531	0.3922	0.6363	0.8901	0.9684	0.9865	(94)
Useful gains	591.7002	649.1615	673.3841	669.3713	575.2813	402.5307	268.3346	281.2453	427.7315	544.8789	565.1406	572.0275	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1082.7591	1050.6257	952.5616	794.7637	609.7389	406.5218	268.7339	281.9700	441.6498	673.3650	893.0658	1076.1876	(97)
Space heating kWh													
	365.3478	269.7839	207.7080	90.2825	25.6365	0.0000	0.0000	0.0000	0.0000	95.5937	236.1062	375.0951	(98a)
Space heating requirement - total per year (kWh/year)												1665.5536	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	365.3478	269.7839	207.7080	90.2825	25.6365	0.0000	0.0000	0.0000	0.0000	95.5937	236.1062	375.0951	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1665.5536	
Space heating per m2											(98c) / (4) =	19.2105	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	365.3478	269.7839	207.7080	90.2825	25.6365	0.0000	0.0000	0.0000	0.0000	95.5937	236.1062	375.0951	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	395.3981	291.9739	224.7922	97.7084	27.7451	0.0000	0.0000	0.0000	0.0000	103.4564	255.5262	405.9471	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	238.0452	210.5103	223.8702	197.6651	192.1104	173.6740	171.9383	178.5303	180.2015	200.2327	211.9975	235.5810	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.2961	84.9141	84.2211	82.8118	81.2251	80.3000	80.3000	80.3000	80.3000	82.8912	84.6128	85.3728	(217)
Fuel for water heating, kWh/month													
	279.0809	247.9098	265.8124	238.6921	236.5161	216.2814	214.1200	222.3291	224.4104	241.5610	250.5501	275.9439	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.0522	-34.0491	-51.2340	-60.3739	-67.5059	-63.8722	-63.0931	-58.3837	-50.4758	-40.1585	-25.8892	-19.7533	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.6843	-18.6438	-37.7720	-57.7989	-77.4856	-78.2579	-77.3368	-64.9856	-46.9877	-27.0053	-11.7029	-6.8394	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1802.5472	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2913.2072	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												224.3782	(232)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1071.3411	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3954.7915	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1802.5472	0.2100	378.5349	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2913.2072	0.2100	611.7735	(264)
Space and water heating			990.3084	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	0.1336	-74.5440	
PV Unit electricity exported	-513.5003	0.1254	-64.3679	
Total			-138.9120	(269)
Total CO2, kg/year			895.7104	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.3300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1802.5472	1.1300	2036.8784	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2913.2072	1.1300	3291.9241	(278)
Space and water heating			5328.8025	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	1.4938	-833.3127	
PV Unit electricity exported	-513.5003	0.4601	-236.2611	
Total			-1069.5738	(283)
Total Primary energy kWh/year			4733.4884	(286)
Target Primary Energy Rate (TPER)			54.6000	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	9.95	**TER**	10.33
Environmental	92 A	**% DER < TER**			3.68
CO_2 Emissions (t/year)	0.81	**DFEE**	19.61	**TFEE**	23.82
Compliance Check	See BREL	**% DFEE < TFEE**			17.65
% DPER < TPER	-3.43	**DPER**	56.47	**TPER**	54.60

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2257	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2878	0.2821	0.2765	0.2483	0.2426	0.2144	0.2144	0.2088	0.2257	0.2426	0.2539	0.2652	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5414	0.5398	0.5382	0.5308	0.5294	0.5230	0.5230	0.5218	0.5255	0.5294	0.5322	0.5352	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		18083.8300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							208.5794	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9510	37.8383	37.7278	37.2089	37.1118	36.6599	36.6599	36.5762	36.8339	37.1118	37.3082	37.5135	(38)
Heat transfer coeff	65.3058	65.1931	65.0826	64.5637	64.4666	64.0147	64.0147	63.9310	64.1888	64.4666	64.6630	64.8684	(39)
Average = Sum(39)m / 12 =												64.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7532	0.7519	0.7507	0.7447	0.7436	0.7383	0.7383	0.7374	0.7404	0.7436	0.7458	0.7482	(40)
HLP (average)												0.7447	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
									Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)											908	(64)

Electric shower(s)

54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 614.3496 (64a)

Heat gains from water heating, kWh/month

37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	545.1343	624.6069	686.9038	773.6007	821.2924	817.0482	782.1979	728.3014	668.6668	584.4747	536.9133	522.5689	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.9194	77.0524	77.1832	77.8035	77.9207	78.4708	78.4708	78.5736	78.2580	77.9207	77.6840	77.4381	
alpha	6.1280	6.1368	6.1455	6.1869	6.1947	6.2314	6.2314	6.2382	6.2172	6.1947	6.1789	6.1625	
util living area	0.9928	0.9828	0.9569	0.8650	0.6987	0.4980	0.3597	0.4030	0.6442	0.9127	0.9829	0.9944	(86)

MIT	20.1474	20.3236	20.5553	20.8258	20.9600	20.9957	20.9995	20.9990	20.9811	20.7869	20.4232	20.1142	(87)
Th 2	20.2940	20.2952	20.2963	20.3015	20.3025	20.3071	20.3071	20.3079	20.3053	20.3025	20.3005	20.2985	(88)
util rest of house	0.9910	0.9787	0.9469	0.8386	0.6548	0.4455	0.3033	0.3428	0.5858	0.8884	0.9781	0.9929	(89)
MIT 2	19.5115	19.6862	19.9120	20.1657	20.2764	20.3050	20.3069	20.3076	20.2951	20.1373	19.7900	19.4822	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.7104	19.8856	20.1132	20.3722	20.4902	20.5210	20.5236	20.5239	20.5097	20.3405	19.9880	19.6799	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7104	19.8856	20.1132	20.3722	20.4902	20.5210	20.5236	20.5239	20.5097	20.3405	19.9880	19.6799	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9892	0.9758	0.9439	0.8415	0.6669	0.4618	0.3209	0.3616	0.6034	0.8899	0.9754	0.9914	(94)
Useful gains	539.2247	609.5155	648.3454	650.9535	547.7288	377.3310	251.0226	263.3471	403.4594	520.1241	523.7266	518.0501	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1006.3914	976.9551	885.9846	740.6854	566.6755	379.0332	251.1663	263.6444	411.4276	627.9374	833.3797	1004.1547	(97)
Space heating kWh	347.5720	246.9194	176.8036	64.6070	14.0964	0.0000	0.0000	0.0000	0.0000	80.2131	222.9502	361.6619	(98a)
Space heating requirement - total per year (kWh/year)												1514.8235	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	347.5720	246.9194	176.8036	64.6070	14.0964	0.0000	0.0000	0.0000	0.0000	80.2131	222.9502	361.6619	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1514.8235	
Space heating per m2											(98c) / (4) =	17.4720	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	601.7381	473.7088	485.8756	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9701	0.9885	0.9812	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	583.7487	468.2440	476.7501	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	890.8770	853.1757	792.9430	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	221.1324	286.3892	235.2475	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	55.2831	71.5973	58.8119	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												185.6923	(107)
Energy for space heating												17.4720	(99)
Energy for space cooling												2.1418	(108)
Total												19.6138	(109)
Fabric Energy Efficiency (DFEE)												19.6	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
Heatloss Floor 1			43.3500	0.1300	5.6355			(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1247			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	6.2700	0.0500	0.3135
E2 Other lintels (including other steel lintels)	2.5200	0.0500	0.1260
E3 Sill	20.7200	0.0500	1.0360
E4 Jamb	13.5400	0.0000	0.0000
E6 Intermediate floor within a dwelling	6.7700	0.1600	1.0832
E5 Ground floor (normal)	22.0000	0.0600	1.3200
E18 Party wall between dwellings	12.6600	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	19.4300	0.0800	1.5544
P1 Party wall - Ground floor	6.7700	0.0200	0.1354
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0700	0.4739
E7 Party floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0424 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.1671 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	71.4535	71.2501	71.0507	70.1143	69.9391	69.1235	69.1235	68.9725	69.4377	69.9391	70.2935	70.6641	(39)
Average = Sum(39)m / 12 =												70.1135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8241	0.8218	0.8195	0.8087	0.8067	0.7973	0.7973	0.7955	0.8009	0.8067	0.8108	0.8150	(40)
HLP (average)												0.8087	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122 (71)

Water heating gains (Table 5)

	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778 (72)

Total internal gains

	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(80)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088 (83)
Total gains	533.6898	602.2192	650.0344	719.8289	755.3931	749.5884	717.9735	673.1335	625.7862	557.9097	522.6435	513.1575 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3015	70.5022	70.7000	71.6442	71.8237	72.6712	72.6712	72.8303	72.3424	71.8237	71.4616	71.0868	
alpha	5.6868	5.7001	5.7133	5.7763	5.7882	5.8447	5.8447	5.8554	5.8228	5.7882	5.7641	5.7391	
util living area	0.9943	0.9878	0.9722	0.9127	0.7821	0.5788	0.4220	0.4683	0.7204	0.9399	0.9872	0.9954	(86)
MIT	19.9881	20.1562	20.3911	20.7067	20.9086	20.9869	20.9982	20.9968	20.9566	20.6888	20.2937	19.9650	(87)
Th 2	20.2325	20.2345	20.2365	20.2458	20.2475	20.2557	20.2557	20.2572	20.2526	20.2475	20.2440	20.2403	(88)
util rest of house	0.9928	0.9847	0.9650	0.8915	0.7378	0.5159	0.3514	0.3942	0.6574	0.9205	0.9834	0.9942	(89)
MIT 2	19.3031	19.4712	19.7034	20.0101	20.1855	20.2492	20.2551	20.2561	20.2282	20.0005	19.6160	19.2865	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.5174	19.6854	19.9185	20.2280	20.4117	20.4800	20.4876	20.4878	20.4560	20.2158	19.8280	19.4988	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5174	19.6854	19.9185	20.2280	20.4117	20.4800	20.4876	20.4878	20.4560	20.2158	19.8280	19.4988	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9910	0.9819	0.9614	0.8909	0.7480	0.5352	0.3735	0.4174	0.6753	0.9196	0.9807	0.9927	(94)
Useful gains	528.9006	591.3161	624.9258	641.3079	565.0433	401.1637	268.1836	280.9411	422.5869	513.0475	512.5746	509.3875	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1087.3358	1053.4647	953.3951	794.2554	609.2891	406.4436	268.7227	281.9472	441.3491	672.5188	894.6974	1081.0736	(97)
Space heating kWh	415.4757	310.5639	244.3812	110.1222	32.9189	0.0000	0.0000	0.0000	0.0000	118.6466	275.1285	425.3345	(98a)
Space heating requirement - total per year (kWh/year)												1932.5715	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	415.4757	310.5639	244.3812	110.1222	32.9189	0.0000	0.0000	0.0000	0.0000	118.6466	275.1285	425.3345	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1932.5715	
Space heating per m2										(98c) / (4) =		22.2903	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	649.7609	511.5139	524.1907	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9306	0.9687	0.9544	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	604.6778	495.5119	500.2837	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	812.0280	778.1082	728.4611	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	149.2922	210.2516	169.7640	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	37.3230	52.5629	42.4410	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												132.3270	(107)
Energy for space heating												22.2903	(99)
Energy for space cooling												1.5263	(108)
Total												23.8166	(109)
Fabric Energy Efficiency (TFEE)												23.8	(109)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	9.95	**TER**	10.33
Environmental	92 A	**% DER < TER**			3.68
CO_2 Emissions (t/year)	0.81	**DFEE**	19.61	**TFEE**	23.82
Compliance Check	See BREL	**% DFEE < TFEE**			17.65
% DPER < TPER	-3.43	**DPER**	56.47	**TPER**	54.60

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17650.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 203.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2796	12.8855	14.2401	13.7256	14.1482	13.6565	14.0893	14.1078	13.6737	14.1700	13.7658	14.2723	(61)
Total heat required for water heating calculated for each month	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
										Total per year (kWh/year) = Sum(64)m =		2267.8420	(64)
12Total per year (kWh/year)												2268	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	76.0275	66.9783	70.5469	60.6190	57.7963	51.0327	49.6244	52.1934	53.4246	60.8228	66.1962	75.0165	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	102.1874	99.6702	94.8210	84.1931	77.6833	70.8788	66.6995	70.1525	74.2008	81.7511	91.9392	100.8286	(72)
Total internal gains	533.5334	547.7688	522.4940	503.3624	476.0278	455.3032	436.3887	437.4252	452.0232	471.0771	502.0899	521.8995	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	600.4392	678.6509	738.0381	817.7206	861.2856	849.6831	811.8544	759.9447	702.7099	626.3797	585.5137	576.9196	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675
alpha	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378

util living area													
	0.9861	0.9702	0.9329	0.8252	0.6540	0.4678	0.3379	0.3772	0.6012	0.8766	0.9703	0.9890	(86)
MIT	20.2819	20.4474	20.6548	20.8719	20.9727	20.9969	20.9997	20.9993	20.9871	20.8406	20.5224	20.2376	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house													
	0.9830	0.9638	0.9193	0.7963	0.6119	0.4192	0.2861	0.3220	0.5465	0.8478	0.9627	0.9865	(89)
MIT 2	19.4845	19.6919	19.9464	20.1971	20.3007	20.3215	20.3233	20.3231	20.3145	20.1683	19.7880	19.4285	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.7340	19.9282	20.1680	20.4082	20.5109	20.5328	20.5348	20.5346	20.5249	20.3786	20.0177	19.6816	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.5840	19.7782	20.0180	20.2582	20.3609	20.3828	20.3848	20.3846	20.3749	20.2286	19.8677	19.5316	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9786	0.9575	0.9123	0.7934	0.6143	0.4235	0.2908	0.3270	0.5507	0.8433	0.9565	0.9826	(94)
Useful gains	587.5839	649.8192	673.3289	648.7510	529.0743	359.8689	236.1114	248.4975	386.9901	528.2116	560.0520	566.8993	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	953.7697	928.4514	843.5681	708.7891	540.4673	360.8648	236.1871	248.6550	391.5732	600.8566	796.7476	956.7438	(97)
Space heating kWh	272.4423	187.2409	126.6580	43.2274	8.4764	0.0000	0.0000	0.0000	0.0000	54.0478	170.4208	290.0444	(98a)
Space heating requirement - total per year (kWh/year)												1152.5579	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	272.4423	187.2409	126.6580	43.2274	8.4764	0.0000	0.0000	0.0000	0.0000	54.0478	170.4208	290.0444	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1152.5579	
Space heating per m2											(98c) / (4) =	13.2936	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	272.4423	187.2409	126.6580	43.2274	8.4764	0.0000	0.0000	0.0000	0.0000	54.0478	170.4208	290.0444	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	306.1149	210.3830	142.3124	48.5701	9.5240	0.0000	0.0000	0.0000	0.0000	60.7279	191.4841	325.8925	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.2096	88.1041	87.9213	87.6160	87.3761	87.3000	87.3000	87.3000	87.3000	87.6764	88.0687	88.2416	(217)
Fuel for water heating, kWh/month	263.2332	232.2659	245.3379	211.9688	202.9548	179.6911	174.9625	183.8181	187.9361	212.6475	229.9362	259.6901	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.1487	9.1665	10.1487	9.8213	10.1487	9.8213	10.1487	10.1487	9.8213	10.1487	9.8213	10.1487	(231)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1295.0089	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2584.4422	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	119.4924	(231)
Electricity for lighting (calculated in Appendix L)	216.3282	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)

Total delivered energy for all uses 4215.2718 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1295.0089	0.2100	271.9519	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2584.4422	0.2100	542.7329	(264)
Space and water heating			814.6847	(265)
Pumps, fans and electric keep-hot	119.4924	0.1387	16.5751	(267)
Energy for lighting	216.3282	0.1443	31.2229	(268)
Total CO2, kg/year			862.4827	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.9500	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1295.0089	1.1300	1463.3601	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2584.4422	1.1300	2920.4197	(278)
Space and water heating			4383.7798	(279)
Pumps, fans and electric keep-hot	119.4924	1.5128	180.7681	(281)
Energy for lighting	216.3282	1.5338	331.8115	(282)
Total Primary energy kWh/year			4896.3594	(286)
Dwelling Primary energy Rate (DPER)			56.4700	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
Heatloss Floor 1			43.3500	0.1300	5.6355			(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1247			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E5 Ground floor (normal)	6.7700	0.1600	1.0832
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P1 Party wall - Ground floor	19.4300	0.0800	1.5544
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0424 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 31.1671 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	71.4535	71.2501	71.0507	70.1143	69.9391	69.1235	69.1235	68.9725	69.4377	69.9391	70.2935	70.6641	(39)
Average = Sum(39)m / 12 =												70.1135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8241	0.8218	0.8195	0.8087	0.8067	0.7973	0.7973	0.7955	0.8009	0.8067	0.8108	0.8150	(40)
HLP (average)												0.8087	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)											Total = Sum(45)m =	2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	268.8764	237.7777	252.4231	221.3080	214.1447	192.5289	189.6118	197.3242	199.7096	223.2306	238.0513	265.8413	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	238.0452	210.5103	223.8702	197.6651	192.1104	173.6740	171.9383	178.5303	180.2015	200.2327	211.9975	235.5810	(64)
										Total per year (kWh/year) = Sum(64)m =		2414.3567	(64)
12Total per year (kWh/year)												2414	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	85.1973	75.2638	79.7266	69.5164	66.9990	59.9474	58.8418	61.4062	62.3349	70.0200	75.0836	84.1881	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	114.5125	111.9997	107.1594	96.5506	90.0524	83.2602	79.0885	82.5352	86.5763	94.1130	104.2827	113.1561	(72)
Total internal gains	545.8584	560.0984	534.8323	515.7198	488.3970	467.6846	448.7777	449.8079	464.3987	483.4390	514.4334	534.2270	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(80)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)

Total gains	601.3198	668.5927	713.5070	776.3062	807.7554	794.6048	760.0190	717.1596	672.2047	612.1767	583.5873	579.8358	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3015	70.5022	70.7000	71.6442	71.8237	72.6712	72.6712	72.8303	72.3424	71.8237	71.4616	71.0868	
alpha	5.6868	5.7001	5.7133	5.7763	5.7882	5.8447	5.8447	5.8554	5.8228	5.7882	5.7641	5.7391	
util living area													
	0.9898	0.9802	0.9588	0.8875	0.7471	0.5485	0.3990	0.4403	0.6811	0.9154	0.9787	0.9916	(86)
MIT	20.0867	20.2487	20.4709	20.7557	20.9280	20.9900	20.9987	20.9977	20.9673	20.7440	20.3783	20.0632	(87)
Th 2	20.2325	20.2345	20.2365	20.2458	20.2475	20.2557	20.2557	20.2572	20.2526	20.2475	20.2440	20.2403	(88)
util rest of house													
	0.9873	0.9755	0.9488	0.8626	0.7014	0.4880	0.3321	0.3703	0.6182	0.8908	0.9727	0.9895	(89)
MIT 2	19.1650	19.3711	19.6500	19.9984	20.1860	20.2494	20.2552	20.2562	20.2296	19.9930	19.5438	19.1412	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.4533	19.6456	19.9068	20.2353	20.4181	20.4811	20.4877	20.4882	20.4604	20.2279	19.8048	19.4296	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4533	19.6456	19.9068	20.2353	20.4181	20.4811	20.4877	20.4882	20.4604	20.2279	19.8048	19.4296	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9840	0.9709	0.9438	0.8623	0.7122	0.5066	0.3531	0.3922	0.6363	0.8901	0.9684	0.9865	(94)
Useful gains	591.7002	649.1615	673.3841	669.3713	575.2813	402.5307	268.3346	281.2453	427.7315	544.8789	565.1406	572.0275	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1082.7591	1050.6257	952.5616	794.7637	609.7389	406.5218	268.7339	281.9700	441.6498	673.3650	893.0658	1076.1876	(97)
Space heating kWh													
	365.3478	269.7839	207.7080	90.2825	25.6365	0.0000	0.0000	0.0000	0.0000	95.5937	236.1062	375.0951	(98a)
Space heating requirement - total per year (kWh/year)												1665.5536	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	365.3478	269.7839	207.7080	90.2825	25.6365	0.0000	0.0000	0.0000	0.0000	95.5937	236.1062	375.0951	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1665.5536	
Space heating per m2											(98c) / (4) =	19.2105	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	365.3478	269.7839	207.7080	90.2825	25.6365	0.0000	0.0000	0.0000	0.0000	95.5937	236.1062	375.0951	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	395.3981	291.9739	224.7922	97.7084	27.7451	0.0000	0.0000	0.0000	0.0000	103.4564	255.5262	405.9471	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	238.0452	210.5103	223.8702	197.6651	192.1104	173.6740	171.9383	178.5303	180.2015	200.2327	211.9975	235.5810	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.2961	84.9141	84.2211	82.8118	81.2251	80.3000	80.3000	80.3000	80.3000	82.8912	84.6128	85.3728	(217)
Fuel for water heating, kWh/month													
	279.0809	247.9098	265.8124	238.6921	236.5161	216.2814	214.1200	222.3291	224.4104	241.5610	250.5501	275.9439	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.0522	-34.0491	-51.2340	-60.3739	-67.5059	-63.8722	-63.0931	-58.3837	-50.4758	-40.1585	-25.8892	-19.7533	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.6843	-18.6438	-37.7720	-57.7989	-77.4856	-78.2579	-77.3368	-64.9856	-46.9877	-27.0053	-11.7029	-6.8394	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1802.5472	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2913.2072	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												224.3782	(232)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1071.3411	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3954.7915	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1802.5472	0.2100	378.5349	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2913.2072	0.2100	611.7735	(264)
Space and water heating			990.3084	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	0.1336	-74.5440	
PV Unit electricity exported	-513.5003	0.1254	-64.3679	
Total			-138.9120	(269)
Total CO2, kg/year			895.7104	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.3300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1802.5472	1.1300	2036.8784	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2913.2072	1.1300	3291.9241	(278)
Space and water heating			5328.8025	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	1.4938	-833.3127	
PV Unit electricity exported	-513.5003	0.4601	-236.2611	
Total			-1069.5738	(283)
Total Primary energy kWh/year			4733.4884	(286)
Target Primary Energy Rate (TPER)			54.6000	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Be Lean	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	87 B	**DER**	9.95	**TER**	10.33
Environmental	92 A	**% DER < TER**			3.68
CO_2 Emissions (t/year)	0.81	**DFEE**	19.61	**TFEE**	23.82
Compliance Check	See BREL	**% DFEE < TFEE**			17.65
% DPER < TPER	-3.43	**DPER**	56.47	**TPER**	54.60

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2796	12.8855	14.2401	13.7256	14.1482	13.6565	14.0893	14.1078	13.6737	14.1700	13.7658	14.2723	(61)
Total heat required for water heating calculated for each month	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
									Total per year (kWh/year) = Sum(64)m =			2267.8420	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	76.0275	66.9783	70.5469	60.6190	57.7963	51.0327	49.6244	52.1934	53.4246	60.8228	66.1962	75.0165	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	102.1874	99.6702	94.8210	84.1931	77.6833	70.8788	66.6995	70.1525	74.2008	81.7511	91.9392	100.8286	(72)
Total internal gains	587.9847	585.6501	566.6328	531.2821	496.1193	461.4093	442.7453	446.0155	464.2321	499.5052	538.3462	572.1411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	654.8905	716.5322	782.1769	845.6403	881.3771	855.7892	818.2111	768.5351	714.9188	654.8078	621.7699	627.1612	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area													

	0.9800	0.9636	0.9185	0.8107	0.6420	0.4647	0.3354	0.3731	0.5926	0.8604	0.9628	0.9844	(86)
MIT	20.3740	20.5086	20.7085	20.8914	20.9773	20.9974	20.9997	20.9995	20.9891	20.8661	20.5797	20.3260	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house													
	0.9756	0.9559	0.9027	0.7807	0.6000	0.4164	0.2839	0.3184	0.5381	0.8292	0.9536	0.9808	(89)
MIT 2	19.5990	19.7666	20.0092	20.2177	20.3047	20.3218	20.3233	20.3232	20.3160	20.1954	19.8573	19.5388	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8414	19.9987	20.2280	20.4284	20.5151	20.5331	20.5349	20.5347	20.5266	20.4052	20.0833	19.7850	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.6914	19.8487	20.0780	20.2784	20.3651	20.3831	20.3849	20.3847	20.3766	20.2552	19.9333	19.6350	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9705	0.9495	0.8962	0.7785	0.6026	0.4207	0.2886	0.3234	0.5424	0.8258	0.9472	0.9763	(94)
Useful gains	635.5434	680.3744	701.0211	658.3603	531.1523	360.0296	236.1279	248.5323	387.7910	540.7148	588.9247	612.2826	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	960.4762	932.8473	847.3100	710.0490	540.7314	360.8864	236.1895	248.6600	391.6784	602.5153	800.8381	963.1972	(97)
Space heating kWh													
	241.7500	169.6618	108.8389	37.2158	7.1269	0.0000	0.0000	0.0000	0.0000	45.9796	152.5777	261.0805	(98a)
Space heating requirement - total per year (kWh/year)												1024.2312	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	241.7500	169.6618	108.8389	37.2158	7.1269	0.0000	0.0000	0.0000	0.0000	45.9796	152.5777	261.0805	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1024.2312	
Space heating per m2											(98c) / (4) =	11.8135	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	89.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	241.7500	169.6618	108.8389	37.2158	7.1269	0.0000	0.0000	0.0000	0.0000	45.9796	152.5777	261.0805	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	271.6292	190.6312	122.2909	41.8155	8.0077	0.0000	0.0000	0.0000	0.0000	51.6625	171.4356	293.3488	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.1589	88.0625	87.8628	87.5793	87.3645	87.3000	87.3000	87.3000	87.3000	87.6311	88.0225	88.1972	(217)
Fuel for water heating, kWh/month													
	263.3846	232.3757	245.5011	212.0577	202.9819	179.6911	174.9625	183.8181	187.9361	212.7573	230.0571	259.8209	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.1487	9.1665	10.1487	9.8213	10.1487	9.8213	10.1487	10.1487	9.8213	10.1487	9.8213	10.1487	(231)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1150.8216 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	87.3000
Water heating fuel used	2585.3441 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)	
mechanical ventilation fans (SFP = 0.1292)	33.4924 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	119.4924 (231)
Electricity for lighting (calculated in Appendix L)	216.3282 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4071.9864 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1150.8216	3.6400	41.8899	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2585.3441	3.6400	94.1065	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	119.4924	16.4900	19.7043	(249)
Energy for lighting	216.3282	16.4900	35.6725	(250)
Additional standing charges			92.0000	(251)
Total energy cost			283.3733	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7746	(257)
SAP value		87.4438	
SAP rating (Section 12)		87	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1150.8216	0.2100	241.6725	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2585.3441	0.2100	542.9223	(264)
Space and water heating			784.5948	(265)
Pumps, fans and electric keep-hot	119.4924	0.1387	16.5751	(267)
Energy for lighting	216.3282	0.1443	31.2229	(268)
Total CO2, kg/year			832.3927	(272)
CO2 emissions per m2			9.6000	(273)
EI value			91.5307	
EI rating			92	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	0 * 10 = 0.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5778 (42)
Hot water usage for mixer showers		
	67.4410 66.4275 64.9507 62.1249 60.0396 57.7140 56.3922 57.8579 59.4646 61.9615 64.8480 67.1826	(42a)
Hot water usage for baths		
	29.1251 28.6925 28.0834 26.9603 26.1193 25.1868 24.6831 25.2880 25.9466 26.9444 28.0906 29.0266	(42b)
Hot water usage for other uses		
	41.0293 39.5373 38.0453 36.5534 35.0614 33.5694 33.5694 35.0614 36.5534 38.0453 39.5373 41.0293	(42c)
Average daily hot water use (litres/day)		126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2796	12.8855	14.2401	13.7256	14.1482	13.6565	14.0893	14.1078	13.6737	14.1700	13.7658	14.2723	(61)
Total heat required for water heating calculated for each month	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
									Total per year (kWh/year) = Sum(64)m =			2267.8420	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	76.0275	66.9783	70.5469	60.6190	57.7963	51.0327	49.6244	52.1934	53.4246	60.8228	66.1962	75.0165	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	102.1874	99.6702	94.8210	84.1931	77.6833	70.8788	66.6995	70.1525	74.2008	81.7511	91.9392	100.8286	(72)
Total internal gains	587.9847	585.6501	566.6328	531.2821	496.1193	461.4093	442.7453	446.0155	464.2321	499.5052	538.3462	572.1411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	23.7835	0.7600	0.7000	0.7700	65.5876	(80)
West	1.7600	23.7835	0.7600	0.7000	0.7700	15.4324	(80)

Solar gains	81.0200	140.8292	228.1692	335.8028	395.8111	434.4066	405.9044	355.9037	279.8628	176.2264	99.5150	67.0100	(83)
Total gains	669.0047	726.4794	794.8020	867.0849	891.9304	895.8159	848.6497	801.9193	744.0949	675.7315	637.8612	639.1511	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area	0.9758	0.9579	0.9015	0.7801	0.6046	0.4033	0.2867	0.3189	0.5477	0.8226	0.9526	0.9812	(86)
MIT	20.4205	20.5464	20.7543	20.9160	20.9845	20.9989	20.9999	20.9998	20.9933	20.9031	20.6328	20.3706	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house	0.9705	0.9491	0.8829	0.7475	0.5615	0.3566	0.2370	0.2664	0.4938	0.7862	0.9410	0.9769	(89)
MIT 2	19.6573	19.8132	20.0632	20.2436	20.3112	20.3228	20.3234	20.3233	20.3190	20.2345	19.9221	19.5950	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.8960	20.0425	20.2794	20.4539	20.5218	20.5343	20.5350	20.5349	20.5299	20.4436	20.1444	19.8376	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.7460	19.8925	20.1294	20.3039	20.3718	20.3843	20.3850	20.3849	20.3799	20.2936	19.9944	19.6876	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9649	0.9425	0.8770	0.7465	0.5647	0.3608	0.2415	0.2711	0.4984	0.7845	0.9344	0.9719	(94)
Useful gains	645.5037	684.6742	697.0522	647.2502	503.6302	323.2027	204.9763	217.4329	370.8555	530.0958	596.0068	621.2212	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	945.1626	916.8626	819.3157	686.6791	509.9478	323.5186	204.9947	217.4719	373.1680	573.7141	779.6919	947.7553	(97)
Space heating kWh	222.9462	156.0306	90.9641	28.3888	4.7003	0.0000	0.0000	0.0000	0.0000	32.4520	132.2533	242.9414	(98a)
Space heating requirement - total per year (kWh/year)												910.6767	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	222.9462	156.0306	90.9641	28.3888	4.7003	0.0000	0.0000	0.0000	0.0000	32.4520	132.2533	242.9414	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												910.6767	
Space heating per m2											(98c) / (4) =	10.5038	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	222.9462	156.0306	90.9641	28.3888	4.7003	0.0000	0.0000	0.0000	0.0000	32.4520	132.2533	242.9414	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	250.5014	175.3153	102.2068	31.8976	5.2812	0.0000	0.0000	0.0000	0.0000	36.4629	148.5992	272.9678	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.1245	88.0274	87.7974	87.5217	87.3431	87.3000	87.3000	87.3000	87.3000	87.5479	87.9638	88.1666	(217)
Fuel for water heating, kWh/month	263.4874	232.4683	245.6840	212.1972	203.0316	179.6911	174.9625	183.8181	187.9361	212.9596	230.2106	259.9109	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.1487	9.1665	10.1487	9.8213	10.1487	9.8213	10.1487	10.1487	9.8213	10.1487	9.8213	10.1487	(231)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													

Space heating fuel - main system 1	1023.2322	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2586.3573	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	119.4924	(231)
Electricity for lighting (calculated in Appendix L)	216.3282	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3945.4101	(238)

10a. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1023.2322	6.5500	67.0217	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2586.3573	6.5500	169.4064	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	119.4924	28.4300	33.9717	(249)
Energy for lighting	216.3282	28.4300	61.5021	(250)
Additional standing charges			104.0000	(251)
Total energy cost			435.9019	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1023.2322	0.2100	214.8788	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2586.3573	0.2100	543.1350	(264)
Space and water heating			758.0138	(265)
Pumps, fans and electric keep-hot	119.4924	0.1387	16.5751	(267)
Energy for lighting	216.3282	0.1443	31.2229	(268)
Total CO2, kg/year			805.8117	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1023.2322	1.1300	1156.2524	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2586.3573	1.1300	2922.5837	(278)
Space and water heating			4078.8361	(279)
Pumps, fans and electric keep-hot	119.4924	1.5128	180.7681	(281)
Energy for lighting	216.3282	1.5338	331.8115	(282)
Total Primary energy kWh/year			4591.4157	(286)

SAP 10 EPC IMPROVEMENTS

Rev C - Be Lean

Current energy efficiency rating: B 87
Current environmental impact rating: A 92

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 87
Potential environmental impact rating: A 92

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£95	£95	£0
Mains gas	£340	£340	£0
Space heating	£205	£205	£0

Water heating	£169	£169	£0
Lighting	£62	£62	£0
Total cost of fuels	£435	£435	£0
Total cost of uses	£436	£436	£0
Delivered energy	46 kWh/m²	46 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.8 tonnes	0.0 tonnes
CO2 emissions per m²	9 kg/m²	9 kg/m²	0 kg/m²
Primary energy	53 kWh/m²	53 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778 (42)
Hot water usage for mixer showers												
	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths												
	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses												
	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m													
	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2796	12.8855	14.2401	13.7256	14.1482	13.6565	14.0893	14.1078	13.6737	14.1700	13.7658	14.2723	(61)
Total heat required for water heating calculated for each month													
	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
										Total per year (kWh/year) = Sum(64)m =		2267.8420	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	76.0275	66.9783	70.5469	60.6190	57.7963	51.0327	49.6244	52.1934	53.4246	60.8228	66.1962	75.0165	(65)

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5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	102.1874	99.6702	94.8210	84.1931	77.6833	70.8788	66.6995	70.1525	74.2008	81.7511	91.9392	100.8286	(72)
Total internal gains													
	587.9847	585.6501	566.6328	531.2821	496.1193	461.4093	442.7453	446.0155	464.2321	499.5052	538.3462	572.1411	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	654.8905	716.5322	782.1769	845.6403	881.3771	855.7892	818.2111	768.5351	714.9188	654.8078	621.7699	627.1612	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area													
	0.9800	0.9636	0.9185	0.8107	0.6420	0.4647	0.3354	0.3731	0.5926	0.8604	0.9628	0.9844	(86)
MIT	20.3740	20.5086	20.7085	20.8914	20.9773	20.9974	20.9997	20.9995	20.9891	20.8661	20.5797	20.3260	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house													
	0.9756	0.9559	0.9027	0.7807	0.6000	0.4164	0.2839	0.3184	0.5381	0.8292	0.9536	0.9808	(89)
MIT 2	19.5990	19.7666	20.0092	20.2177	20.3047	20.3218	20.3233	20.3232	20.3160	20.1954	19.8573	19.5388	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.8414	19.9987	20.2280	20.4284	20.5151	20.5331	20.5349	20.5347	20.5266	20.4052	20.0833	19.7850	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.6914	19.8487	20.0780	20.2784	20.3651	20.3831	20.3849	20.3847	20.3766	20.2552	19.9333	19.6350	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9705	0.9495	0.8962	0.7785	0.6026	0.4207	0.2886	0.3234	0.5424	0.8258	0.9472	0.9763	(94)
Useful gains	635.5434	680.3744	701.0211	658.3603	531.1523	360.0296	236.1279	248.5323	387.7910	540.7148	588.9247	612.2826	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	960.4762	932.8473	847.3100	710.0490	540.7314	360.8864	236.1895	248.6600	391.6784	602.5153	800.8381	963.1972	(97)
Space heating kWh	241.7500	169.6618	108.8389	37.2158	7.1269	0.0000	0.0000	0.0000	0.0000	45.9796	152.5777	261.0805	(98a)
Space heating requirement - total per year (kWh/year)												1024.2312	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	241.7500	169.6618	108.8389	37.2158	7.1269	0.0000	0.0000	0.0000	0.0000	45.9796	152.5777	261.0805	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1024.2312	
Space heating per m2											(98c) / (4) =	11.8135	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	241.7500	169.6618	108.8389	37.2158	7.1269	0.0000	0.0000	0.0000	0.0000	45.9796	152.5777	261.0805	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	271.6292	190.6312	122.2909	41.8155	8.0077	0.0000	0.0000	0.0000	0.0000	51.6625	171.4356	293.3488	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.1589	88.0625	87.8628	87.5793	87.3645	87.3000	87.3000	87.3000	87.3000	87.6311	88.0225	88.1972	(217)
Fuel for water heating, kWh/month	263.3846	232.3757	245.5011	212.0577	202.9819	179.6911	174.9625	183.8181	187.9361	212.7573	230.0571	259.8209	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.1487	9.1665	10.1487	9.8213	10.1487	9.8213	10.1487	10.1487	9.8213	10.1487	9.8213	10.1487	(231)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1150.8216	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	87.3000	
Water heating fuel used	2585.3441	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	119.4924	(231)
Electricity for lighting (calculated in Appendix L)	216.3282	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4071.9864	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1150.8216	3.6400	41.8899	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2585.3441	3.6400	94.1065	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	119.4924	16.4900	19.7043	(249)

Energy for lighting	216.3282	16.4900	35.6725	(250)
Additional standing charges			92.0000	(251)
Total energy cost			283.3733	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):			0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =		0.7746	(257)
SAP value			87.4438	
SAP rating (Section 12)			87	(258)
SAP band			B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1150.8216	0.2100	241.6725	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2585.3441	0.2100	542.9223	(264)
Space and water heating			784.5948	(265)
Pumps, fans and electric keep-hot	119.4924	0.1387	16.5751	(267)
Energy for lighting	216.3282	0.1443	31.2229	(268)
Total CO2, kg/year			832.3927	(272)
CO2 emissions per m2			9.6000	(273)
EI value			91.5307	
EI rating			92	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)

100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999 (29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000 (29a)
Total net area of external elements Aum(A, m2)			93.1100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615		(33)
Main dwelling							
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000 (32)
Party Ceiling 1			43.3500			40.0000	1734.0000 (32b)
Timber partitions			141.0200			9.0000	1269.1800 (32c)
Internal Floor 1			43.3500			18.0000	780.3000 (32d)
Internal Ceiling 1			43.3500			9.0000	390.1500 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778	(42)
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)											Total = Sum(45)m =	2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.2796	12.8855	14.2401	13.7256	14.1482	13.6565	14.0893	14.1078	13.6737	14.1700	13.7658	14.2723	(61)
Total heat required for water heating calculated for each month	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
										Total per year (kWh/year) = Sum(64)m =		2267.8420	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	76.0275	66.9783	70.5469	60.6190	57.7963	51.0327	49.6244	52.1934	53.4246	60.8228	66.1962	75.0165	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	102.1874	99.6702	94.8210	84.1931	77.6833	70.8788	66.6995	70.1525	74.2008	81.7511	91.9392	100.8286	(72)
Total internal gains	587.9847	585.6501	566.6328	531.2821	496.1193	461.4093	442.7453	446.0155	464.2321	499.5052	538.3462	572.1411	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	23.7835	0.7600	0.7000	0.7700	65.5876	(80)
West	1.7600	23.7835	0.7600	0.7000	0.7700	15.4324	(80)

Solar gains	81.0200	140.8292	228.1692	335.8028	395.8111	434.4066	405.9044	355.9037	279.8628	176.2264	99.5150	67.0100	(83)
Total gains	669.0047	726.4794	794.8020	867.0849	891.9304	895.8159	848.6497	801.9193	744.0949	675.7315	637.8612	639.1511	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area	0.9758	0.9579	0.9015	0.7801	0.6046	0.4033	0.2867	0.3189	0.5477	0.8226	0.9526	0.9812	(86)
MIT	20.4205	20.5464	20.7543	20.9160	20.9845	20.9989	20.9999	20.9998	20.9933	20.9031	20.6328	20.3706	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house	0.9705	0.9491	0.8829	0.7475	0.5615	0.3566	0.2370	0.2664	0.4938	0.7862	0.9410	0.9769	(89)
MIT 2	19.6573	19.8132	20.0632	20.2436	20.3112	20.3228	20.3234	20.3233	20.3190	20.2345	19.9221	19.5950	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.8960	20.0425	20.2794	20.4539	20.5218	20.5343	20.5350	20.5349	20.5299	20.4436	20.1444	19.8376	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.7460	19.8925	20.1294	20.3039	20.3718	20.3843	20.3850	20.3849	20.3799	20.2936	19.9944	19.6876	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9649	0.9425	0.8770	0.7465	0.5647	0.3608	0.2415	0.2711	0.4984	0.7845	0.9344	0.9719	(94)
Useful gains	645.5037	684.6742	697.0522	647.2502	503.6302	323.2027	204.9763	217.4329	370.8555	530.0958	596.0068	621.2212	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	945.1626	916.8626	819.3157	686.6791	509.9478	323.5186	204.9947	217.4719	373.1680	573.7141	779.6919	947.7553	(97)
Space heating kWh	222.9462	156.0306	90.9641	28.3888	4.7003	0.0000	0.0000	0.0000	0.0000	32.4520	132.2533	242.9414	(98a)
Space heating requirement - total per year (kWh/year)												910.6767	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	222.9462	156.0306	90.9641	28.3888	4.7003	0.0000	0.0000	0.0000	0.0000	32.4520	132.2533	242.9414	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												910.6767	
Space heating per m2											(98c) / (4) =	10.5038	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 89.0000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	222.9462	156.0306	90.9641	28.3888	4.7003	0.0000	0.0000	0.0000	0.0000	32.4520	132.2533	242.9414	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	250.5014	175.3153	102.2068	31.8976	5.2812	0.0000	0.0000	0.0000	0.0000	36.4629	148.5992	272.9678	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	232.1971	204.6358	215.7042	185.7185	177.3341	156.8703	152.7423	160.4732	164.0682	186.4417	202.5020	229.1547	(64)
Efficiency of water heater												87.3000	(216)
(217)m	88.1245	88.0274	87.7974	87.5217	87.3431	87.3000	87.3000	87.3000	87.3000	87.5479	87.9638	88.1666	(217)
Fuel for water heating, kWh/month	263.4874	232.4683	245.6840	212.1972	203.0316	179.6911	174.9625	183.8181	187.9361	212.9596	230.2106	259.9109	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.1487	9.1665	10.1487	9.8213	10.1487	9.8213	10.1487	10.1487	9.8213	10.1487	9.8213	10.1487	(231)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1 1023.2322 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 87.3000

Water heating fuel used 2586.3573 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)

mechanical ventilation fans (SFP = 0.1292) 33.4924 (230a)

central heating pump 41.0000 (230c)

main heating flue fan 45.0000 (230e)

Total electricity for the above, kWh/year 119.4924 (231)

Electricity for lighting (calculated in Appendix L)	216.3282	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3945.4101	(238)

10a. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1023.2322	6.5500	67.0217	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2586.3573	6.5500	169.4064	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	119.4924	28.4300	33.9717	(249)
Energy for lighting	216.3282	28.4300	61.5021	(250)
Additional standing charges			104.0000	(251)
Total energy cost			435.9019	(255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1023.2322	0.2100	214.8788	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2586.3573	0.2100	543.1350	(264)
Space and water heating			758.0138	(265)
Pumps, fans and electric keep-hot	119.4924	0.1387	16.5751	(267)
Energy for lighting	216.3282	0.1443	31.2229	(268)
Total CO2, kg/year			805.8117	(272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1023.2322	1.1300	1156.2524	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2586.3573	1.1300	2922.5837	(278)
Space and water heating			4078.8361	(279)
Pumps, fans and electric keep-hot	119.4924	1.5128	180.7681	(281)
Energy for lighting	216.3282	1.5338	331.8115	(282)
Total Primary energy kWh/year			4591.4157	(286)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.65	**TER**	9.93
Environmental	99 A	**% DER < TER**			83.38
CO_2 Emissions (t/year)	0.12	**DFEE**	19.61	**TFEE**	23.82
Compliance Check	See BREL	**% DFEE < TFEE**			17.65
% DPER < TPER	59.18	**DPER**	21.41	**TPER**	52.44

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17650.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 203.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674 (64)
12Total per year (kWh/year)												2752 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201 (83)
Total gains	652.0784	730.2946	789.6905	869.3922	912.9689	904.3786	866.5575	814.6416	757.3995	678.0557	637.1713	628.5612 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	
alpha	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	
util living area	0.9792	0.9585	0.9131	0.7944	0.6214	0.4401	0.3167	0.3520	0.5611	0.8423	0.9566	0.9831	(86)
MIT	20.3560	20.5138	20.7068	20.8972	20.9792	20.9978	20.9998	20.9996	20.9911	20.8757	20.5885	20.3132	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house	0.9747	0.9501	0.8968	0.7638	0.5803	0.3942	0.2681	0.3004	0.5089	0.8097	0.9463	0.9794	(89)
MIT 2	19.5774	19.7734	20.0073	20.2235	20.3063	20.3221	20.3233	20.3232	20.3174	20.2052	19.8684	19.5237	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8209	20.0050	20.2261	20.4342	20.5168	20.5334	20.5349	20.5348	20.5281	20.4149	20.0937	19.7707	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8209	20.0050	20.2261	20.4342	20.5168	20.5334	20.5349	20.5348	20.5281	20.4149	20.0937	19.7707	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9706	0.9456	0.8943	0.7690	0.5922	0.4085	0.2833	0.3166	0.5248	0.8144	0.9423	0.9756	(94)
Useful gains	632.9262	690.5459	706.2003	668.5908	540.6690	369.4323	245.4840	257.8883	397.5186	552.2070	600.4044	613.2422	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	968.5573	942.6040	856.5525	719.7730	550.1974	370.2664	245.5515	258.0238	401.1349	612.4828	810.8472	971.6605	(97)
Space heating kWh	249.7095	169.3831	111.8620	36.8511	7.0892	0.0000	0.0000	0.0000	0.0000	44.8452	151.5189	266.6632	(98a)
Space heating requirement - total per year (kWh/year)												1037.9222	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	249.7095	169.3831	111.8620	36.8511	7.0892	0.0000	0.0000	0.0000	0.0000	44.8452	151.5189	266.6632	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1037.9222	
Space heating per m2											(98c) / (4) =	11.9714	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	249.7095	169.3831	111.8620	36.8511	7.0892	0.0000	0.0000	0.0000	0.0000	44.8452	151.5189	266.6632	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	374.5643	254.0746	167.7930	55.2767	10.6338	0.0000	0.0000	0.0000	0.0000	67.2678	227.2783	399.9948	
Space heating requirement	374.5643	254.0746	167.7930	55.2767	10.6338	0.0000	0.0000	0.0000	0.0000	67.2678	227.2783	399.9948	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1556.8833	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												15.5688	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4975.9841	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1515.8358	0.1576	65.4275	(367)
Electrical energy for heat distribution (space & water)	15.5688	0.0000	8.2692	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			228.7810	(373)
Space and water heating			228.7810	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			143.2061	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1515.8358	1.5834	657.3707	(467)
Electrical energy for heat distribution (space & water)	15.5688	0.0000	87.4306	(472)
Overall CO2 factor for heat network			0.4255	(486)
Total CO2 associated with community systems			2418.9139	(473)
Space and water heating			2418.9139	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1855.9706	(483)
Dwelling Primary energy Rate (DPER)			21.4100	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
Heatloss Floor 1			43.3500	0.1300	5.6355			(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1247			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E5 Ground floor (normal)	6.7700	0.1600	1.0832
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P1 Party wall - Ground floor	19.4300	0.0800	1.5544
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0424 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.1671 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	71.4535	71.2501	71.0507	70.1143	69.9391	69.1235	69.1235	68.9725	69.4377	69.9391	70.2935	70.6641	(39)
Average = Sum(39)m / 12 =												70.1135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8241	0.8218	0.8195	0.8087	0.8067	0.7973	0.7973	0.7955	0.8009	0.8067	0.8108	0.8150	(40)
HLP (average)												0.8087	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
										Total per year (kWh/year) = Sum(64)m =		2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(80)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)
Total gains	634.2986	701.5715	746.4857	809.2850	840.7342	827.5835	792.9978	750.1384	705.1835	645.1554	616.5661	612.8145	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3015	70.5022	70.7000	71.6442	71.8237	72.6712	72.6712	72.8303	72.3424	71.8237	71.4616	71.0868	
alpha	5.6868	5.7001	5.7133	5.7763	5.7882	5.8447	5.8447	5.8554	5.8228	5.7882	5.7641	5.7391	
util living area	0.9869	0.9755	0.9506	0.8718	0.7256	0.5281	0.3827	0.4214	0.6547	0.8987	0.9728	0.9890	(86)
MIT	20.1338	20.2930	20.5099	20.7811	20.9380	20.9918	20.9989	20.9982	20.9732	20.7737	20.4221	20.1108	(87)
Th 2	20.2325	20.2345	20.2365	20.2458	20.2475	20.2557	20.2557	20.2572	20.2526	20.2475	20.2440	20.2403	(88)
util rest of house	0.9838	0.9698	0.9391	0.8450	0.6794	0.4693	0.3184	0.3541	0.5925	0.8711	0.9654	0.9863	(89)
MIT 2	19.2244	19.4263	19.6971	20.0263	20.1952	20.2506	20.2553	20.2564	20.2340	20.0258	19.5980	19.2015	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.5089	19.6974	19.9513	20.2624	20.4275	20.4824	20.4879	20.4884	20.4653	20.2597	19.8558	19.4860	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5089	19.6974	19.9513	20.2624	20.4275	20.4824	20.4879	20.4884	20.4653	20.2597	19.8558	19.4860	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9800	0.9649	0.9341	0.8456	0.6908	0.4874	0.3385	0.3752	0.6107	0.8716	0.9608	0.9829	(94)
Useful gains	621.5918	676.9382	697.2896	684.3671	580.8200	403.3397	268.4262	281.4173	430.6569	562.3167	592.4069	602.3346	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1086.7269	1054.3197	955.7277	796.6638	610.3965	406.6140	268.7448	281.9902	441.9886	675.5921	896.6507	1080.1680	(97)
Space heating kWh	346.0605	253.6004	192.2779	80.8537	22.0049	0.0000	0.0000	0.0000	0.0000	84.2769	219.0556	355.5081	(98a)
Space heating requirement - total per year (kWh/year)												1553.6380	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	346.0605	253.6004	192.2779	80.8537	22.0049	0.0000	0.0000	0.0000	0.0000	84.2769	219.0556	355.5081	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1553.6380	
Space heating per m2											(98c) / (4) =	17.9197	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	346.0605	253.6004	192.2779	80.8537	22.0049	0.0000	0.0000	0.0000	0.0000	84.2769	219.0556	355.5081	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	374.9301	274.7566	208.3185	87.5988	23.8406	0.0000	0.0000	0.0000	0.0000	91.3076	237.3300	385.1659	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9387	84.5209	83.7641	82.2575	80.6576	79.8000	79.8000	79.8000	79.8000	82.3096	84.1786	85.0212	(217)
Fuel for water heating, kWh/month	275.1175	244.3994	262.0528	235.1664	232.7696	212.3443	209.9929	218.2535	220.5242	237.9658	246.8257	271.9522	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.0522	-34.0491	-51.2340	-60.3739	-67.5059	-63.8722	-63.0931	-58.3837	-50.4758	-40.1585	-25.8892	-19.7533	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.6843	-18.6438	-37.7720	-57.7989	-77.4856	-78.2579	-77.3368	-64.9856	-46.9877	-27.0053	-11.7029	-6.8394	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1683.2481	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2867.3643	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1071.3411	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3789.6495	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1683.2481	0.2100	353.4821	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2867.3643	0.2100	602.1465	(264)
Space and water heating			955.6286	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	0.1336	-74.5440	
PV Unit electricity exported	-513.5003	0.1254	-64.3679	
Total			-138.9120	(269)
Total CO2, kg/year			861.0306	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.9300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1683.2481	1.1300	1902.0704	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2867.3643	1.1300	3240.1217	(278)
Space and water heating			5142.1920	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	1.4938	-833.3127	
PV Unit electricity exported	-513.5003	0.4601	-236.2611	
Total			-1069.5738	(283)
Total Primary energy kWh/year			4546.8779	(286)
Target Primary Energy Rate (TPER)			52.4400	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.65	**TER**	9.93
Environmental	99 A	**% DER < TER**			83.38
CO_2 Emissions (t/year)	0.12	**DFEE**	19.61	**TFEE**	23.82
Compliance Check	See BREL	**% DFEE < TFEE**			17.65
% DPER < TPER	59.18	**DPER**	21.41	**TPER**	52.44

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2257	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2878	0.2821	0.2765	0.2483	0.2426	0.2144	0.2144	0.2088	0.2257	0.2426	0.2539	0.2652	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5414	0.5398	0.5382	0.5308	0.5294	0.5230	0.5230	0.5218	0.5255	0.5294	0.5322	0.5352	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		18083.8300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							208.5794	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9510	37.8383	37.7278	37.2089	37.1118	36.6599	36.6599	36.5762	36.8339	37.1118	37.3082	37.5135	(38)
Heat transfer coeff	65.3058	65.1931	65.0826	64.5637	64.4666	64.0147	64.0147	63.9310	64.1888	64.4666	64.6630	64.8684	(39)
Average = Sum(39)m / 12 =												64.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7532	0.7519	0.7507	0.7447	0.7436	0.7383	0.7383	0.7374	0.7404	0.7436	0.7458	0.7482	(40)
HLP (average)												0.7447	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
									Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)											908	(64)

Electric shower(s)

54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 614.3496 (64a)

Heat gains from water heating, kWh/month

37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	545.1343	624.6069	686.9038	773.6007	821.2924	817.0482	782.1979	728.3014	668.6668	584.4747	536.9133	522.5689	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.9194	77.0524	77.1832	77.8035	77.9207	78.4708	78.4708	78.5736	78.2580	77.9207	77.6840	77.4381	
alpha	6.1280	6.1368	6.1455	6.1869	6.1947	6.2314	6.2314	6.2382	6.2172	6.1947	6.1789	6.1625	
util living area	0.9928	0.9828	0.9569	0.8650	0.6987	0.4980	0.3597	0.4030	0.6442	0.9127	0.9829	0.9944	(86)

MIT	20.1474	20.3236	20.5553	20.8258	20.9600	20.9957	20.9995	20.9990	20.9811	20.7869	20.4232	20.1142	(87)
Th 2	20.2940	20.2952	20.2963	20.3015	20.3025	20.3071	20.3071	20.3079	20.3053	20.3025	20.3005	20.2985	(88)
util rest of house	0.9910	0.9787	0.9469	0.8386	0.6548	0.4455	0.3033	0.3428	0.5858	0.8884	0.9781	0.9929	(89)
MIT 2	19.5115	19.6862	19.9120	20.1657	20.2764	20.3050	20.3069	20.3076	20.2951	20.1373	19.7900	19.4822	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.7104	19.8856	20.1132	20.3722	20.4902	20.5210	20.5236	20.5239	20.5097	20.3405	19.9880	19.6799	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7104	19.8856	20.1132	20.3722	20.4902	20.5210	20.5236	20.5239	20.5097	20.3405	19.9880	19.6799	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9892	0.9758	0.9439	0.8415	0.6669	0.4618	0.3209	0.3616	0.6034	0.8899	0.9754	0.9914	(94)
Useful gains	539.2247	609.5155	648.3454	650.9535	547.7288	377.3310	251.0226	263.3471	403.4594	520.1241	523.7266	518.0501	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1006.3914	976.9551	885.9846	740.6854	566.6755	379.0332	251.1663	263.6444	411.4276	627.9374	833.3797	1004.1547	(97)
Space heating kWh	347.5720	246.9194	176.8036	64.6070	14.0964	0.0000	0.0000	0.0000	0.0000	80.2131	222.9502	361.6619	(98a)
Space heating requirement - total per year (kWh/year)												1514.8235	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	347.5720	246.9194	176.8036	64.6070	14.0964	0.0000	0.0000	0.0000	0.0000	80.2131	222.9502	361.6619	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1514.8235	
Space heating per m2											(98c) / (4) =	17.4720	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	601.7381	473.7088	485.8756	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9701	0.9885	0.9812	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	583.7487	468.2440	476.7501	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	890.8770	853.1757	792.9430	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	221.1324	286.3892	235.2475	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	55.2831	71.5973	58.8119	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												185.6923	(107)
Energy for space heating												17.4720	(99)
Energy for space cooling												2.1418	(108)
Total												19.6138	(109)
Fabric Energy Efficiency (DFEE)												19.6	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
Heatloss Floor 1			43.3500	0.1300	5.6355			(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1247			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	6.2700	0.0500	0.3135
E2 Other lintels (including other steel lintels)	2.5200	0.0500	0.1260
E3 Sill	20.7200	0.0500	1.0360
E4 Jamb	13.5400	0.0000	0.0000
E6 Intermediate floor within a dwelling	6.7700	0.1600	1.0832
E5 Ground floor (normal)	22.0000	0.0600	1.3200
E18 Party wall between dwellings	12.6600	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	19.4300	0.0800	1.5544
P1 Party wall - Ground floor	6.7700	0.0200	0.1354
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0700	0.4739
E7 Party floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0424 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.1671 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	71.4535	71.2501	71.0507	70.1143	69.9391	69.1235	69.1235	68.9725	69.4377	69.9391	70.2935	70.6641	(39)
Average = Sum(39)m / 12 =												70.1135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8241	0.8218	0.8195	0.8087	0.8067	0.7973	0.7973	0.7955	0.8009	0.8067	0.8108	0.8150	(40)
HLP (average)												0.8087	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122 (71)

Water heating gains (Table 5)

	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778 (72)

Total internal gains

	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(80)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088 (83)
Total gains	533.6898	602.2192	650.0344	719.8289	755.3931	749.5884	717.9735	673.1335	625.7862	557.9097	522.6435	513.1575 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3015	70.5022	70.7000	71.6442	71.8237	72.6712	72.6712	72.8303	72.3424	71.8237	71.4616	71.0868	
alpha	5.6868	5.7001	5.7133	5.7763	5.7882	5.8447	5.8447	5.8554	5.8228	5.7882	5.7641	5.7391	
util living area	0.9943	0.9878	0.9722	0.9127	0.7821	0.5788	0.4220	0.4683	0.7204	0.9399	0.9872	0.9954	(86)
MIT	19.9881	20.1562	20.3911	20.7067	20.9086	20.9869	20.9982	20.9968	20.9566	20.6888	20.2937	19.9650	(87)
Th 2	20.2325	20.2345	20.2365	20.2458	20.2475	20.2557	20.2557	20.2572	20.2526	20.2475	20.2440	20.2403	(88)
util rest of house	0.9928	0.9847	0.9650	0.8915	0.7378	0.5159	0.3514	0.3942	0.6574	0.9205	0.9834	0.9942	(89)
MIT 2	19.3031	19.4712	19.7034	20.0101	20.1855	20.2492	20.2551	20.2561	20.2282	20.0005	19.6160	19.2865	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.5174	19.6854	19.9185	20.2280	20.4117	20.4800	20.4876	20.4878	20.4560	20.2158	19.8280	19.4988	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5174	19.6854	19.9185	20.2280	20.4117	20.4800	20.4876	20.4878	20.4560	20.2158	19.8280	19.4988	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9910	0.9819	0.9614	0.8909	0.7480	0.5352	0.3735	0.4174	0.6753	0.9196	0.9807	0.9927	(94)
Useful gains	528.9006	591.3161	624.9258	641.3079	565.0433	401.1637	268.1836	280.9411	422.5869	513.0475	512.5746	509.3875	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1087.3358	1053.4647	953.3951	794.2554	609.2891	406.4436	268.7227	281.9472	441.3491	672.5188	894.6974	1081.0736	(97)
Space heating kWh	415.4757	310.5639	244.3812	110.1222	32.9189	0.0000	0.0000	0.0000	0.0000	118.6466	275.1285	425.3345	(98a)
Space heating requirement - total per year (kWh/year)												1932.5715	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	415.4757	310.5639	244.3812	110.1222	32.9189	0.0000	0.0000	0.0000	0.0000	118.6466	275.1285	425.3345	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1932.5715	
Space heating per m2										(98c) / (4) =		22.2903	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	649.7609	511.5139	524.1907	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9306	0.9687	0.9544	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	604.6778	495.5119	500.2837	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	812.0280	778.1082	728.4611	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	149.2922	210.2516	169.7640	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	37.3230	52.5629	42.4410	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												132.3270	(107)
Energy for space heating												22.2903	(99)
Energy for space cooling												1.5263	(108)
Total												23.8166	(109)
Fabric Energy Efficiency (TFEE)												23.8	(109)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.65	**TER**	9.93
Environmental	99 A	**% DER < TER**			83.38
CO_2 Emissions (t/year)	0.12	**DFEE**	19.61	**TFEE**	23.82
Compliance Check	See BREL	**% DFEE < TFEE**			17.65
% DPER < TPER	59.18	**DPER**	21.41	**TPER**	52.44

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17650.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 203.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674 (64)
12Total per year (kWh/year)												2752 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201 (83)
Total gains	652.0784	730.2946	789.6905	869.3922	912.9689	904.3786	866.5575	814.6416	757.3995	678.0557	637.1713	628.5612 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	
alpha	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	
util living area	0.9792	0.9585	0.9131	0.7944	0.6214	0.4401	0.3167	0.3520	0.5611	0.8423	0.9566	0.9831	(86)
MIT	20.3560	20.5138	20.7068	20.8972	20.9792	20.9978	20.9998	20.9996	20.9911	20.8757	20.5885	20.3132	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house	0.9747	0.9501	0.8968	0.7638	0.5803	0.3942	0.2681	0.3004	0.5089	0.8097	0.9463	0.9794	(89)
MIT 2	19.5774	19.7734	20.0073	20.2235	20.3063	20.3221	20.3233	20.3232	20.3174	20.2052	19.8684	19.5237	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.8209	20.0050	20.2261	20.4342	20.5168	20.5334	20.5349	20.5348	20.5281	20.4149	20.0937	19.7707	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8209	20.0050	20.2261	20.4342	20.5168	20.5334	20.5349	20.5348	20.5281	20.4149	20.0937	19.7707	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9706	0.9456	0.8943	0.7690	0.5922	0.4085	0.2833	0.3166	0.5248	0.8144	0.9423	0.9756	(94)
Useful gains	632.9262	690.5459	706.2003	668.5908	540.6690	369.4323	245.4840	257.8883	397.5186	552.2070	600.4044	613.2422	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	968.5573	942.6040	856.5525	719.7730	550.1974	370.2664	245.5515	258.0238	401.1349	612.4828	810.8472	971.6605	(97)
Space heating kWh	249.7095	169.3831	111.8620	36.8511	7.0892	0.0000	0.0000	0.0000	0.0000	44.8452	151.5189	266.6632	(98a)
Space heating requirement - total per year (kWh/year)												1037.9222	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	249.7095	169.3831	111.8620	36.8511	7.0892	0.0000	0.0000	0.0000	0.0000	44.8452	151.5189	266.6632	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1037.9222	
Space heating per m2											(98c) / (4) =	11.9714	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	249.7095	169.3831	111.8620	36.8511	7.0892	0.0000	0.0000	0.0000	0.0000	44.8452	151.5189	266.6632	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	374.5643	254.0746	167.7930	55.2767	10.6338	0.0000	0.0000	0.0000	0.0000	67.2678	227.2783	399.9948	
Space heating requirement	374.5643	254.0746	167.7930	55.2767	10.6338	0.0000	0.0000	0.0000	0.0000	67.2678	227.2783	399.9948	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1556.8833	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												15.5688	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4975.9841	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1515.8358	0.1576	65.4275	(367)
Electrical energy for heat distribution (space & water)	15.5688	0.0000	8.2692	(372)
Overall CO2 factor for heat network			0.0402	(386)
Total CO2 associated with community systems			228.7810	(373)
Space and water heating			228.7810	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			143.2061	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6500	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1515.8358	1.5834	657.3707	(467)
Electrical energy for heat distribution (space & water)	15.5688	0.0000	87.4306	(472)
Overall CO2 factor for heat network			0.4255	(486)
Total CO2 associated with community systems			2418.9139	(473)
Space and water heating			2418.9139	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1855.9706	(483)
Dwelling Primary energy Rate (DPER)			21.4100	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
Heatloss Floor 1			43.3500	0.1300	5.6355			(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1247			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E5 Ground floor (normal)	6.7700	0.1600	1.0832
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P1 Party wall - Ground floor	19.4300	0.0800	1.5544
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0424 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.1671 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	71.4535	71.2501	71.0507	70.1143	69.9391	69.1235	69.1235	68.9725	69.4377	69.9391	70.2935	70.6641	(39)
Average = Sum(39)m / 12 =												70.1135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8241	0.8218	0.8195	0.8087	0.8067	0.7973	0.7973	0.7955	0.8009	0.8067	0.8108	0.8150	(40)
HLP (average)												0.8087	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
										Total per year (kWh/year) = Sum(64)m =		2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	9.2400	19.6403	0.6300	0.7000	0.7700	55.4614	(80)

Solar gains	55.4614	108.4943	178.6747	260.5864	319.3584	326.9202	311.2414	267.3517	207.8061	128.7377	69.1539	45.6088	(83)
Total gains	634.2986	701.5715	746.4857	809.2850	840.7342	827.5835	792.9978	750.1384	705.1835	645.1554	616.5661	612.8145	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3015	70.5022	70.7000	71.6442	71.8237	72.6712	72.6712	72.8303	72.3424	71.8237	71.4616	71.0868	
alpha	5.6868	5.7001	5.7133	5.7763	5.7882	5.8447	5.8447	5.8554	5.8228	5.7882	5.7641	5.7391	
util living area	0.9869	0.9755	0.9506	0.8718	0.7256	0.5281	0.3827	0.4214	0.6547	0.8987	0.9728	0.9890	(86)
MIT	20.1338	20.2930	20.5099	20.7811	20.9380	20.9918	20.9989	20.9982	20.9732	20.7737	20.4221	20.1108	(87)
Th 2	20.2325	20.2345	20.2365	20.2458	20.2475	20.2557	20.2557	20.2572	20.2526	20.2475	20.2440	20.2403	(88)
util rest of house	0.9838	0.9698	0.9391	0.8450	0.6794	0.4693	0.3184	0.3541	0.5925	0.8711	0.9654	0.9863	(89)
MIT 2	19.2244	19.4263	19.6971	20.0263	20.1952	20.2506	20.2553	20.2564	20.2340	20.0258	19.5980	19.2015	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.5089	19.6974	19.9513	20.2624	20.4275	20.4824	20.4879	20.4884	20.4653	20.2597	19.8558	19.4860	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5089	19.6974	19.9513	20.2624	20.4275	20.4824	20.4879	20.4884	20.4653	20.2597	19.8558	19.4860	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9800	0.9649	0.9341	0.8456	0.6908	0.4874	0.3385	0.3752	0.6107	0.8716	0.9608	0.9829	(94)
Useful gains	621.5918	676.9382	697.2896	684.3671	580.8200	403.3397	268.4262	281.4173	430.6569	562.3167	592.4069	602.3346	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1086.7269	1054.3197	955.7277	796.6638	610.3965	406.6140	268.7448	281.9902	441.9886	675.5921	896.6507	1080.1680	(97)
Space heating kWh	346.0605	253.6004	192.2779	80.8537	22.0049	0.0000	0.0000	0.0000	0.0000	84.2769	219.0556	355.5081	(98a)
Space heating requirement - total per year (kWh/year)												1553.6380	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	346.0605	253.6004	192.2779	80.8537	22.0049	0.0000	0.0000	0.0000	0.0000	84.2769	219.0556	355.5081	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1553.6380	
Space heating per m2											(98c) / (4) =	17.9197	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	346.0605	253.6004	192.2779	80.8537	22.0049	0.0000	0.0000	0.0000	0.0000	84.2769	219.0556	355.5081	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	374.9301	274.7566	208.3185	87.5988	23.8406	0.0000	0.0000	0.0000	0.0000	91.3076	237.3300	385.1659	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9387	84.5209	83.7641	82.2575	80.6576	79.8000	79.8000	79.8000	79.8000	82.3096	84.1786	85.0212	(217)
Fuel for water heating, kWh/month	275.1175	244.3994	262.0528	235.1664	232.7696	212.3443	209.9929	218.2535	220.5242	237.9658	246.8257	271.9522	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.0522	-34.0491	-51.2340	-60.3739	-67.5059	-63.8722	-63.0931	-58.3837	-50.4758	-40.1585	-25.8892	-19.7533	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.6843	-18.6438	-37.7720	-57.7989	-77.4856	-78.2579	-77.3368	-64.9856	-46.9877	-27.0053	-11.7029	-6.8394	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1683.2481	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2867.3643	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1071.3411	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3789.6495	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1683.2481	0.2100	353.4821	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2867.3643	0.2100	602.1465	(264)
Space and water heating			955.6286	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	0.1336	-74.5440	
PV Unit electricity exported	-513.5003	0.1254	-64.3679	
Total			-138.9120	(269)
Total CO2, kg/year			861.0306	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.9300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1683.2481	1.1300	1902.0704	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2867.3643	1.1300	3240.1217	(278)
Space and water heating			5142.1920	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	1.4938	-833.3127	
PV Unit electricity exported	-513.5003	0.4601	-236.2611	
Total			-1069.5738	(283)
Total Primary energy kWh/year			4546.8779	(286)
Target Primary Energy Rate (TPER)			52.4400	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - East	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	88 B	**DER**	1.65	**TER**	9.93
Environmental	99 A	**% DER < TER**			83.38
CO_2 Emissions (t/year)	0.12	**DFEE**	19.61	**TFEE**	23.82
Compliance Check	See BREL	**% DFEE < TFEE**			17.65
% DPER < TPER	59.18	**DPER**	21.41	**TPER**	52.44

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201 (83)
Total gains	706.5297	768.1759	833.8294	897.3119	933.0604	910.4848	872.9142	823.2320	769.6084	706.4837	673.4276	678.8029 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area	0.9712	0.9505	0.8969	0.7797	0.6102	0.4373	0.3144	0.3484	0.5533	0.8250	0.9472	0.9769	(86)
MIT	20.4434	20.5707	20.7545	20.9133	20.9828	20.9981	20.9998	20.9996	20.9925	20.8965	20.6410	20.3976	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house	0.9651	0.9407	0.8785	0.7482	0.5693	0.3917	0.2661	0.2973	0.5014	0.7906	0.9350	0.9719	(89)
MIT 2	19.6853	19.8421	20.0623	20.2402	20.3094	20.3223	20.3233	20.3233	20.3184	20.2266	19.9311	19.6283	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9224	20.0700	20.2788	20.4507	20.5201	20.5337	20.5349	20.5348	20.5293	20.4362	20.1532	19.8689	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9224	20.0700	20.2788	20.4507	20.5201	20.5337	20.5349	20.5348	20.5293	20.4362	20.1532	19.8689	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9609	0.9365	0.8772	0.7544	0.5813	0.4059	0.2812	0.3133	0.5173	0.7966	0.9316	0.9679	(94)
Useful gains	678.9085	719.4095	731.3969	676.9021	542.3988	369.5665	245.4983	257.9174	398.1471	562.8187	627.3317	656.9944	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	974.8915	946.6594	859.8430	720.8045	550.4004	370.2822	245.5532	258.0272	401.2087	613.8092	814.5609	977.7911	(97)
Space heating kWh	220.2114	152.7119	95.5639	31.6097	5.9532	0.0000	0.0000	0.0000	0.0000	37.9370	134.8051	238.6728	(98a)
Space heating requirement - total per year (kWh/year)												917.4649	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	220.2114	152.7119	95.5639	31.6097	5.9532	0.0000	0.0000	0.0000	0.0000	37.9370	134.8051	238.6728	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												917.4649	
Space heating per m2											(98c) / (4) =	10.5821	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	220.2114	152.7119	95.5639	31.6097	5.9532	0.0000	0.0000	0.0000	0.0000	37.9370	134.8051	238.6728	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	330.3170	229.0679	143.3458	47.4146	8.9298	0.0000	0.0000	0.0000	0.0000	56.9055	202.2076	358.0092	
Space heating requirement	330.3170	229.0679	143.3458	47.4146	8.9298	0.0000	0.0000	0.0000	0.0000	56.9055	202.2076	358.0092	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1376.1973	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												13.7620	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4795.2981	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1376.1973	4.4400	61.1032	(340a)
Space heating total			61.1032	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			269.6942	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7372 (357)
SAP value		88.0499
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1467.6529	0.1577	57.8697	(367)
Electrical energy for heat distribution (space & water)	13.7620	0.0000	7.9858	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			220.9398	(373)
Space and water heating			220.9398	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			135.3649	(383)
CO2 emissions per m2			1.5600	(384)
EI value			98.6227	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)

Average = Sum(39)m / 12 = 62.4033

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)

Total per year (kWh/year) = Sum(64)m = 2751.6674 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	23.7835	0.7600	0.7000	0.7700	65.5876	(80)
West	1.7600	23.7835	0.7600	0.7000	0.7700	15.4324	(80)

Solar gains	81.0200	140.8292	228.1692	335.8028	395.8111	434.4066	405.9044	355.9037	279.8628	176.2264	99.5150	67.0100	(83)
Total gains	720.6439	778.1231	846.4545	918.7565	943.6137	950.5115	903.3528	856.6161	798.7845	727.4075	689.5188	690.7928	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area													
	0.9657	0.9434	0.8775	0.7484	0.5741	0.3803	0.2694	0.2986	0.5119	0.7847	0.9343	0.9726	(86)
MIT	20.4879	20.6061	20.7954	20.9335	20.9883	20.9992	20.9999	20.9999	20.9954	20.9265	20.6900	20.4405	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house													
	0.9585	0.9323	0.8564	0.7149	0.5324	0.3361	0.2227	0.2494	0.4609	0.7460	0.9195	0.9667	(89)
MIT 2	19.7406	19.8853	20.1096	20.2611	20.3143	20.3230	20.3234	20.3234	20.3204	20.2573	19.9899	19.6820	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9743	20.1108	20.3241	20.4714	20.5251	20.5345	20.5350	20.5350	20.5316	20.4666	20.2089	19.9193	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9743	20.1108	20.3241	20.4714	20.5251	20.5345	20.5350	20.5350	20.5316	20.4666	20.2089	19.9193	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9542	0.9284	0.8564	0.7225	0.5450	0.3499	0.2373	0.2648	0.4767	0.7545	0.9167	0.9625	(94)
Useful gains	687.6309	722.3789	724.9117	663.7583	514.2262	332.6205	214.3390	226.7993	380.7829	548.8609	632.0886	664.9114	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	959.4096	930.4829	831.4699	697.1320	519.5167	332.8923	214.3562	226.8346	382.6299	584.5089	793.0766	962.2142	(97)
Space heating kWh													
	202.2034	139.8458	79.2793	24.0291	3.9361	0.0000	0.0000	0.0000	0.0000	26.5221	115.9113	221.1932	(98a)
Space heating requirement - total per year (kWh/year)												812.9203	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	202.2034	139.8458	79.2793	24.0291	3.9361	0.0000	0.0000	0.0000	0.0000	26.5221	115.9113	221.1932	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												812.9203	
Space heating per m2											(98c) / (4) =	9.3762	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump-Space and Water	1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.5000 (306)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)
Space heating:	
Space heating requirement	

	202.2034	139.8458	79.2793	24.0291	3.9361	0.0000	0.0000	0.0000	0.0000	26.5221	115.9113	221.1932	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	303.3050	209.7688	118.9189	36.0436	5.9042	0.0000	0.0000	0.0000	0.0000	39.7831	173.8669	331.7899	
Space heating requirement													
	303.3050	209.7688	118.9189	36.0436	5.9042	0.0000	0.0000	0.0000	0.0000	39.7831	173.8669	331.7899	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)

Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year	
Space heating fuel - community heating	1219.3805 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	12.1938 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)	
mechanical ventilation fans (SFP = 0.1292)	33.4924 (330a)
Total electricity for the above, kWh/year	33.4924 (331)
Electricity for lighting (calculated in Appendix L)	216.3282 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4541.9552 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1219.3805	6.5500	79.8694	(340a)
Space heating total			79.8694	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			343.1745	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1425.8351	0.1582	51.4336	(367)
Electrical energy for heat distribution (space & water)	12.1938	0.0000	7.7444	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			214.2623	(373)
Space and water heating			214.2623	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			116.4294	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1425.8351	1.5855	515.5619	(467)
Electrical energy for heat distribution (space & water)	12.1938	0.0000	82.1128	(472)
Overall CO2 factor for heat network			0.4249	(486)
Total CO2 associated with community systems			2271.7872	(473)
Space and water heating			2271.7872	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1627.9520	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - East

Current energy efficiency rating: B 88
Current environmental impact rating: A 99

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£71	£71	£0
Community scheme	£454	£454	£0
Space heating	£193	£193	£0
Water heating	£270	£270	£0
Lighting	£62	£62	£0
Generated (PV)	-£182	-£182	£0
Total cost of fuels	£343	£343	£0
Total cost of uses	£343	£343	£0
Delivered energy	52 kWh/m²	52 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	19 kWh/m²	19 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5778 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day)	126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	

Distribution loss (46)m = 0.15 x (45)m

32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss / Combi loss

Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS / PV diverter / Solar input / FGHRS

Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
									Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	19.6403	0.7600	0.7000	0.7700	54.1619	(80)
West	1.7600	19.6403	0.7600	0.7000	0.7700	12.7440	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	66.9059	130.8821	215.5441	314.3582	385.2578	394.3799	375.4658	322.5195	250.6867	155.3026	83.4237	55.0201	(83)
Total gains	706.5297	768.1759	833.8294	897.3119	933.0604	910.4848	872.9142	823.2320	769.6084	706.4837	673.4276	678.8029	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area	0.9712	0.9505	0.8969	0.7797	0.6102	0.4373	0.3144	0.3484	0.5533	0.8250	0.9472	0.9769	(86)
MIT	20.4434	20.5707	20.7545	20.9133	20.9828	20.9981	20.9998	20.9996	20.9925	20.8965	20.6410	20.3976	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house	0.9651	0.9407	0.8785	0.7482	0.5693	0.3917	0.2661	0.2973	0.5014	0.7906	0.9350	0.9719	(89)
MIT 2	19.6853	19.8421	20.0623	20.2402	20.3094	20.3223	20.3233	20.3233	20.3184	20.2266	19.9311	19.6283	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.9224	20.0700	20.2788	20.4507	20.5201	20.5337	20.5349	20.5348	20.5293	20.4362	20.1532	19.8689	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9224	20.0700	20.2788	20.4507	20.5201	20.5337	20.5349	20.5348	20.5293	20.4362	20.1532	19.8689	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9609	0.9365	0.8772	0.7544	0.5813	0.4059	0.2812	0.3133	0.5173	0.7966	0.9316	0.9679	(94)
Useful gains	678.9085	719.4095	731.3969	676.9021	542.3988	369.5665	245.4983	257.9174	398.1471	562.8187	627.3317	656.9944	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	974.8915	946.6594	859.8430	720.8045	550.4004	370.2822	245.5532	258.0272	401.2087	613.8092	814.5609	977.7911	(97)
Space heating kWh	220.2114	152.7119	95.5639	31.6097	5.9532	0.0000	0.0000	0.0000	0.0000	37.9370	134.8051	238.6728	(98a)
Space heating requirement - total per year (kWh/year)												917.4649	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	220.2114	152.7119	95.5639	31.6097	5.9532	0.0000	0.0000	0.0000	0.0000	37.9370	134.8051	238.6728	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												917.4649	
Space heating per m2										(98c) / (4) =		10.5821	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

Space heating:

Space heating requirement

220.2114	152.7119	95.5639	31.6097	5.9532	0.0000	0.0000	0.0000	0.0000	37.9370	134.8051	238.6728	(98)

Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50

307a 330.3170	229.0679	143.3458	47.4146	8.9298	0.0000	0.0000	0.0000	0.0000	56.9055	202.2076	358.0092	
Space heating requirement												
330.3170	229.0679	143.3458	47.4146	8.9298	0.0000	0.0000	0.0000	0.0000	56.9055	202.2076	358.0092	(307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)

Space heating fuel for secondary/supplementary system

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)

Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50

310a 409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel												
409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)

Cooling System Energy Efficiency Ratio	0.0000 (314)

Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446 (331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496 (332)

Electricity generated by PVs (Appendix M) (negative quantity)

(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176 (333a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)

Electricity generated by PVs (Appendix M) (negative quantity)

(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314 (333b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year

Space heating fuel - community heating	1376.1973 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)

Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	13.7620	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4795.2981	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1376.1973	4.4400	61.1032	(340a)
Space heating total			61.1032	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			269.6942	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.7372	(357)
SAP value	88.0499	
SAP rating (Section 12)	88	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1467.6529	0.1577	57.8697	(367)
Electrical energy for heat distribution (space & water)	13.7620	0.0000	7.9858	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			220.9398	(373)
Space and water heating			220.9398	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			135.3649	(383)
CO2 emissions per m2			1.5600	(384)
EI value			98.6227	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5778	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
West	7.4800	23.7835	0.7600	0.7000	0.7700	65.5876	(80)
West	1.7600	23.7835	0.7600	0.7000	0.7700	15.4324	(80)

Solar gains	81.0200	140.8292	228.1692	335.8028	395.8111	434.4066	405.9044	355.9037	279.8628	176.2264	99.5150	67.0100	(83)
Total gains	720.6439	778.1231	846.4545	918.7565	943.6137	950.5115	903.3528	856.6161	798.7845	727.4075	689.5188	690.7928	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area													
	0.9657	0.9434	0.8775	0.7484	0.5741	0.3803	0.2694	0.2986	0.5119	0.7847	0.9343	0.9726	(86)
MIT	20.4879	20.6061	20.7954	20.9335	20.9883	20.9992	20.9999	20.9999	20.9954	20.9265	20.6900	20.4405	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house													
	0.9585	0.9323	0.8564	0.7149	0.5324	0.3361	0.2227	0.2494	0.4609	0.7460	0.9195	0.9667	(89)
MIT 2	19.7406	19.8853	20.1096	20.2611	20.3143	20.3230	20.3234	20.3234	20.3204	20.2573	19.9899	19.6820	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9743	20.1108	20.3241	20.4714	20.5251	20.5345	20.5350	20.5350	20.5316	20.4666	20.2089	19.9193	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9743	20.1108	20.3241	20.4714	20.5251	20.5345	20.5350	20.5350	20.5316	20.4666	20.2089	19.9193	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9542	0.9284	0.8564	0.7225	0.5450	0.3499	0.2373	0.2648	0.4767	0.7545	0.9167	0.9625	(94)
Useful gains	687.6309	722.3789	724.9117	663.7583	514.2262	332.6205	214.3390	226.7993	380.7829	548.8609	632.0886	664.9114	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	959.4096	930.4829	831.4699	697.1320	519.5167	332.8923	214.3562	226.8346	382.6299	584.5089	793.0766	962.2142	(97)
Space heating kWh													
	202.2034	139.8458	79.2793	24.0291	3.9361	0.0000	0.0000	0.0000	0.0000	26.5221	115.9113	221.1932	(98a)
Space heating requirement - total per year (kWh/year)												812.9203	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	202.2034	139.8458	79.2793	24.0291	3.9361	0.0000	0.0000	0.0000	0.0000	26.5221	115.9113	221.1932	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												812.9203	
Space heating per m2											(98c) / (4) =	9.3762	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement													
	202.2034	139.8458	79.2793	24.0291	3.9361	0.0000	0.0000	0.0000	0.0000	26.5221	115.9113	221.1932	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	303.3050	209.7688	118.9189	36.0436	5.9042	0.0000	0.0000	0.0000	0.0000	39.7831	173.8669	331.7899	
Space heating requirement													
	303.3050	209.7688	118.9189	36.0436	5.9042	0.0000	0.0000	0.0000	0.0000	39.7831	173.8669	331.7899	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1219.3805	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												12.1938	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1054.7470	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4541.9552	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1219.3805	6.5500	79.8694	(340a)
Space heating total			79.8694	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			343.1745	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1425.8351	0.1582	51.4336	(367)
Electrical energy for heat distribution (space & water)	12.1938	0.0000	7.7444	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			214.2623	(373)
Space and water heating			214.2623	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			116.4294	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)

Space and Water heating from Heat pump	1425.8351	1.5855	515.5619	(467)
Electrical energy for heat distribution (space & water)	12.1938	0.0000	82.1128	(472)
Overall CO2 factor for heat network			0.4249	(486)
Total CO2 associated with community systems			2271.7872	(473)
Space and water heating			2271.7872	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1627.9520	(483)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.46	**TER**	9.28
Environmental	99 A	**% DER < TER**			84.27
CO_2 Emissions (t/year)	0.1	**DFEE**	15.87	**TFEE**	20.38
Compliance Check	See BREL	**% DFEE < TFEE**			22.14
% DPER < TPER	60.16	**DPER**	19.50	**TPER**	48.95

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17650.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 203.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674 (64)
12Total per year (kWh/year)												2752 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.4800	46.7521	0.7600	0.7000	0.7700	128.9280	(78)
South	1.7600	46.7521	0.7600	0.7000	0.7700	30.3360	(78)

Solar gains	159.2640	260.8334	332.2555	375.5208	391.3159	376.5883	367.9497	357.3302	347.0801	281.3333	188.7822	137.6188 (83)
Total gains	744.4365	860.2459	906.4019	930.5548	919.0271	886.5871	859.0415	849.4522	853.7929	804.0864	742.5297	711.1599 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	
alpha	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	
util living area	0.9616	0.9191	0.8611	0.7581	0.6178	0.4488	0.3195	0.3377	0.5008	0.7552	0.9192	0.9696	(86)
MIT	20.4793	20.6585	20.8016	20.9208	20.9799	20.9976	20.9998	20.9997	20.9952	20.9334	20.7050	20.4274	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house	0.9540	0.9052	0.8396	0.7263	0.5767	0.4020	0.2704	0.2881	0.4530	0.7178	0.9029	0.9634	(89)
MIT 2	19.7302	19.9472	20.1154	20.2476	20.3069	20.3219	20.3233	20.3233	20.3202	20.2629	20.0066	19.6660	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9645	20.1697	20.3300	20.4582	20.5174	20.5333	20.5349	20.5348	20.5314	20.4726	20.2250	19.9042	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9645	20.1697	20.3300	20.4582	20.5174	20.5333	20.5349	20.5348	20.5314	20.4726	20.2250	19.9042	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9493	0.9018	0.8398	0.7328	0.5887	0.4166	0.2858	0.3036	0.4678	0.7264	0.9003	0.9588	(94)
Useful gains	706.7302	775.7553	761.2300	681.9426	541.0067	369.3237	245.4801	257.9211	399.4122	584.0727	668.5093	681.8874	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	977.5185	952.8777	863.0393	721.2706	550.2338	370.2547	245.5511	258.0274	401.3378	616.0839	819.0453	979.9940	(97)
Space heating kWh	201.4664	119.0263	75.7461	28.3162	6.8649	0.0000	0.0000	0.0000	0.0000	23.8163	108.3859	221.7913	(98a)
Space heating requirement - total per year (kWh/year)												785.4135	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	201.4664	119.0263	75.7461	28.3162	6.8649	0.0000	0.0000	0.0000	0.0000	23.8163	108.3859	221.7913	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												785.4135	
Space heating per m2											(98c) / (4) =	9.0590	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	201.4664	119.0263	75.7461	28.3162	6.8649	0.0000	0.0000	0.0000	0.0000	23.8163	108.3859	221.7913	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	302.1997	178.5394	113.6192	42.4742	10.2974	0.0000	0.0000	0.0000	0.0000	35.7245	162.5789	332.6870	
Space heating requirement	302.1997	178.5394	113.6192	42.4742	10.2974	0.0000	0.0000	0.0000	0.0000	35.7245	162.5789	332.6870	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1178.1202	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												11.7812	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4597.2210	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1414.8323	0.1581	49.6740	(367)
Electrical energy for heat distribution (space & water)	11.7812	0.0000	7.6784	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			212.4368	(373)
Space and water heating			212.4368	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			126.8619	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.4600	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1414.8323	1.5853	498.0393	(467)
Electrical energy for heat distribution (space & water)	11.7812	0.0000	81.4557	(472)
Overall CO2 factor for heat network			0.4248	(486)
Total CO2 associated with community systems			2253.6075	(473)
Space and water heating			2253.6075	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1690.6642	(483)
Dwelling Primary energy Rate (DPER)			19.5000	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
Heatloss Floor 1			43.3500	0.1300	5.6355			(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1247			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E5 Ground floor (normal)	6.7700	0.1600	1.0832
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P1 Party wall - Ground floor	19.4300	0.0800	1.5544
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0424 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.1671 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	71.4535	71.2501	71.0507	70.1143	69.9391	69.1235	69.1235	68.9725	69.4377	69.9391	70.2935	70.6641	(39)
Average = Sum(39)m / 12 =												70.1135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8241	0.8218	0.8195	0.8087	0.8067	0.7973	0.7973	0.7955	0.8009	0.8067	0.8108	0.8150	(40)
HLP (average)												0.8087	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
										Total per year (kWh/year) = Sum(64)m =		2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	9.2400	46.7521	0.6300	0.7000	0.7700	132.0215	(78)

Solar gains	132.0215	216.2172	275.4223	311.2870	324.3803	312.1719	305.0110	296.2079	287.7111	233.2105	156.4905	114.0787	(83)
Total gains	710.8586	809.2943	843.2333	859.9856	845.7561	812.8353	786.7674	778.9946	785.0885	749.6283	703.9027	681.2845	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3015	70.5022	70.7000	71.6442	71.8237	72.6712	72.6712	72.8303	72.3424	71.8237	71.4616	71.0868	
alpha	5.6868	5.7001	5.7133	5.7763	5.7882	5.8447	5.8447	5.8554	5.8228	5.7882	5.7641	5.7391	
util living area	0.9781	0.9554	0.9218	0.8466	0.7224	0.5371	0.3857	0.4060	0.5964	0.8395	0.9526	0.9820	(86)
MIT	20.2395	20.4287	20.6134	20.8156	20.9394	20.9910	20.9989	20.9985	20.9833	20.8497	20.5305	20.2071	(87)
Th 2	20.2325	20.2345	20.2365	20.2458	20.2475	20.2557	20.2557	20.2572	20.2526	20.2475	20.2440	20.2403	(88)
util rest of house	0.9730	0.9459	0.9056	0.8173	0.6761	0.4775	0.3209	0.3411	0.5369	0.8043	0.9410	0.9778	(89)
MIT 2	19.3571	19.5932	19.8200	20.0636	20.1964	20.2501	20.2553	20.2566	20.2413	20.1063	19.7299	19.3227	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.6331	19.8546	20.0682	20.2988	20.4288	20.4819	20.4879	20.4886	20.4734	20.3388	19.9803	19.5994	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6331	19.8546	20.0682	20.2988	20.4288	20.4819	20.4879	20.4886	20.4734	20.3388	19.9803	19.5994	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9682	0.9404	0.9017	0.8195	0.6877	0.4958	0.3412	0.3614	0.5548	0.8089	0.9362	0.9734	(94)
Useful gains	688.2802	761.0844	760.3014	704.7255	581.5888	403.0002	268.4106	281.5344	435.5553	606.3857	659.0179	663.1779	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1095.6042	1065.5144	964.0282	799.2193	610.4874	406.5753	268.7429	282.0039	442.5524	681.1263	905.4032	1088.1828	(97)
Space heating kWh	303.0491	204.5769	151.5728	68.0355	21.5006	0.0000	0.0000	0.0000	0.0000	55.6071	177.3974	316.2036	(98a)
Space heating requirement - total per year (kWh/year)												1297.9430	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	303.0491	204.5769	151.5728	68.0355	21.5006	0.0000	0.0000	0.0000	0.0000	55.6071	177.3974	316.2036	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1297.9430	
Space heating per m2											(98c) / (4) =	14.9705	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	303.0491	204.5769	151.5728	68.0355	21.5006	0.0000	0.0000	0.0000	0.0000	55.6071	177.3974	316.2036	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	328.3306	221.6435	164.2175	73.7113	23.2943	0.0000	0.0000	0.0000	0.0000	60.2460	192.1966	342.5825	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.6437	84.0381	83.2463	81.9614	80.6398	79.8000	79.8000	79.8000	79.8000	81.6294	83.7074	84.7622	(217)
Fuel for water heating, kWh/month	276.0761	245.8037	263.6830	236.0158	232.8211	212.3443	209.9929	218.2535	220.5242	239.9488	248.2150	272.7831	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.0522	-34.0491	-51.2340	-60.3739	-67.5059	-63.8722	-63.0931	-58.3837	-50.4758	-40.1585	-25.8892	-19.7533	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.6843	-18.6438	-37.7720	-57.7989	-77.4856	-78.2579	-77.3368	-64.9856	-46.9877	-27.0053	-11.7029	-6.8394	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1406.2221	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2876.4614	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1071.3411	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3521.7206	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1406.2221	0.2100	295.3066	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2876.4614	0.2100	604.0569	(264)
Space and water heating			899.3635	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	0.1336	-74.5440	
PV Unit electricity exported	-513.5003	0.1254	-64.3679	
Total			-138.9120	(269)
Total CO2, kg/year			804.7655	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.2800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1406.2221	1.1300	1589.0310	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2876.4614	1.1300	3250.4013	(278)
Space and water heating			4839.4323	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	1.4938	-833.3127	
PV Unit electricity exported	-513.5003	0.4601	-236.2611	
Total			-1069.5738	(283)
Total Primary energy kWh/year			4244.1182	(286)
Target Primary Energy Rate (TPER)			48.9500	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.46	**TER**	9.28
Environmental	99 A	**% DER < TER**			84.27
CO_2 Emissions (t/year)	0.1	**DFEE**	15.87	**TFEE**	20.38
Compliance Check	See BREL	**% DFEE < TFEE**			22.14
% DPER < TPER	60.16	**DPER**	19.50	**TPER**	48.95

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		3 * 10 =	30.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1412	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.2912	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2257	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2878	0.2821	0.2765	0.2483	0.2426	0.2144	0.2144	0.2088	0.2257	0.2426	0.2539	0.2652	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5414	0.5398	0.5382	0.5308	0.5294	0.5230	0.5230	0.5218	0.5255	0.5294	0.5322	0.5352	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		18083.8300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							208.5794	(35)

Thermal bridges (User defined value 0.030 * total exposed area)												2.7933	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	27.3548	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9510	37.8383	37.7278	37.2089	37.1118	36.6599	36.6599	36.5762	36.8339	37.1118	37.3082	37.5135	(38)
Heat transfer coeff	65.3058	65.1931	65.0826	64.5637	64.4666	64.0147	64.0147	63.9310	64.1888	64.4666	64.6630	64.8684	(39)
Average = Sum(39)m / 12 =												64.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7532	0.7519	0.7507	0.7447	0.7436	0.7383	0.7383	0.7374	0.7404	0.7436	0.7458	0.7482	(40)
HLP (average)												0.7447	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												64.3029	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)											Total = Sum(45)m =	1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =					614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.4800	46.7521	0.7600	0.7000	0.7700	128.9280	(78)
South	1.7600	46.7521	0.7600	0.7000	0.7700	30.3360	(78)

Solar gains	159.2640	260.8334	332.2555	375.5208	391.3159	376.5883	367.9497	357.3302	347.0801	281.3333	188.7822	137.6188	(83)
Total gains	637.4924	754.5582	803.6151	834.7633	827.3506	799.2566	774.6819	763.1120	765.0602	710.5054	642.2718	605.1675	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	76.9194	77.0524	77.1832	77.8035	77.9207	78.4708	78.4708	78.5736	78.2580	77.9207	77.6840	77.4381	
alpha	6.1280	6.1368	6.1455	6.1869	6.1947	6.2314	6.2314	6.2382	6.2172	6.1947	6.1789	6.1625	
util living area	0.9842	0.9590	0.9190	0.8308	0.6945	0.5087	0.3632	0.3848	0.5706	0.8348	0.9607	0.9880	(86)

MIT	20.2812	20.4940	20.6814	20.8636	20.9613	20.9951	20.9995	20.9993	20.9901	20.8798	20.5620	20.2358	(87)
Th 2	20.2940	20.2952	20.2963	20.3015	20.3025	20.3071	20.3071	20.3079	20.3053	20.3025	20.3005	20.2985	(88)
util rest of house	0.9805	0.9504	0.9030	0.8014	0.6507	0.4552	0.3062	0.3272	0.5163	0.8007	0.9509	0.9851	(89)
MIT 2	19.6432	19.8504	20.0288	20.1971	20.2772	20.3047	20.3069	20.3077	20.3001	20.2145	19.9231	19.6023	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.8427	20.0518	20.2330	20.4056	20.4912	20.5207	20.5236	20.5240	20.5160	20.4226	20.1229	19.8004	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8427	20.0518	20.2330	20.4056	20.4912	20.5207	20.5236	20.5240	20.5160	20.4226	20.1229	19.8004	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9777	0.9470	0.9014	0.8060	0.6628	0.4718	0.3240	0.3452	0.5330	0.8069	0.9481	0.9827	(94)
Useful gains	623.2643	714.5945	724.3808	672.8238	548.3995	377.0954	251.0135	263.4242	407.7420	573.3114	608.9196	594.6696	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1015.0315	987.7898	893.7783	742.8439	566.7391	379.0108	251.1654	263.6522	411.8328	633.2280	842.1016	1011.9746	(97)
Space heating kWh	291.4748	183.5872	126.0318	50.4145	13.6447	0.0000	0.0000	0.0000	0.0000	44.5780	167.8911	310.4749	(98a)
Space heating requirement - total per year (kWh/year)												1188.0970	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	291.4748	183.5872	126.0318	50.4145	13.6447	0.0000	0.0000	0.0000	0.0000	44.5780	167.8911	310.4749	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1188.0970	
Space heating per m2											(98c) / (4) =	13.7035	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	601.7381	473.7088	485.8756	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9667	0.9878	0.9853	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	581.7007	467.9492	478.7456	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	870.0817	844.3908	833.6307	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	207.6343	280.0725	264.0346	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	51.9086	70.0181	66.0086	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												187.9353	(107)
Energy for space heating												13.7035	(99)
Energy for space cooling												2.1677	(108)
Total												15.8712	(109)
Fabric Energy Efficiency (DFEE)												15.9	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
Heatloss Floor 1			43.3500	0.1300	5.6355			(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1247			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	6.2700	0.0500	0.3135
E2 Other lintels (including other steel lintels)	2.5200	0.0500	0.1260
E3 Sill	20.7200	0.0500	1.0360
E4 Jamb	13.5400	0.0000	0.0000
E6 Intermediate floor within a dwelling	6.7700	0.1600	1.0832
E5 Ground floor (normal)	22.0000	0.0600	1.3200
E18 Party wall between dwellings	12.6600	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	19.4300	0.0800	1.5544
P1 Party wall - Ground floor	6.7700	0.0200	0.1354
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0700	0.4739
E7 Party floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0424 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.1671 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	71.4535	71.2501	71.0507	70.1143	69.9391	69.1235	69.1235	68.9725	69.4377	69.9391	70.2935	70.6641	(39)
Average = Sum(39)m / 12 =												70.1135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8241	0.8218	0.8195	0.8087	0.8067	0.7973	0.7973	0.7955	0.8009	0.8067	0.8108	0.8150	(40)
HLP (average)												0.8087	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122 (71)

Water heating gains (Table 5)

	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778 (72)

Total internal gains

	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	9.2400	46.7521	0.6300	0.7000	0.7700	132.0215	(78)

Solar gains	132.0215	216.2172	275.4223	311.2870	324.3803	312.1719	305.0110	296.2079	287.7111	233.2105	156.4905	114.0787 (83)
Total gains	610.2499	709.9420	746.7820	770.5294	760.4149	734.8402	711.7431	701.9897	705.6912	662.3826	609.9801	581.6275 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3015	70.5022	70.7000	71.6442	71.8237	72.6712	72.6712	72.8303	72.3424	71.8237	71.4616	71.0868	
alpha	5.6868	5.7001	5.7133	5.7763	5.7882	5.8447	5.8447	5.8554	5.8228	5.7882	5.7641	5.7391	
util living area													
	0.9891	0.9742	0.9505	0.8902	0.7788	0.5893	0.4256	0.4496	0.6543	0.8895	0.9741	0.9914	(86)
MIT	20.0995	20.3041	20.5102	20.7510	20.9107	20.9856	20.9981	20.9974	20.9733	20.7881	20.4135	20.0658	(87)
Th 2	20.2325	20.2345	20.2365	20.2458	20.2475	20.2557	20.2557	20.2572	20.2526	20.2475	20.2440	20.2403	(88)
util rest of house													
	0.9864	0.9682	0.9390	0.8657	0.7343	0.5257	0.3545	0.3782	0.5921	0.8605	0.9670	0.9893	(89)
MIT 2	19.4132	19.6154	19.8165	20.0489	20.1870	20.2486	20.2551	20.2563	20.2382	20.0869	19.7323	19.3864	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.6279	19.8308	20.0335	20.2685	20.4134	20.4791	20.4875	20.4882	20.4681	20.3062	19.9454	19.5989	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6279	19.8308	20.0335	20.2685	20.4134	20.4791	20.4875	20.4882	20.4681	20.3062	19.9454	19.5989	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9838	0.9645	0.9355	0.8665	0.7446	0.5451	0.3768	0.4005	0.6106	0.8629	0.9636	0.9870	(94)
Useful gains	600.3397	684.7125	698.6007	667.6460	566.1895	400.5883	268.1554	281.1603	430.8645	571.6001	587.7830	574.0820	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1095.2324	1063.8229	961.5628	797.0969	609.4075	406.3857	268.7196	281.9703	442.1877	678.8457	902.9463	1088.1487	(97)
Space heating kWh													
	368.2002	254.7622	195.6438	93.2046	32.1542	0.0000	0.0000	0.0000	0.0000	79.7907	226.9176	382.4656	(98a)
Space heating requirement - total per year (kWh/year)												1633.1389	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	368.2002	254.7622	195.6438	93.2046	32.1542	0.0000	0.0000	0.0000	0.0000	79.7907	226.9176	382.4656	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1633.1389	
Space heating per m2											(98c) / (4) =	18.8367	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	649.7609	511.5139	524.1907	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9249	0.9674	0.9622	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	600.9470	494.8478	504.3850	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	794.7898	770.8260	762.1891	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	139.5668	205.3277	191.8063	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction											fC = cooled area / (4) =	1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	34.8917	51.3319	47.9516	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												134.1752	(107)
Energy for space heating												18.8367	(99)
Energy for space cooling												1.5476	(108)
Total												20.3842	(109)
Fabric Energy Efficiency (TFEE)												20.4	(109)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.46	**TER**	9.28
Environmental	99 A	**% DER < TER**			84.27
CO_2 Emissions (t/year)	0.1	**DFEE**	15.87	**TFEE**	20.38
Compliance Check	See BREL	**% DFEE < TFEE**			22.14
% DPER < TPER	60.16	**DPER**	19.50	**TPER**	48.95

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17650.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 203.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674 (64)
12Total per year (kWh/year)												2752 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.4800	46.7521	0.7600	0.7000	0.7700	128.9280	(78)
South	1.7600	46.7521	0.7600	0.7000	0.7700	30.3360	(78)

Solar gains	159.2640	260.8334	332.2555	375.5208	391.3159	376.5883	367.9497	357.3302	347.0801	281.3333	188.7822	137.6188 (83)
Total gains	744.4365	860.2459	906.4019	930.5548	919.0271	886.5871	859.0415	849.4522	853.7929	804.0864	742.5297	711.1599 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	
alpha	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	
util living area	0.9616	0.9191	0.8611	0.7581	0.6178	0.4488	0.3195	0.3377	0.5008	0.7552	0.9192	0.9696	(86)
MIT	20.4793	20.6585	20.8016	20.9208	20.9799	20.9976	20.9998	20.9997	20.9952	20.9334	20.7050	20.4274	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house	0.9540	0.9052	0.8396	0.7263	0.5767	0.4020	0.2704	0.2881	0.4530	0.7178	0.9029	0.9634	(89)
MIT 2	19.7302	19.9472	20.1154	20.2476	20.3069	20.3219	20.3233	20.3233	20.3202	20.2629	20.0066	19.6660	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9645	20.1697	20.3300	20.4582	20.5174	20.5333	20.5349	20.5348	20.5314	20.4726	20.2250	19.9042	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9645	20.1697	20.3300	20.4582	20.5174	20.5333	20.5349	20.5348	20.5314	20.4726	20.2250	19.9042	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9493	0.9018	0.8398	0.7328	0.5887	0.4166	0.2858	0.3036	0.4678	0.7264	0.9003	0.9588	(94)
Useful gains	706.7302	775.7553	761.2300	681.9426	541.0067	369.3237	245.4801	257.9211	399.4122	584.0727	668.5093	681.8874	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	977.5185	952.8777	863.0393	721.2706	550.2338	370.2547	245.5511	258.0274	401.3378	616.0839	819.0453	979.9940	(97)
Space heating kWh	201.4664	119.0263	75.7461	28.3162	6.8649	0.0000	0.0000	0.0000	0.0000	23.8163	108.3859	221.7913	(98a)
Space heating requirement - total per year (kWh/year)												785.4135	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	201.4664	119.0263	75.7461	28.3162	6.8649	0.0000	0.0000	0.0000	0.0000	23.8163	108.3859	221.7913	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												785.4135	
Space heating per m2											(98c) / (4) =	9.0590	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	201.4664	119.0263	75.7461	28.3162	6.8649	0.0000	0.0000	0.0000	0.0000	23.8163	108.3859	221.7913	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	302.1997	178.5394	113.6192	42.4742	10.2974	0.0000	0.0000	0.0000	0.0000	35.7245	162.5789	332.6870	
Space heating requirement	302.1997	178.5394	113.6192	42.4742	10.2974	0.0000	0.0000	0.0000	0.0000	35.7245	162.5789	332.6870	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1178.1202	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												11.7812	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4597.2210	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1414.8323	0.1581	49.6740	(367)
Electrical energy for heat distribution (space & water)	11.7812	0.0000	7.6784	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			212.4368	(373)
Space and water heating			212.4368	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			126.8619	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.4600	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1414.8323	1.5853	498.0393	(467)
Electrical energy for heat distribution (space & water)	11.7812	0.0000	81.4557	(472)
Overall CO2 factor for heat network			0.4248	(486)
Total CO2 associated with community systems			2253.6075	(473)
Space and water heating			2253.6075	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1690.6642	(483)
Dwelling Primary energy Rate (DPER)			19.5000	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3912 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
Heatloss Floor 1			43.3500	0.1300	5.6355			(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1247			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E5 Ground floor (normal)	6.7700	0.1600	1.0832
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P1 Party wall - Ground floor	19.4300	0.0800	1.5544
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0424 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.1671 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	71.4535	71.2501	71.0507	70.1143	69.9391	69.1235	69.1235	68.9725	69.4377	69.9391	70.2935	70.6641	(39)
Average = Sum(39)m / 12 =												70.1135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8241	0.8218	0.8195	0.8087	0.8067	0.7973	0.7973	0.7955	0.8009	0.8067	0.8108	0.8150	(40)
HLP (average)												0.8087	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
										Total per year (kWh/year) = Sum(64)m =		2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	9.2400	46.7521	0.6300	0.7000	0.7700	132.0215	(78)

Solar gains	132.0215	216.2172	275.4223	311.2870	324.3803	312.1719	305.0110	296.2079	287.7111	233.2105	156.4905	114.0787	(83)
Total gains	710.8586	809.2943	843.2333	859.9856	845.7561	812.8353	786.7674	778.9946	785.0885	749.6283	703.9027	681.2845	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3015	70.5022	70.7000	71.6442	71.8237	72.6712	72.6712	72.8303	72.3424	71.8237	71.4616	71.0868	
alpha	5.6868	5.7001	5.7133	5.7763	5.7882	5.8447	5.8447	5.8554	5.8228	5.7882	5.7641	5.7391	
util living area	0.9781	0.9554	0.9218	0.8466	0.7224	0.5371	0.3857	0.4060	0.5964	0.8395	0.9526	0.9820	(86)
MIT	20.2395	20.4287	20.6134	20.8156	20.9394	20.9910	20.9989	20.9985	20.9833	20.8497	20.5305	20.2071	(87)
Th 2	20.2325	20.2345	20.2365	20.2458	20.2475	20.2557	20.2557	20.2572	20.2526	20.2475	20.2440	20.2403	(88)
util rest of house	0.9730	0.9459	0.9056	0.8173	0.6761	0.4775	0.3209	0.3411	0.5369	0.8043	0.9410	0.9778	(89)
MIT 2	19.3571	19.5932	19.8200	20.0636	20.1964	20.2501	20.2553	20.2566	20.2413	20.1063	19.7299	19.3227	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.6331	19.8546	20.0682	20.2988	20.4288	20.4819	20.4879	20.4886	20.4734	20.3388	19.9803	19.5994	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6331	19.8546	20.0682	20.2988	20.4288	20.4819	20.4879	20.4886	20.4734	20.3388	19.9803	19.5994	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9682	0.9404	0.9017	0.8195	0.6877	0.4958	0.3412	0.3614	0.5548	0.8089	0.9362	0.9734	(94)
Useful gains	688.2802	761.0844	760.3014	704.7255	581.5888	403.0002	268.4106	281.5344	435.5553	606.3857	659.0179	663.1779	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1095.6042	1065.5144	964.0282	799.2193	610.4874	406.5753	268.7429	282.0039	442.5524	681.1263	905.4032	1088.1828	(97)
Space heating kWh	303.0491	204.5769	151.5728	68.0355	21.5006	0.0000	0.0000	0.0000	0.0000	55.6071	177.3974	316.2036	(98a)
Space heating requirement - total per year (kWh/year)												1297.9430	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	303.0491	204.5769	151.5728	68.0355	21.5006	0.0000	0.0000	0.0000	0.0000	55.6071	177.3974	316.2036	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1297.9430	
Space heating per m2											(98c) / (4) =	14.9705	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	303.0491	204.5769	151.5728	68.0355	21.5006	0.0000	0.0000	0.0000	0.0000	55.6071	177.3974	316.2036	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	328.3306	221.6435	164.2175	73.7113	23.2943	0.0000	0.0000	0.0000	0.0000	60.2460	192.1966	342.5825	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.6437	84.0381	83.2463	81.9614	80.6398	79.8000	79.8000	79.8000	79.8000	81.6294	83.7074	84.7622	(217)
Fuel for water heating, kWh/month	276.0761	245.8037	263.6830	236.0158	232.8211	212.3443	209.9929	218.2535	220.5242	239.9488	248.2150	272.7831	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.0522	-34.0491	-51.2340	-60.3739	-67.5059	-63.8722	-63.0931	-58.3837	-50.4758	-40.1585	-25.8892	-19.7533	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.6843	-18.6438	-37.7720	-57.7989	-77.4856	-78.2579	-77.3368	-64.9856	-46.9877	-27.0053	-11.7029	-6.8394	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1406.2221	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2876.4614	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1071.3411	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3521.7206	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1406.2221	0.2100	295.3066	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2876.4614	0.2100	604.0569	(264)
Space and water heating			899.3635	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	0.1336	-74.5440	
PV Unit electricity exported	-513.5003	0.1254	-64.3679	
Total			-138.9120	(269)
Total CO2, kg/year			804.7655	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.2800	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1406.2221	1.1300	1589.0310	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2876.4614	1.1300	3250.4013	(278)
Space and water heating			4839.4323	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	1.4938	-833.3127	
PV Unit electricity exported	-513.5003	0.4601	-236.2611	
Total			-1069.5738	(283)
Total Primary energy kWh/year			4244.1182	(286)
Target Primary Energy Rate (TPER)			48.9500	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - North	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.46	**TER**	9.28
Environmental	99 A	**% DER < TER**			84.27
CO_2 Emissions (t/year)	0.1	**DFEE**	15.87	**TFEE**	20.38
Compliance Check	See BREL	**% DFEE < TFEE**			22.14
% DPER < TPER	60.16	**DPER**	19.50	**TPER**	48.95

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.4800	46.7521	0.7600	0.7000	0.7700	128.9280	(78)
South	1.7600	46.7521	0.7600	0.7000	0.7700	30.3360	(78)

Solar gains	159.2640	260.8334	332.2555	375.5208	391.3159	376.5883	367.9497	357.3302	347.0801	281.3333	188.7822	137.6188	(83)
Total gains	798.8879	898.1273	950.5408	958.4745	939.1186	892.6932	865.3981	858.0426	866.0018	832.5145	778.7860	761.4015	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area													
	0.9500	0.9076	0.8421	0.7435	0.6066	0.4459	0.3171	0.3343	0.4943	0.7377	0.9061	0.9605	(86)
MIT	20.5571	20.7036	20.8367	20.9337	20.9833	20.9979	20.9998	20.9997	20.9960	20.9455	20.7471	20.5042	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house													
	0.9404	0.8922	0.8189	0.7111	0.5658	0.3994	0.2684	0.2853	0.4469	0.6996	0.8879	0.9527	(89)
MIT 2	19.8245	20.0001	20.1544	20.2607	20.3099	20.3221	20.3233	20.3233	20.3208	20.2746	20.0552	19.7600	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0537	20.2201	20.3678	20.4712	20.5205	20.5335	20.5349	20.5349	20.5320	20.4844	20.2716	19.9928	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0537	20.2201	20.3678	20.4712	20.5205	20.5335	20.5349	20.5349	20.5320	20.4844	20.2716	19.9928	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9361	0.8897	0.8205	0.7184	0.5779	0.4139	0.2837	0.3006	0.4616	0.7090	0.8864	0.9483	(94)
Useful gains	747.8718	799.0545	779.9373	688.5704	542.6857	369.4717	245.4950	257.9442	399.7625	590.2142	690.3190	722.0138	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	983.0825	956.0272	865.3992	722.0799	550.4306	370.2722	245.5529	258.0301	401.3786	616.8215	821.9510	985.5225	(97)
Space heating kWh													
	174.9968	105.4856	63.5837	24.1268	5.7622	0.0000	0.0000	0.0000	0.0000	19.7959	94.7750	196.0505	(98a)
Space heating requirement - total per year (kWh/year)												684.5765	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	174.9968	105.4856	63.5837	24.1268	5.7622	0.0000	0.0000	0.0000	0.0000	19.7959	94.7750	196.0505	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												684.5765	
Space heating per m2											(98c) / (4) =	7.8959	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	174.9968	105.4856	63.5837	24.1268	5.7622	0.0000	0.0000	0.0000	0.0000	19.7959	94.7750	196.0505	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	262.4952	158.2284	95.3755	36.1902	8.6433	0.0000	0.0000	0.0000	0.0000	29.6938	142.1625	294.0757	
Space heating requirement													
	262.4952	158.2284	95.3755	36.1902	8.6433	0.0000	0.0000	0.0000	0.0000	29.6938	142.1625	294.0757	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1026.8648	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												10.2686	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4445.9656	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1026.8648	4.4400	45.5928	(340a)
Space heating total			45.5928	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			254.1838	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.6948 (357)
SAP value		88.7372
SAP rating (Section 12)		89 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1374.4976	0.1582	43.3203	(367)
Electrical energy for heat distribution (space & water)	10.2686	0.0000	7.4402	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			205.8448	(373)
Space and water heating			205.8448	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			120.2699	(383)
CO2 emissions per m2			1.3900	(384)
EI value			98.7763	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075 (1b) - (3b)	
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)

Average = Sum(39)m / 12 = 62.4033

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)

Total per year (kWh/year) = Sum(64)m = 2751.6674 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.4800	54.0600	0.7600	0.7000	0.7700	149.0811	(78)
South	1.7600	54.0600	0.7600	0.7000	0.7700	35.0779	(78)

Solar gains	184.1590	267.3147	335.0854	384.8681	389.5564	404.1002	386.5845	379.8122	369.8751	303.9017	214.8392	160.2075	(83)
Total gains	823.7829	904.6086	953.3707	967.8218	937.3591	920.2051	884.0330	880.5246	888.7968	855.0828	804.8430	783.9902	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area													
	0.9386	0.8985	0.8237	0.7192	0.5776	0.3927	0.2752	0.2905	0.4615	0.6946	0.8832	0.9514	(86)
MIT	20.6087	20.7292	20.8619	20.9467	20.9879	20.9991	20.9999	20.9999	20.9974	20.9628	20.7941	20.5563	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house													
	0.9272	0.8818	0.7986	0.6853	0.5358	0.3472	0.2275	0.2426	0.4150	0.6544	0.8617	0.9420	(89)
MIT 2	19.8873	20.0304	20.1828	20.2740	20.3140	20.3229	20.3234	20.3234	20.3218	20.2913	20.1094	19.8239	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.1129	20.2490	20.3952	20.4844	20.5248	20.5344	20.5350	20.5350	20.5331	20.5013	20.3236	20.0530	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1129	20.2490	20.3952	20.4844	20.5248	20.5344	20.5350	20.5350	20.5331	20.5013	20.3236	20.0530	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9233	0.8799	0.8014	0.6936	0.5484	0.3614	0.2425	0.2576	0.4295	0.6652	0.8618	0.9377	(94)
Useful gains	760.5948	795.9378	764.0303	671.2598	514.0187	332.5574	214.3363	226.8053	381.7046	568.8292	693.5781	735.1367	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	968.0581	939.1053	835.9076	697.9446	519.4949	332.8856	214.3559	226.8353	382.7270	586.6741	800.2345	970.5567	(97)
Space heating kWh													
	154.3527	96.2086	53.4767	19.2131	4.0743	0.0000	0.0000	0.0000	0.0000	13.2766	76.7926	175.1525	(98a)
Space heating requirement - total per year (kWh/year)												592.5469	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	154.3527	96.2086	53.4767	19.2131	4.0743	0.0000	0.0000	0.0000	0.0000	13.2766	76.7926	175.1525	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												592.5469	
Space heating per m2											(98c) / (4) =	6.8345	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	154.3527	96.2086	53.4767	19.2131	4.0743	0.0000	0.0000	0.0000	0.0000	13.2766	76.7926	175.1525	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	231.5290	144.3128	80.2150	28.8196	6.1115	0.0000	0.0000	0.0000	0.0000	19.9148	115.1889	262.7287	
Space heating requirement													
	231.5290	144.3128	80.2150	28.8196	6.1115	0.0000	0.0000	0.0000	0.0000	19.9148	115.1889	262.7287	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)

Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year		
Space heating fuel - community heating	888.8204	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4127.5010	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	8.8882	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4211.3951	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	888.8204	6.5500	58.2177	(340a)
Space heating total			58.2177	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			321.5228	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1337.6857	0.1586	37.5885	(367)
Electrical energy for heat distribution (space & water)	8.8882	0.0000	7.2252	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			199.8980	(373)
Space and water heating			199.8980	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			102.0651	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1337.6857	1.5870	376.1578	(467)
Electrical energy for heat distribution (space & water)	8.8882	0.0000	76.8851	(472)
Overall CO2 factor for heat network			0.4240	(486)
Total CO2 associated with community systems			2127.1555	(473)
Space and water heating			2127.1555	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1483.3203	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - North

Current energy efficiency rating: B 89
Current environmental impact rating: A 99

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Energy Environmental
Typical annual savings efficiency impact
Recommended measures
(none)
Total Savings £0 0.00 kg/m²

Potential energy efficiency rating: B 89
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£71	£71	£0
Community scheme	£433	£433	£0
Space heating	£172	£172	£0
Water heating	£270	£270	£0
Lighting	£62	£62	£0
Generated (PV)	-£182	-£182	£0
Total cost of fuels	£322	£322	£0
Total cost of uses	£322	£322	£0
Delivered energy	49 kWh/m²	49 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	17 kWh/m²	17 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5778 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day)	126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	

Distribution loss (46)m = 0.15 x (45)m

32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss / Combi loss

Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS / PV diverter / Solar input / FGHRS

Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
									Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.4800	46.7521	0.7600	0.7000	0.7700	128.9280	(78)
South	1.7600	46.7521	0.7600	0.7000	0.7700	30.3360	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	159.2640	260.8334	332.2555	375.5208	391.3159	376.5883	367.9497	357.3302	347.0801	281.3333	188.7822	137.6188	(83)
Total gains	798.8879	898.1273	950.5408	958.4745	939.1186	892.6932	865.3981	858.0426	866.0018	832.5145	778.7860	761.4015	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area	0.9500	0.9076	0.8421	0.7435	0.6066	0.4459	0.3171	0.3343	0.4943	0.7377	0.9061	0.9605	(86)
MIT	20.5571	20.7036	20.8367	20.9337	20.9833	20.9979	20.9998	20.9997	20.9960	20.9455	20.7471	20.5042	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house	0.9404	0.8922	0.8189	0.7111	0.5658	0.3994	0.2684	0.2853	0.4469	0.6996	0.8879	0.9527	(89)
MIT 2	19.8245	20.0001	20.1544	20.2607	20.3099	20.3221	20.3233	20.3233	20.3208	20.2746	20.0552	19.7600	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0537	20.2201	20.3678	20.4712	20.5205	20.5335	20.5349	20.5349	20.5320	20.4844	20.2716	19.9928	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0537	20.2201	20.3678	20.4712	20.5205	20.5335	20.5349	20.5349	20.5320	20.4844	20.2716	19.9928	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9361	0.8897	0.8205	0.7184	0.5779	0.4139	0.2837	0.3006	0.4616	0.7090	0.8864	0.9483	(94)
Useful gains	747.8718	799.0545	779.9373	688.5704	542.6857	369.4717	245.4950	257.9442	399.7625	590.2142	690.3190	722.0138	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	983.0825	956.0272	865.3992	722.0799	550.4306	370.2722	245.5529	258.0301	401.3786	616.8215	821.9510	985.5225	(97)
Space heating kWh	174.9968	105.4856	63.5837	24.1268	5.7622	0.0000	0.0000	0.0000	0.0000	19.7959	94.7750	196.0505	(98a)
Space heating requirement - total per year (kWh/year)												684.5765	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	174.9968	105.4856	63.5837	24.1268	5.7622	0.0000	0.0000	0.0000	0.0000	19.7959	94.7750	196.0505	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												684.5765	
Space heating per m2										(98c) / (4) =		7.8959	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	174.9968	105.4856	63.5837	24.1268	5.7622	0.0000	0.0000	0.0000	0.0000	19.7959	94.7750	196.0505	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	262.4952	158.2284	95.3755	36.1902	8.6433	0.0000	0.0000	0.0000	0.0000	29.6938	142.1625	294.0757	
Space heating requirement													
	262.4952	158.2284	95.3755	36.1902	8.6433	0.0000	0.0000	0.0000	0.0000	29.6938	142.1625	294.0757	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1026.8648	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)

Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	10.2686	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4445.9656	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1026.8648	4.4400	45.5928	(340a)
Space heating total			45.5928	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			254.1838	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.6948	(357)
SAP value	88.7372	
SAP rating (Section 12)	89	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1374.4976	0.1582	43.3203	(367)
Electrical energy for heat distribution (space & water)	10.2686	0.0000	7.4402	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			205.8448	(373)
Space and water heating			205.8448	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			120.2699	(383)
CO2 emissions per m2			1.3900	(384)
EI value			98.7763	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 86.7000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5778	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	7.4800	54.0600	0.7600	0.7000	0.7700	149.0811	(78)
South	1.7600	54.0600	0.7600	0.7000	0.7700	35.0779	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	184.1590	267.3147	335.0854	384.8681	389.5564	404.1002	386.5845	379.8122	369.8751	303.9017	214.8392	160.2075	(83)
Total gains	823.7829	904.6086	953.3707	967.8218	937.3591	920.2051	884.0330	880.5246	888.7968	855.0828	804.8430	783.9902	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area													
	0.9386	0.8985	0.8237	0.7192	0.5776	0.3927	0.2752	0.2905	0.4615	0.6946	0.8832	0.9514	(86)
MIT	20.6087	20.7292	20.8619	20.9467	20.9879	20.9991	20.9999	20.9999	20.9974	20.9628	20.7941	20.5563	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house													
	0.9272	0.8818	0.7986	0.6853	0.5358	0.3472	0.2275	0.2426	0.4150	0.6544	0.8617	0.9420	(89)
MIT 2	19.8873	20.0304	20.1828	20.2740	20.3140	20.3229	20.3234	20.3234	20.3218	20.2913	20.1094	19.8239	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.1129	20.2490	20.3952	20.4844	20.5248	20.5344	20.5350	20.5350	20.5331	20.5013	20.3236	20.0530	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1129	20.2490	20.3952	20.4844	20.5248	20.5344	20.5350	20.5350	20.5331	20.5013	20.3236	20.0530	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9233	0.8799	0.8014	0.6936	0.5484	0.3614	0.2425	0.2576	0.4295	0.6652	0.8618	0.9377	(94)
Useful gains	760.5948	795.9378	764.0303	671.2598	514.0187	332.5574	214.3363	226.8053	381.7046	568.8292	693.5781	735.1367	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	968.0581	939.1053	835.9076	697.9446	519.4949	332.8856	214.3559	226.8353	382.7270	586.6741	800.2345	970.5567	(97)
Space heating kWh													
	154.3527	96.2086	53.4767	19.2131	4.0743	0.0000	0.0000	0.0000	0.0000	13.2766	76.7926	175.1525	(98a)
Space heating requirement - total per year (kWh/year)												592.5469	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	154.3527	96.2086	53.4767	19.2131	4.0743	0.0000	0.0000	0.0000	0.0000	13.2766	76.7926	175.1525	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												592.5469	
Space heating per m2											(98c) / (4) =	6.8345	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement

	154.3527	96.2086	53.4767	19.2131	4.0743	0.0000	0.0000	0.0000	0.0000	13.2766	76.7926	175.1525 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	231.5290	144.3128	80.2150	28.8196	6.1115	0.0000	0.0000	0.0000	0.0000	19.9148	115.1889	262.7287
Space heating requirement												
	231.5290	144.3128	80.2150	28.8196	6.1115	0.0000	0.0000	0.0000	0.0000	19.9148	115.1889	262.7287 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388
Water heating fuel												
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446 (331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year

Space heating fuel - community heating	888.8204 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	8.8882 (313)
Space cooling fuel	0.0000 (321)

Electricity for pumps and fans:

(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)	
mechanical ventilation fans (SFP = 0.1292)	33.4924 (330a)
Total electricity for the above, kWh/year	33.4924 (331)
Electricity for lighting (calculated in Appendix L)	216.3282 (332)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4211.3951 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	888.8204	6.5500	58.2177	(340a)
Space heating total			58.2177	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			321.5228	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1337.6857	0.1586	37.5885	(367)
Electrical energy for heat distribution (space & water)	8.8882	0.0000	7.2252	(372)
Overall CO2 factor for heat network			0.0398	(386)
Total CO2 associated with community systems			199.8980	(373)
Space and water heating			199.8980	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			102.0651	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)

Space and Water heating from Heat pump	1337.6857	1.5870	376.1578	(467)
Electrical energy for heat distribution (space & water)	8.8882	0.0000	76.8851	(472)
Overall CO2 factor for heat network			0.4240	(486)
Total CO2 associated with community systems			2127.1555	(473)
Space and water heating			2127.1555	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1483.3203	(483)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.53	**TER**	9.50
Environmental	99 A	**% DER < TER**			83.89
CO_2 Emissions (t/year)	0.11	**DFEE**	17.22	**TFEE**	21.61
Compliance Check	See BREL	**% DFEE < TFEE**			20.31
% DPER < TPER	59.84	**DPER**	20.13	**TPER**	50.12

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17650.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 203.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
12Total per year (kWh/year)												2752	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.4800	36.7938	0.7600	0.7000	0.7700	101.4662	(79)
Southwest	1.7600	36.7938	0.7600	0.7000	0.7700	23.8744	(79)

Solar gains	125.3406	213.5015	292.1220	361.9533	405.4179	402.4861	388.0396	355.6131	316.3064	235.9646	150.1292	107.2655	(83)
Total gains	710.5132	812.9140	866.2684	916.9873	933.1290	912.4849	879.1314	847.7351	823.0191	758.7177	703.8768	680.8066	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	
alpha	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	
util living area													
	0.9689	0.9351	0.8799	0.7661	0.6094	0.4363	0.3122	0.3384	0.5187	0.7864	0.9343	0.9752	(86)
MIT	20.4355	20.6097	20.7724	20.9161	20.9813	20.9979	20.9998	20.9996	20.9942	20.9165	20.6653	20.3865	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house													
	0.9625	0.9232	0.8600	0.7345	0.5687	0.3907	0.2643	0.2887	0.4696	0.7502	0.9202	0.9699	(89)
MIT 2	19.6763	19.8893	20.0826	20.2428	20.3081	20.3221	20.3233	20.3233	20.3195	20.2464	19.9601	19.6153	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9138	20.1147	20.2984	20.4534	20.5187	20.5335	20.5349	20.5348	20.5306	20.4560	20.1807	19.8566	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9138	20.1147	20.2984	20.4534	20.5187	20.5335	20.5349	20.5348	20.5306	20.4560	20.1807	19.8566	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9580	0.9191	0.8592	0.7408	0.5806	0.4049	0.2792	0.3042	0.4847	0.7576	0.9169	0.9656	(94)
Useful gains	680.6386	747.1536	744.3204	679.2767	541.7484	369.4774	245.4902	257.9197	398.9460	574.8006	645.3975	657.4102	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	974.3512	949.4456	861.0627	720.9731	550.3135	370.2712	245.5522	258.0272	401.2879	615.0484	816.2764	977.0213	(97)
Space heating kWh													
	218.5222	135.9402	86.8563	30.0214	6.3725	0.0000	0.0000	0.0000	0.0000	29.9444	123.0328	237.7907	(98a)
Space heating requirement - total per year (kWh/year)												868.4805	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	218.5222	135.9402	86.8563	30.0214	6.3725	0.0000	0.0000	0.0000	0.0000	29.9444	123.0328	237.7907	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												868.4805	
Space heating per m2											(98c) / (4) =	10.0171	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	218.5222	135.9402	86.8563	30.0214	6.3725	0.0000	0.0000	0.0000	0.0000	29.9444	123.0328	237.7907	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	327.7833	203.9103	130.2844	45.0321	9.5587	0.0000	0.0000	0.0000	0.0000	44.9166	184.5493	356.6860	
Space heating requirement													
	327.7833	203.9103	130.2844	45.0321	9.5587	0.0000	0.0000	0.0000	0.0000	44.9166	184.5493	356.6860	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1302.7207	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												13.0272	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4721.8215	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1448.0591	0.1580	54.8812	(367)
Electrical energy for heat distribution (space & water)	13.0272	0.0000	7.8737	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			217.8392	(373)
Space and water heating			217.8392	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			132.2644	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.5300	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1448.0591	1.5848	550.5450	(467)
Electrical energy for heat distribution (space & water)	13.0272	0.0000	83.4247	(472)
Overall CO2 factor for heat network			0.4250	(486)
Total CO2 associated with community systems			2308.0822	(473)
Space and water heating			2308.0822	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1745.1389	(483)
Dwelling Primary energy Rate (DPER)			20.1300	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
Heatloss Floor 1			43.3500	0.1300	5.6355			(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1247			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E5 Ground floor (normal)	6.7700	0.1600	1.0832
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P1 Party wall - Ground floor	19.4300	0.0800	1.5544
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0424 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.1671 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	71.4535	71.2501	71.0507	70.1143	69.9391	69.1235	69.1235	68.9725	69.4377	69.9391	70.2935	70.6641	(39)
Average = Sum(39)m / 12 =												70.1135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8241	0.8218	0.8195	0.8087	0.8067	0.7973	0.7973	0.7955	0.8009	0.8067	0.8108	0.8150	(40)
HLP (average)												0.8087	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
										Total per year (kWh/year) = Sum(64)m =		2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	9.2400	36.7938	0.6300	0.7000	0.7700	103.9008	(79)

Solar gains	103.9008	176.9815	242.1538	300.0403	336.0701	333.6398	321.6644	294.7845	262.2013	195.6022	124.4492	88.9174	(83)
Total gains	682.7380	770.0586	809.9648	848.7388	857.4458	834.3032	803.4208	777.5712	759.5787	712.0200	671.8614	656.1232	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3015	70.5022	70.7000	71.6442	71.8237	72.6712	72.6712	72.8303	72.3424	71.8237	71.4616	71.0868	
alpha	5.6868	5.7001	5.7133	5.7763	5.7882	5.8447	5.8447	5.8554	5.8228	5.7882	5.7641	5.7391	
util living area	0.9817	0.9636	0.9325	0.8522	0.7149	0.5241	0.3778	0.4068	0.6141	0.8616	0.9608	0.9848	(86)
MIT	20.2013	20.3810	20.5797	20.8084	20.9426	20.9921	20.9990	20.9985	20.9806	20.8254	20.4922	20.1722	(87)
Th 2	20.2325	20.2345	20.2365	20.2458	20.2475	20.2557	20.2557	20.2572	20.2526	20.2475	20.2440	20.2403	(88)
util rest of house	0.9774	0.9555	0.9179	0.8235	0.6685	0.4656	0.3143	0.3417	0.5536	0.8288	0.9508	0.9813	(89)
MIT 2	19.3093	19.5350	19.7804	20.0558	20.1992	20.2508	20.2553	20.2566	20.2394	20.0811	19.6836	19.2789	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.5883	19.7997	20.0304	20.2912	20.4317	20.4827	20.4879	20.4886	20.4712	20.3139	19.9365	19.5583	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5883	19.7997	20.0304	20.2912	20.4317	20.4827	20.4879	20.4886	20.4712	20.3139	19.9365	19.5583	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9729	0.9502	0.9134	0.8253	0.6803	0.4836	0.3341	0.3621	0.5717	0.8320	0.9460	0.9772	(94)
Useful gains	664.2612	731.6735	739.8511	700.4799	583.3075	403.4835	268.4505	281.5292	434.2643	592.3694	635.5760	641.1744	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1092.4035	1061.6036	961.3439	798.6888	610.6904	406.6304	268.7476	282.0033	442.4043	679.3831	902.3261	1085.2810	(97)
Space heating kWh	318.5379	221.7131	164.7907	70.7104	20.3729	0.0000	0.0000	0.0000	0.0000	64.7382	192.0601	330.4153	(98a)
Space heating requirement - total per year (kWh/year)												1383.3387	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	318.5379	221.7131	164.7907	70.7104	20.3729	0.0000	0.0000	0.0000	0.0000	64.7382	192.0601	330.4153	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1383.3387	
Space heating per m2											(98c) / (4) =	15.9555	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	318.5379	221.7131	164.7907	70.7104	20.3729	0.0000	0.0000	0.0000	0.0000	64.7382	192.0601	330.4153	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	345.1115	240.2092	178.5381	76.6094	22.0725	0.0000	0.0000	0.0000	0.0000	70.1389	208.0825	357.9798	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.7550	84.2188	83.4257	82.0254	80.5997	79.8000	79.8000	79.8000	79.8000	81.8610	83.8838	84.8599	(217)
Fuel for water heating, kWh/month	275.7137	245.2763	263.1157	235.8317	232.9370	212.3443	209.9929	218.2535	220.5242	239.2699	247.6930	272.4692	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.0522	-34.0491	-51.2340	-60.3739	-67.5059	-63.8722	-63.0931	-58.3837	-50.4758	-40.1585	-25.8892	-19.7533	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.6843	-18.6438	-37.7720	-57.7989	-77.4856	-78.2579	-77.3368	-64.9856	-46.9877	-27.0053	-11.7029	-6.8394	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1498.7418	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2873.4214	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1071.3411	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3611.2003	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1498.7418	0.2100	314.7358	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2873.4214	0.2100	603.4185	(264)
Space and water heating			918.1543	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	0.1336	-74.5440	
PV Unit electricity exported	-513.5003	0.1254	-64.3679	
Total			-138.9120	(269)
Total CO2, kg/year			823.5563	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.5000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1498.7418	1.1300	1693.5782	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2873.4214	1.1300	3246.9662	(278)
Space and water heating			4940.5444	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	1.4938	-833.3127	
PV Unit electricity exported	-513.5003	0.4601	-236.2611	
Total			-1069.5738	(283)
Total Primary energy kWh/year			4345.2302	(286)
Target Primary Energy Rate (TPER)			50.1200	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.53	**TER**	9.50
Environmental	99 A	**% DER < TER**			83.89
CO_2 Emissions (t/year)	0.11	**DFEE**	17.22	**TFEE**	21.61
Compliance Check	See BREL	**% DFEE < TFEE**			20.31
% DPER < TPER	59.84	**DPER**	20.13	**TPER**	50.12

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area		Storey height		Volume	
Main dwelling		(m2)		(m)		(m3)	
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2257	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2878	0.2821	0.2765	0.2483	0.2426	0.2144	0.2144	0.2088	0.2257	0.2426	0.2539	0.2652	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5414	0.5398	0.5382	0.5308	0.5294	0.5230	0.5230	0.5218	0.5255	0.5294	0.5322	0.5352	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		18083.8300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							208.5794	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9510	37.8383	37.7278	37.2089	37.1118	36.6599	36.6599	36.5762	36.8339	37.1118	37.3082	37.5135	(38)
Heat transfer coeff	65.3058	65.1931	65.0826	64.5637	64.4666	64.0147	64.0147	63.9310	64.1888	64.4666	64.6630	64.8684	(39)
Average = Sum(39)m / 12 =												64.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7532	0.7519	0.7507	0.7447	0.7436	0.7383	0.7383	0.7374	0.7404	0.7436	0.7458	0.7482	(40)
HLP (average)												0.7447	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
									Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)											908	(64)

Electric shower(s)

54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =					614.3496	(64a)

Heat gains from water heating, kWh/month

37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.4800	36.7938	0.7600	0.7000	0.7700	101.4662	(79)
Southwest	1.7600	36.7938	0.7600	0.7000	0.7700	23.8744	(79)

Solar gains	125.3406	213.5015	292.1220	361.9533	405.4179	402.4861	388.0396	355.6131	316.3064	235.9646	150.1292	107.2655	(83)
Total gains	603.5690	707.2263	763.4817	821.1958	841.4525	825.1544	794.7718	761.3949	734.2864	665.1367	603.6188	574.8142	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.9194	77.0524	77.1832	77.8035	77.9207	78.4708	78.4708	78.5736	78.2580	77.9207	77.6840	77.4381	
alpha	6.1280	6.1368	6.1455	6.1869	6.1947	6.2314	6.2314	6.2382	6.2172	6.1947	6.1789	6.1625	
util living area	0.9879	0.9692	0.9334	0.8385	0.6850	0.4933	0.3540	0.3856	0.5926	0.8644	0.9702	0.9907	(86)

MIT	20.2329	20.4348	20.6413	20.8559	20.9640	20.9959	20.9996	20.9993	20.9879	20.8515	20.5132	20.1917	(87)
Th 2	20.2940	20.2952	20.2963	20.3015	20.3025	20.3071	20.3071	20.3079	20.3053	20.3025	20.3005	20.2985	(88)
util rest of house	0.9850	0.9624	0.9195	0.8097	0.6412	0.4412	0.2985	0.3279	0.5368	0.8332	0.9625	0.9885	(89)
MIT 2	19.5958	19.7938	19.9921	20.1908	20.2791	20.3051	20.3069	20.3077	20.2989	20.1916	19.8767	19.5588	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.7951	19.9943	20.1952	20.3989	20.4934	20.5212	20.5236	20.5240	20.5144	20.3980	20.0758	19.7568	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7951	19.9943	20.1952	20.3989	20.4934	20.5212	20.5236	20.5240	20.5144	20.3980	20.0758	19.7568	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9826	0.9591	0.9172	0.8139	0.6535	0.4574	0.3159	0.3460	0.5539	0.8378	0.9595	0.9863	(94)
Useful gains	593.0387	678.2821	700.2870	668.3948	549.8737	377.4284	251.0367	263.4209	406.6991	557.2559	579.1865	566.9638	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1011.9189	984.0444	891.3173	742.4088	566.8788	379.0424	251.1678	263.6518	411.7342	631.6461	839.0568	1009.1424	(97)
Space heating kWh	311.6468	205.4723	142.1266	53.2901	12.6518	0.0000	0.0000	0.0000	0.0000	55.3463	187.1066	328.9809	(98a)
Space heating requirement - total per year (kWh/year)												1296.6214	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	311.6468	205.4723	142.1266	53.2901	12.6518	0.0000	0.0000	0.0000	0.0000	55.3463	187.1066	328.9809	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1296.6214	
Space heating per m2											(98c) / (4) =	14.9553	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	601.7381	473.7088	485.8756	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9715	0.9894	0.9851	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	584.6061	468.7003	478.6593	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	900.3518	867.8724	831.6237	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	227.3370	296.9841	262.6055	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	56.8342	74.2460	65.6514	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												196.7316	(107)
Energy for space heating												14.9553	(99)
Energy for space cooling												2.2691	(108)
Total												17.2244	(109)
Fabric Energy Efficiency (DFEE)												17.2	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
Heatloss Floor 1			43.3500	0.1300	5.6355			(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1247			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	6.2700	0.0500	0.3135
E2 Other lintels (including other steel lintels)	2.5200	0.0500	0.1260
E3 Sill	20.7200	0.0500	1.0360
E4 Jamb	13.5400	0.0000	0.0000
E6 Intermediate floor within a dwelling	6.7700	0.1600	1.0832
E5 Ground floor (normal)	22.0000	0.0600	1.3200
E18 Party wall between dwellings	12.6600	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	19.4300	0.0800	1.5544
P1 Party wall - Ground floor	6.7700	0.0200	0.1354
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0700	0.4739
E7 Party floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0424 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.1671 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	71.4535	71.2501	71.0507	70.1143	69.9391	69.1235	69.1235	68.9725	69.4377	69.9391	70.2935	70.6641	(39)
Average = Sum(39)m / 12 =												70.1135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8241	0.8218	0.8195	0.8087	0.8067	0.7973	0.7973	0.7955	0.8009	0.8067	0.8108	0.8150	(40)
HLP (average)												0.8087	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122 (71)

Water heating gains (Table 5)

	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778 (72)

Total internal gains

	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	9.2400	36.7938	0.6300	0.7000	0.7700	103.9008	(79)

Solar gains	103.9008	176.9815	242.1538	300.0403	336.0701	333.6398	321.6644	294.7845	262.2013	195.6022	124.4492	88.9174 (83)
Total gains	582.1292	670.7063	713.5134	759.2827	772.1047	756.3081	728.3966	700.5663	680.1814	624.7743	577.9388	556.4662 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3015	70.5022	70.7000	71.6442	71.8237	72.6712	72.6712	72.8303	72.3424	71.8237	71.4616	71.0868	
alpha	5.6868	5.7001	5.7133	5.7763	5.7882	5.8447	5.8447	5.8554	5.8228	5.7882	5.7641	5.7391	
util living area													
	0.9913	0.9800	0.9588	0.8953	0.7709	0.5741	0.4161	0.4505	0.6746	0.9091	0.9796	0.9931	(86)
MIT	20.0590	20.2516	20.4709	20.7417	20.9153	20.9874	20.9983	20.9974	20.9689	20.7557	20.3706	20.0290	(87)
Th 2	20.2325	20.2345	20.2365	20.2458	20.2475	20.2557	20.2557	20.2572	20.2526	20.2475	20.2440	20.2403	(88)
util rest of house													
	0.9891	0.9751	0.9488	0.8715	0.7260	0.5116	0.3465	0.3789	0.6118	0.8834	0.9738	0.9913	(89)
MIT 2	19.3733	19.5644	19.7794	20.0408	20.1904	20.2495	20.2552	20.2563	20.2356	20.0593	19.6909	19.3500	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.5878	19.7794	19.9957	20.2600	20.4172	20.4803	20.4876	20.4881	20.4650	20.2771	19.9035	19.5624	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5878	19.7794	19.9957	20.2600	20.4172	20.4803	20.4876	20.4881	20.4650	20.2771	19.9035	19.5624	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9868	0.9717	0.9452	0.8720	0.7366	0.5307	0.3682	0.4013	0.6303	0.8845	0.9707	0.9894	(94)
Useful gains	574.4297	651.6996	674.4014	662.1138	568.7549	401.4066	268.2276	281.1507	428.6927	552.6286	560.9934	550.5430	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1092.3642	1060.1564	958.8815	796.5019	609.6722	406.4680	268.7274	281.9693	441.9683	676.8075	900.0044	1085.5711	(97)
Space heating kWh													
	385.3433	274.4829	211.6532	96.7594	30.4424	0.0000	0.0000	0.0000	0.0000	92.3891	244.0879	398.0609	(98a)
Space heating requirement - total per year (kWh/year)												1733.2191	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	385.3433	274.4829	211.6532	96.7594	30.4424	0.0000	0.0000	0.0000	0.0000	92.3891	244.0879	398.0609	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1733.2191	
Space heating per m2										(98c) / (4) =		19.9910	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	649.7609	511.5139	524.1907	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9331	0.9708	0.9619	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	606.2797	496.5593	504.2015	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	819.8821	790.2910	760.5254	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	153.7938	218.5364	190.7050	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	38.4484	54.6341	47.6763	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												140.7588	(107)
Energy for space heating												19.9910	(99)
Energy for space cooling												1.6235	(108)
Total												21.6145	(109)
Fabric Energy Efficiency (TFEE)												21.6	(109)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.53	**TER**	9.50
Environmental	99 A	**% DER < TER**			83.89
CO_2 Emissions (t/year)	0.11	**DFEE**	17.22	**TFEE**	21.61
Compliance Check	See BREL	**% DFEE < TFEE**			20.31
% DPER < TPER	59.84	**DPER**	20.13	**TPER**	50.12

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17650.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 203.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
12Total per year (kWh/year)												2752	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.4800	36.7938	0.7600	0.7000	0.7700	101.4662	(79)
Southwest	1.7600	36.7938	0.7600	0.7000	0.7700	23.8744	(79)

Solar gains	125.3406	213.5015	292.1220	361.9533	405.4179	402.4861	388.0396	355.6131	316.3064	235.9646	150.1292	107.2655	(83)
Total gains	710.5132	812.9140	866.2684	916.9873	933.1290	912.4849	879.1314	847.7351	823.0191	758.7177	703.8768	680.8066	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	
alpha	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	
util living area													
	0.9689	0.9351	0.8799	0.7661	0.6094	0.4363	0.3122	0.3384	0.5187	0.7864	0.9343	0.9752	(86)
MIT	20.4355	20.6097	20.7724	20.9161	20.9813	20.9979	20.9998	20.9996	20.9942	20.9165	20.6653	20.3865	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house													
	0.9625	0.9232	0.8600	0.7345	0.5687	0.3907	0.2643	0.2887	0.4696	0.7502	0.9202	0.9699	(89)
MIT 2	19.6763	19.8893	20.0826	20.2428	20.3081	20.3221	20.3233	20.3233	20.3195	20.2464	19.9601	19.6153	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9138	20.1147	20.2984	20.4534	20.5187	20.5335	20.5349	20.5348	20.5306	20.4560	20.1807	19.8566	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9138	20.1147	20.2984	20.4534	20.5187	20.5335	20.5349	20.5348	20.5306	20.4560	20.1807	19.8566	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9580	0.9191	0.8592	0.7408	0.5806	0.4049	0.2792	0.3042	0.4847	0.7576	0.9169	0.9656	(94)
Useful gains	680.6386	747.1536	744.3204	679.2767	541.7484	369.4774	245.4902	257.9197	398.9460	574.8006	645.3975	657.4102	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	974.3512	949.4456	861.0627	720.9731	550.3135	370.2712	245.5522	258.0272	401.2879	615.0484	816.2764	977.0213	(97)
Space heating kWh													
	218.5222	135.9402	86.8563	30.0214	6.3725	0.0000	0.0000	0.0000	0.0000	29.9444	123.0328	237.7907	(98a)
Space heating requirement - total per year (kWh/year)												868.4805	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	218.5222	135.9402	86.8563	30.0214	6.3725	0.0000	0.0000	0.0000	0.0000	29.9444	123.0328	237.7907	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												868.4805	
Space heating per m2											(98c) / (4) =	10.0171	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	218.5222	135.9402	86.8563	30.0214	6.3725	0.0000	0.0000	0.0000	0.0000	29.9444	123.0328	237.7907	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	327.7833	203.9103	130.2844	45.0321	9.5587	0.0000	0.0000	0.0000	0.0000	44.9166	184.5493	356.6860	
Space heating requirement													
	327.7833	203.9103	130.2844	45.0321	9.5587	0.0000	0.0000	0.0000	0.0000	44.9166	184.5493	356.6860	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1302.7207	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												13.0272	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4721.8215	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1448.0591	0.1580	54.8812	(367)
Electrical energy for heat distribution (space & water)	13.0272	0.0000	7.8737	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			217.8392	(373)
Space and water heating			217.8392	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			132.2644	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.5300	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1448.0591	1.5848	550.5450	(467)
Electrical energy for heat distribution (space & water)	13.0272	0.0000	83.4247	(472)
Overall CO2 factor for heat network			0.4250	(486)
Total CO2 associated with community systems			2308.0822	(473)
Space and water heating			2308.0822	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1745.1389	(483)
Dwelling Primary energy Rate (DPER)			20.1300	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
Heatloss Floor 1			43.3500	0.1300	5.6355			(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1247			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E5 Ground floor (normal)	6.7700	0.1600	1.0832
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P1 Party wall - Ground floor	19.4300	0.0800	1.5544
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0424 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.1671 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	71.4535	71.2501	71.0507	70.1143	69.9391	69.1235	69.1235	68.9725	69.4377	69.9391	70.2935	70.6641	(39)
Average = Sum(39)m / 12 =												70.1135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8241	0.8218	0.8195	0.8087	0.8067	0.7973	0.7973	0.7955	0.8009	0.8067	0.8108	0.8150	(40)
HLP (average)												0.8087	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
										Total per year (kWh/year) = Sum(64)m =		2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	9.2400	36.7938	0.6300	0.7000	0.7700	103.9008	(79)

Solar gains	103.9008	176.9815	242.1538	300.0403	336.0701	333.6398	321.6644	294.7845	262.2013	195.6022	124.4492	88.9174	(83)
Total gains	682.7380	770.0586	809.9648	848.7388	857.4458	834.3032	803.4208	777.5712	759.5787	712.0200	671.8614	656.1232	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3015	70.5022	70.7000	71.6442	71.8237	72.6712	72.6712	72.8303	72.3424	71.8237	71.4616	71.0868	
alpha	5.6868	5.7001	5.7133	5.7763	5.7882	5.8447	5.8447	5.8554	5.8228	5.7882	5.7641	5.7391	
util living area	0.9817	0.9636	0.9325	0.8522	0.7149	0.5241	0.3778	0.4068	0.6141	0.8616	0.9608	0.9848	(86)
MIT	20.2013	20.3810	20.5797	20.8084	20.9426	20.9921	20.9990	20.9985	20.9806	20.8254	20.4922	20.1722	(87)
Th 2	20.2325	20.2345	20.2365	20.2458	20.2475	20.2557	20.2557	20.2572	20.2526	20.2475	20.2440	20.2403	(88)
util rest of house	0.9774	0.9555	0.9179	0.8235	0.6685	0.4656	0.3143	0.3417	0.5536	0.8288	0.9508	0.9813	(89)
MIT 2	19.3093	19.5350	19.7804	20.0558	20.1992	20.2508	20.2553	20.2566	20.2394	20.0811	19.6836	19.2789	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.5883	19.7997	20.0304	20.2912	20.4317	20.4827	20.4879	20.4886	20.4712	20.3139	19.9365	19.5583	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5883	19.7997	20.0304	20.2912	20.4317	20.4827	20.4879	20.4886	20.4712	20.3139	19.9365	19.5583	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9729	0.9502	0.9134	0.8253	0.6803	0.4836	0.3341	0.3621	0.5717	0.8320	0.9460	0.9772	(94)
Useful gains	664.2612	731.6735	739.8511	700.4799	583.3075	403.4835	268.4505	281.5292	434.2643	592.3694	635.5760	641.1744	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1092.4035	1061.6036	961.3439	798.6888	610.6904	406.6304	268.7476	282.0033	442.4043	679.3831	902.3261	1085.2810	(97)
Space heating kWh	318.5379	221.7131	164.7907	70.7104	20.3729	0.0000	0.0000	0.0000	0.0000	64.7382	192.0601	330.4153	(98a)
Space heating requirement - total per year (kWh/year)												1383.3387	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	318.5379	221.7131	164.7907	70.7104	20.3729	0.0000	0.0000	0.0000	0.0000	64.7382	192.0601	330.4153	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1383.3387	
Space heating per m2											(98c) / (4) =	15.9555	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	318.5379	221.7131	164.7907	70.7104	20.3729	0.0000	0.0000	0.0000	0.0000	64.7382	192.0601	330.4153	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	345.1115	240.2092	178.5381	76.6094	22.0725	0.0000	0.0000	0.0000	0.0000	70.1389	208.0825	357.9798	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.7550	84.2188	83.4257	82.0254	80.5997	79.8000	79.8000	79.8000	79.8000	81.8610	83.8838	84.8599	(217)
Fuel for water heating, kWh/month	275.7137	245.2763	263.1157	235.8317	232.9370	212.3443	209.9929	218.2535	220.5242	239.2699	247.6930	272.4692	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.0522	-34.0491	-51.2340	-60.3739	-67.5059	-63.8722	-63.0931	-58.3837	-50.4758	-40.1585	-25.8892	-19.7533	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.6843	-18.6438	-37.7720	-57.7989	-77.4856	-78.2579	-77.3368	-64.9856	-46.9877	-27.0053	-11.7029	-6.8394	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1498.7418	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2873.4214	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1071.3411	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3611.2003	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1498.7418	0.2100	314.7358	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2873.4214	0.2100	603.4185	(264)
Space and water heating			918.1543	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	0.1336	-74.5440	
PV Unit electricity exported	-513.5003	0.1254	-64.3679	
Total			-138.9120	(269)
Total CO2, kg/year			823.5563	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.5000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1498.7418	1.1300	1693.5782	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2873.4214	1.1300	3246.9662	(278)
Space and water heating			4940.5444	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	1.4938	-833.3127	
PV Unit electricity exported	-513.5003	0.4601	-236.2611	
Total			-1069.5738	(283)
Total Primary energy kWh/year			4345.2302	(286)
Target Primary Energy Rate (TPER)			50.1200	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northeast	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.53	**TER**	9.50
Environmental	99 A	**% DER < TER**			83.89
CO_2 Emissions (t/year)	0.11	**DFEE**	17.22	**TFEE**	21.61
Compliance Check	See BREL	**% DFEE < TFEE**			20.31
% DPER < TPER	59.84	**DPER**	20.13	**TPER**	50.12

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)										(28)...(30) + (32) + (32a)...(32e) =		18083.8300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												208.5794	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												2.7933	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss										(33) + (36) + (36a) =		27.3548	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778	(42)
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.4800	36.7938	0.7600	0.7000	0.7700	101.4662	(79)
Southwest	1.7600	36.7938	0.7600	0.7000	0.7700	23.8744	(79)

Solar gains	125.3406	213.5015	292.1220	361.9533	405.4179	402.4861	388.0396	355.6131	316.3064	235.9646	150.1292	107.2655	(83)
Total gains	764.9645	850.7953	910.4073	944.9070	953.2205	918.5910	885.4880	856.3255	835.2281	787.1458	740.1330	731.0482	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area													
	0.9586	0.9247	0.8616	0.7515	0.5985	0.4335	0.3100	0.3350	0.5118	0.7687	0.9225	0.9672	(86)
MIT	20.5171	20.6592	20.8116	20.9296	20.9845	20.9982	20.9998	20.9997	20.9952	20.9313	20.7113	20.4663	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house													
	0.9504	0.9114	0.8399	0.7192	0.5580	0.3882	0.2624	0.2858	0.4631	0.7314	0.9065	0.9605	(89)
MIT 2	19.7758	19.9480	20.1268	20.2566	20.3109	20.3223	20.3233	20.3233	20.3202	20.2610	20.0138	19.7134	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0077	20.1704	20.3410	20.4671	20.5216	20.5338	20.5349	20.5349	20.5313	20.4707	20.2320	19.9489	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0077	20.1704	20.3410	20.4671	20.5216	20.5338	20.5349	20.5349	20.5313	20.4707	20.2320	19.9489	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9460	0.9080	0.8405	0.7263	0.5700	0.4024	0.2773	0.3012	0.4782	0.7398	0.9041	0.9561	(94)
Useful gains	723.6638	772.5378	765.1692	686.2502	543.3151	369.6058	245.5033	257.9431	399.3662	582.3243	669.1241	698.9578	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	980.2113	952.9265	863.7236	721.8275	550.4969	370.2864	245.5538	258.0300	401.3369	615.9634	819.4788	982.7822	(97)
Space heating kWh													
	190.8714	121.2212	73.3244	25.6157	5.3432	0.0000	0.0000	0.0000	0.0000	25.0275	108.2554	211.1654	(98a)
Space heating requirement - total per year (kWh/year)												760.8242	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	190.8714	121.2212	73.3244	25.6157	5.3432	0.0000	0.0000	0.0000	0.0000	25.0275	108.2554	211.1654	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												760.8242	
Space heating per m2											(98c) / (4) =	8.7754	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	190.8714	121.2212	73.3244	25.6157	5.3432	0.0000	0.0000	0.0000	0.0000	25.0275	108.2554	211.1654	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	286.3070	181.8318	109.9867	38.4235	8.0149	0.0000	0.0000	0.0000	0.0000	37.5412	162.3831	316.7480	
Space heating requirement													
	286.3070	181.8318	109.9867	38.4235	8.0149	0.0000	0.0000	0.0000	0.0000	37.5412	162.3831	316.7480	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1141.2362	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												11.4124	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4560.3370	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1141.2362	4.4400	50.6709	(340a)
Space heating total			50.6709	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			259.2619	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7087 (357)
SAP value		88.5122
SAP rating (Section 12)		89 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1404.9966	0.1581	48.1059	(367)
Electrical energy for heat distribution (space & water)	11.4124	0.0000	7.6196	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			210.8098	(373)
Space and water heating			210.8098	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			125.2349	(383)
CO2 emissions per m2			1.4400	(384)
EI value			98.7258	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)

Average = Sum(39)m / 12 = 62.4033

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)

Total per year (kWh/year) = Sum(64)m = 2751.6674 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.4800	42.9509	0.7600	0.7000	0.7700	118.4456	(79)
Southwest	1.7600	42.9509	0.7600	0.7000	0.7700	27.8696	(79)

Solar gains	146.3152	221.4792	299.2755	377.4295	409.9363	437.9421	413.7339	384.4230	342.7809	258.3726	172.6085	125.9735	(83)
Total gains	785.9390	858.7730	917.5608	960.3832	957.7390	954.0470	911.1824	885.1354	861.7026	809.5538	762.6124	749.7563	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area													
	0.9496	0.9161	0.8422	0.7235	0.5662	0.3789	0.2671	0.2890	0.4757	0.7257	0.9033	0.9601	(86)
MIT	20.5667	20.6885	20.8422	20.9449	20.9892	20.9993	20.9999	20.9999	20.9969	20.9526	20.7598	20.5155	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house													
	0.9398	0.9014	0.8182	0.6897	0.5249	0.3349	0.2207	0.2413	0.4278	0.6855	0.8841	0.9520	(89)
MIT 2	19.8367	19.9830	20.1614	20.2722	20.3150	20.3230	20.3234	20.3234	20.3215	20.2820	20.0706	19.7742	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0650	20.2037	20.3744	20.4826	20.5259	20.5345	20.5350	20.5350	20.5328	20.4918	20.2862	20.0061	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0650	20.2037	20.3744	20.4826	20.5259	20.5345	20.5350	20.5350	20.5328	20.4918	20.2862	20.0061	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9356	0.8986	0.8201	0.6979	0.5374	0.3486	0.2352	0.2562	0.4427	0.6958	0.8830	0.9476	(94)
Useful gains	735.3087	771.6791	752.4570	670.2310	514.6666	332.6270	214.3400	226.8064	381.4886	563.2751	673.3769	710.4878	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	965.0685	936.2802	834.6057	697.8335	519.5630	332.8930	214.3563	226.8354	382.7042	586.0774	797.9015	967.6323	(97)
Space heating kWh													
	170.9413	110.6119	61.1187	19.8739	3.6429	0.0000	0.0000	0.0000	0.0000	16.9649	89.6577	191.3155	(98a)
Space heating requirement - total per year (kWh/year)												664.1268	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	170.9413	110.6119	61.1187	19.8739	3.6429	0.0000	0.0000	0.0000	0.0000	16.9649	89.6577	191.3155	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												664.1268	
Space heating per m2											(98c) / (4) =	7.6601	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	170.9413	110.6119	61.1187	19.8739	3.6429	0.0000	0.0000	0.0000	0.0000	16.9649	89.6577	191.3155	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	256.4120	165.9178	91.6780	29.8108	5.4643	0.0000	0.0000	0.0000	0.0000	25.4474	134.4866	286.9732	
Space heating requirement													
	256.4120	165.9178	91.6780	29.8108	5.4643	0.0000	0.0000	0.0000	0.0000	25.4474	134.4866	286.9732	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)

Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year		
Space heating fuel - community heating	996.1901	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4127.5010	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	9.9619	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4318.7648	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	996.1901	6.5500	65.2505	(340a)
Space heating total			65.2505	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			328.5555	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1366.3177	0.1585	42.1061	(367)
Electrical energy for heat distribution (space & water)	9.9619	0.0000	7.3946	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			204.5851	(373)
Space and water heating			204.5851	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			106.7521	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1366.3177	1.5867	421.5131	(467)
Electrical energy for heat distribution (space & water)	9.9619	0.0000	78.5860	(472)
Overall CO2 factor for heat network			0.4243	(486)
Total CO2 associated with community systems			2174.2116	(473)
Space and water heating			2174.2116	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1530.3765	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Northeast

Current energy efficiency rating: B 89
Current environmental impact rating: A 99

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 89
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£71	£71	£0
Community scheme	£440	£440	£0
Space heating	£179	£179	£0
Water heating	£270	£270	£0
Lighting	£62	£62	£0
Generated (PV)	-£182	-£182	£0
Total cost of fuels	£329	£329	£0
Total cost of uses	£329	£329	£0
Delivered energy	50 kWh/m²	50 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	18 kWh/m²	18 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5778 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day)	126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	

Distribution loss (46)m = 0.15 x (45)m

32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss / Combi loss

Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS / PV diverter / Solar input / FGHRS

Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
									Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.4800	36.7938	0.7600	0.7000	0.7700	101.4662	(79)
Southwest	1.7600	36.7938	0.7600	0.7000	0.7700	23.8744	(79)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	125.3406	213.5015	292.1220	361.9533	405.4179	402.4861	388.0396	355.6131	316.3064	235.9646	150.1292	107.2655	(83)
Total gains	764.9645	850.7953	910.4073	944.9070	953.2205	918.5910	885.4880	856.3255	835.2281	787.1458	740.1330	731.0482	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area	0.9586	0.9247	0.8616	0.7515	0.5985	0.4335	0.3100	0.3350	0.5118	0.7687	0.9225	0.9672	(86)
MIT	20.5171	20.6592	20.8116	20.9296	20.9845	20.9982	20.9998	20.9997	20.9952	20.9313	20.7113	20.4663	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house	0.9504	0.9114	0.8399	0.7192	0.5580	0.3882	0.2624	0.2858	0.4631	0.7314	0.9065	0.9605	(89)
MIT 2	19.7758	19.9480	20.1268	20.2566	20.3109	20.3223	20.3233	20.3233	20.3202	20.2610	20.0138	19.7134	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0077	20.1704	20.3410	20.4671	20.5216	20.5338	20.5349	20.5349	20.5313	20.4707	20.2320	19.9489	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0077	20.1704	20.3410	20.4671	20.5216	20.5338	20.5349	20.5349	20.5313	20.4707	20.2320	19.9489	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9460	0.9080	0.8405	0.7263	0.5700	0.4024	0.2773	0.3012	0.4782	0.7398	0.9041	0.9561	(94)
Useful gains	723.6638	772.5378	765.1692	686.2502	543.3151	369.6058	245.5033	257.9431	399.3662	582.3243	669.1241	698.9578	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	980.2113	952.9265	863.7236	721.8275	550.4969	370.2864	245.5538	258.0300	401.3369	615.9634	819.4788	982.7822	(97)
Space heating kWh	190.8714	121.2212	73.3244	25.6157	5.3432	0.0000	0.0000	0.0000	0.0000	25.0275	108.2554	211.1654	(98a)
Space heating requirement - total per year (kWh/year)												760.8242	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	190.8714	121.2212	73.3244	25.6157	5.3432	0.0000	0.0000	0.0000	0.0000	25.0275	108.2554	211.1654	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												760.8242	
Space heating per m2											(98c) / (4) =	8.7754	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	190.8714	121.2212	73.3244	25.6157	5.3432	0.0000	0.0000	0.0000	0.0000	25.0275	108.2554	211.1654	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	286.3070	181.8318	109.9867	38.4235	8.0149	0.0000	0.0000	0.0000	0.0000	37.5412	162.3831	316.7480	
Space heating requirement													
	286.3070	181.8318	109.9867	38.4235	8.0149	0.0000	0.0000	0.0000	0.0000	37.5412	162.3831	316.7480	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1141.2362	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)

Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	11.4124	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4560.3370	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1141.2362	4.4400	50.6709	(340a)
Space heating total			50.6709	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			259.2619	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.7087	(357)
SAP value	88.5122	
SAP rating (Section 12)	89	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1404.9966	0.1581	48.1059	(367)
Electrical energy for heat distribution (space & water)	11.4124	0.0000	7.6196	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			210.8098	(373)
Space and water heating			210.8098	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			125.2349	(383)
CO2 emissions per m2			1.4400	(384)
EI value			98.7258	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 86.7000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5778	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southwest	7.4800	42.9509	0.7600	0.7000	0.7700	118.4456	(79)
Southwest	1.7600	42.9509	0.7600	0.7000	0.7700	27.8696	(79)

Solar gains	146.3152	221.4792	299.2755	377.4295	409.9363	437.9421	413.7339	384.4230	342.7809	258.3726	172.6085	125.9735	(83)
Total gains	785.9390	858.7730	917.5608	960.3832	957.7390	954.0470	911.1824	885.1354	861.7026	809.5538	762.6124	749.7563	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area	0.9496	0.9161	0.8422	0.7235	0.5662	0.3789	0.2671	0.2890	0.4757	0.7257	0.9033	0.9601	(86)
MIT	20.5667	20.6885	20.8422	20.9449	20.9892	20.9993	20.9999	20.9999	20.9969	20.9526	20.7598	20.5155	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house	0.9398	0.9014	0.8182	0.6897	0.5249	0.3349	0.2207	0.2413	0.4278	0.6855	0.8841	0.9520	(89)
MIT 2	19.8367	19.9830	20.1614	20.2722	20.3150	20.3230	20.3234	20.3234	20.3215	20.2820	20.0706	19.7742	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0650	20.2037	20.3744	20.4826	20.5259	20.5345	20.5350	20.5350	20.5328	20.4918	20.2862	20.0061	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0650	20.2037	20.3744	20.4826	20.5259	20.5345	20.5350	20.5350	20.5328	20.4918	20.2862	20.0061	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9356	0.8986	0.8201	0.6979	0.5374	0.3486	0.2352	0.2562	0.4427	0.6958	0.8830	0.9476	(94)
Useful gains	735.3087	771.6791	752.4570	670.2310	514.6666	332.6270	214.3400	226.8064	381.4886	563.2751	673.3769	710.4878	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W	965.0685	936.2802	834.6057	697.8335	519.5630	332.8930	214.3563	226.8354	382.7042	586.0774	797.9015	967.6323	(97)
Space heating kWh	170.9413	110.6119	61.1187	19.8739	3.6429	0.0000	0.0000	0.0000	0.0000	16.9649	89.6577	191.3155	(98a)
Space heating requirement - total per year (kWh/year)												664.1268	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	170.9413	110.6119	61.1187	19.8739	3.6429	0.0000	0.0000	0.0000	0.0000	16.9649	89.6577	191.3155	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												664.1268	
Space heating per m2										(98c) / (4) =		7.6601	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement

	170.9413	110.6119	61.1187	19.8739	3.6429	0.0000	0.0000	0.0000	0.0000	16.9649	89.6577	191.3155 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	256.4120	165.9178	91.6780	29.8108	5.4643	0.0000	0.0000	0.0000	0.0000	25.4474	134.4866	286.9732
Space heating requirement												
	256.4120	165.9178	91.6780	29.8108	5.4643	0.0000	0.0000	0.0000	0.0000	25.4474	134.4866	286.9732 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388
Water heating fuel												
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446 (331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year	
Space heating fuel - community heating	996.1901 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	9.9619 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)	
mechanical ventilation fans (SFP = 0.1292)	33.4924 (330a)
Total electricity for the above, kWh/year	33.4924 (331)
Electricity for lighting (calculated in Appendix L)	216.3282 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4318.7648 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	996.1901	6.5500	65.2505	(340a)
Space heating total			65.2505	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			328.5555	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1366.3177	0.1585	42.1061	(367)
Electrical energy for heat distribution (space & water)	9.9619	0.0000	7.3946	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			204.5851	(373)
Space and water heating			204.5851	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			106.7521	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)

Space and Water heating from Heat pump	1366.3177	1.5867	421.5131	(467)
Electrical energy for heat distribution (space & water)	9.9619	0.0000	78.5860	(472)
Overall CO2 factor for heat network			0.4243	(486)
Total CO2 associated with community systems			2174.2116	(473)
Space and water heating			2174.2116	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1530.3765	(483)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.53	**TER**	9.50
Environmental	99 A	**% DER < TER**			83.89
CO_2 Emissions (t/year)	0.11	**DFEE**	17.22	**TFEE**	21.61
Compliance Check	See BREL	**% DFEE < TFEE**			20.31
% DPER < TPER	59.84	**DPER**	20.13	**TPER**	50.12

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)									(28)...(30) + (32) + (32a)...(32e) =			17650.3300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												203.5794	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												2.7933	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss										(33) + (36) + (36a) =		27.3548	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778	(42)
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
12Total per year (kWh/year)												2752	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.4800	36.7938	0.7600	0.7000	0.7700	101.4662	(77)
Southeast	1.7600	36.7938	0.7600	0.7000	0.7700	23.8744	(77)

Solar gains	125.3406	213.5015	292.1220	361.9533	405.4179	402.4861	388.0396	355.6131	316.3064	235.9646	150.1292	107.2655	(83)
Total gains	710.5132	812.9140	866.2684	916.9873	933.1290	912.4849	879.1314	847.7351	823.0191	758.7177	703.8768	680.8066	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	
alpha	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	
util living area													
	0.9689	0.9351	0.8799	0.7661	0.6094	0.4363	0.3122	0.3384	0.5187	0.7864	0.9343	0.9752	(86)
MIT	20.4355	20.6097	20.7724	20.9161	20.9813	20.9979	20.9998	20.9996	20.9942	20.9165	20.6653	20.3865	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house													
	0.9625	0.9232	0.8600	0.7345	0.5687	0.3907	0.2643	0.2887	0.4696	0.7502	0.9202	0.9699	(89)
MIT 2	19.6763	19.8893	20.0826	20.2428	20.3081	20.3221	20.3233	20.3233	20.3195	20.2464	19.9601	19.6153	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9138	20.1147	20.2984	20.4534	20.5187	20.5335	20.5349	20.5348	20.5306	20.4560	20.1807	19.8566	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9138	20.1147	20.2984	20.4534	20.5187	20.5335	20.5349	20.5348	20.5306	20.4560	20.1807	19.8566	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9580	0.9191	0.8592	0.7408	0.5806	0.4049	0.2792	0.3042	0.4847	0.7576	0.9169	0.9656	(94)
Useful gains	680.6386	747.1536	744.3204	679.2767	541.7484	369.4774	245.4902	257.9197	398.9460	574.8006	645.3975	657.4102	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	974.3512	949.4456	861.0627	720.9731	550.3135	370.2712	245.5522	258.0272	401.2879	615.0484	816.2764	977.0213	(97)
Space heating kWh													
	218.5222	135.9402	86.8563	30.0214	6.3725	0.0000	0.0000	0.0000	0.0000	29.9444	123.0328	237.7907	(98a)
Space heating requirement - total per year (kWh/year)												868.4805	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	218.5222	135.9402	86.8563	30.0214	6.3725	0.0000	0.0000	0.0000	0.0000	29.9444	123.0328	237.7907	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												868.4805	
Space heating per m2											(98c) / (4) =	10.0171	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	218.5222	135.9402	86.8563	30.0214	6.3725	0.0000	0.0000	0.0000	0.0000	29.9444	123.0328	237.7907	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	327.7833	203.9103	130.2844	45.0321	9.5587	0.0000	0.0000	0.0000	0.0000	44.9166	184.5493	356.6860	
Space heating requirement													
	327.7833	203.9103	130.2844	45.0321	9.5587	0.0000	0.0000	0.0000	0.0000	44.9166	184.5493	356.6860	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1302.7207	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												13.0272	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4721.8215	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1448.0591	0.1580	54.8812	(367)
Electrical energy for heat distribution (space & water)	13.0272	0.0000	7.8737	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			217.8392	(373)
Space and water heating			217.8392	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			132.2644	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.5300	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1448.0591	1.5848	550.5450	(467)
Electrical energy for heat distribution (space & water)	13.0272	0.0000	83.4247	(472)
Overall CO2 factor for heat network			0.4250	(486)
Total CO2 associated with community systems			2308.0822	(473)
Space and water heating			2308.0822	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1745.1389	(483)
Dwelling Primary energy Rate (DPER)			20.1300	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
Heatloss Floor 1			43.3500	0.1300	5.6355			(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1247			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E5 Ground floor (normal)	6.7700	0.1600	1.0832
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P1 Party wall - Ground floor	19.4300	0.0800	1.5544
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0424 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.1671 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	71.4535	71.2501	71.0507	70.1143	69.9391	69.1235	69.1235	68.9725	69.4377	69.9391	70.2935	70.6641	(39)
Average = Sum(39)m / 12 =												70.1135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8241	0.8218	0.8195	0.8087	0.8067	0.7973	0.7973	0.7955	0.8009	0.8067	0.8108	0.8150	(40)
HLP (average)												0.8087	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
										Total per year (kWh/year) = Sum(64)m =		2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.2400	36.7938	0.6300	0.7000	0.7700	103.9008	(77)

Solar gains	103.9008	176.9815	242.1538	300.0403	336.0701	333.6398	321.6644	294.7845	262.2013	195.6022	124.4492	88.9174	(83)
Total gains	682.7380	770.0586	809.9648	848.7388	857.4458	834.3032	803.4208	777.5712	759.5787	712.0200	671.8614	656.1232	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3015	70.5022	70.7000	71.6442	71.8237	72.6712	72.6712	72.8303	72.3424	71.8237	71.4616	71.0868	
alpha	5.6868	5.7001	5.7133	5.7763	5.7882	5.8447	5.8447	5.8554	5.8228	5.7882	5.7641	5.7391	
util living area													
	0.9817	0.9636	0.9325	0.8522	0.7149	0.5241	0.3778	0.4068	0.6141	0.8616	0.9608	0.9848	(86)
MIT	20.2013	20.3810	20.5797	20.8084	20.9426	20.9921	20.9990	20.9985	20.9806	20.8254	20.4922	20.1722	(87)
Th 2	20.2325	20.2345	20.2365	20.2458	20.2475	20.2557	20.2557	20.2572	20.2526	20.2475	20.2440	20.2403	(88)
util rest of house													
	0.9774	0.9555	0.9179	0.8235	0.6685	0.4656	0.3143	0.3417	0.5536	0.8288	0.9508	0.9813	(89)
MIT 2	19.3093	19.5350	19.7804	20.0558	20.1992	20.2508	20.2553	20.2566	20.2394	20.0811	19.6836	19.2789	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.5883	19.7997	20.0304	20.2912	20.4317	20.4827	20.4879	20.4886	20.4712	20.3139	19.9365	19.5583	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5883	19.7997	20.0304	20.2912	20.4317	20.4827	20.4879	20.4886	20.4712	20.3139	19.9365	19.5583	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9729	0.9502	0.9134	0.8253	0.6803	0.4836	0.3341	0.3621	0.5717	0.8320	0.9460	0.9772	(94)
Useful gains	664.2612	731.6735	739.8511	700.4799	583.3075	403.4835	268.4505	281.5292	434.2643	592.3694	635.5760	641.1744	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1092.4035	1061.6036	961.3439	798.6888	610.6904	406.6304	268.7476	282.0033	442.4043	679.3831	902.3261	1085.2810	(97)
Space heating kWh	318.5379	221.7131	164.7907	70.7104	20.3729	0.0000	0.0000	0.0000	0.0000	64.7382	192.0601	330.4153	(98a)
Space heating requirement - total per year (kWh/year)												1383.3387	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	318.5379	221.7131	164.7907	70.7104	20.3729	0.0000	0.0000	0.0000	0.0000	64.7382	192.0601	330.4153	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1383.3387	
Space heating per m2											(98c) / (4) =	15.9555	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	318.5379	221.7131	164.7907	70.7104	20.3729	0.0000	0.0000	0.0000	0.0000	64.7382	192.0601	330.4153	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	345.1115	240.2092	178.5381	76.6094	22.0725	0.0000	0.0000	0.0000	0.0000	70.1389	208.0825	357.9798	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.7550	84.2188	83.4257	82.0254	80.5997	79.8000	79.8000	79.8000	79.8000	81.8610	83.8838	84.8599	(217)
Fuel for water heating, kWh/month	275.7137	245.2763	263.1157	235.8317	232.9370	212.3443	209.9929	218.2535	220.5242	239.2699	247.6930	272.4692	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.0522	-34.0491	-51.2340	-60.3739	-67.5059	-63.8722	-63.0931	-58.3837	-50.4758	-40.1585	-25.8892	-19.7533	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.6843	-18.6438	-37.7720	-57.7989	-77.4856	-78.2579	-77.3368	-64.9856	-46.9877	-27.0053	-11.7029	-6.8394	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1498.7418	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2873.4214	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1071.3411	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3611.2003	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1498.7418	0.2100	314.7358	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2873.4214	0.2100	603.4185	(264)
Space and water heating			918.1543	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	0.1336	-74.5440	
PV Unit electricity exported	-513.5003	0.1254	-64.3679	
Total			-138.9120	(269)
Total CO2, kg/year			823.5563	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.5000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1498.7418	1.1300	1693.5782	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2873.4214	1.1300	3246.9662	(278)
Space and water heating			4940.5444	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	1.4938	-833.3127	
PV Unit electricity exported	-513.5003	0.4601	-236.2611	
Total			-1069.5738	(283)
Total Primary energy kWh/year			4345.2302	(286)
Target Primary Energy Rate (TPER)			50.1200	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.53	**TER**	9.50
Environmental	99 A	**% DER < TER**			83.89
CO_2 Emissions (t/year)	0.11	**DFEE**	17.22	**TFEE**	21.61
Compliance Check	See BREL	**% DFEE < TFEE**			20.31
% DPER < TPER	59.84	**DPER**	20.13	**TPER**	50.12

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2257	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.2878	0.2821	0.2765	0.2483	0.2426	0.2144	0.2144	0.2088	0.2257	0.2426	0.2539	0.2652	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5414	0.5398	0.5382	0.5308	0.5294	0.5230	0.5230	0.5218	0.5255	0.5294	0.5322	0.5352	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		18083.8300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							208.5794	(35)

Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9510	37.8383	37.7278	37.2089	37.1118	36.6599	36.6599	36.5762	36.8339	37.1118	37.3082	37.5135	(38)
Heat transfer coeff	65.3058	65.1931	65.0826	64.5637	64.4666	64.0147	64.0147	63.9310	64.1888	64.4666	64.6630	64.8684	(39)
Average = Sum(39)m / 12 =												64.5633	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7532	0.7519	0.7507	0.7447	0.7436	0.7383	0.7383	0.7374	0.7404	0.7436	0.7458	0.7482	(40)
HLP (average)												0.7447	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =					614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.4800	36.7938	0.7600	0.7000	0.7700	101.4662	(77)
Southeast	1.7600	36.7938	0.7600	0.7000	0.7700	23.8744	(77)

Solar gains	125.3406	213.5015	292.1220	361.9533	405.4179	402.4861	388.0396	355.6131	316.3064	235.9646	150.1292	107.2655	(83)
Total gains	603.5690	707.2263	763.4817	821.1958	841.4525	825.1544	794.7718	761.3949	734.2864	665.1367	603.6188	574.8142	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.9194	77.0524	77.1832	77.8035	77.9207	78.4708	78.4708	78.5736	78.2580	77.9207	77.6840	77.4381	
alpha	6.1280	6.1368	6.1455	6.1869	6.1947	6.2314	6.2314	6.2382	6.2172	6.1947	6.1789	6.1625	
util living area	0.9879	0.9692	0.9334	0.8385	0.6850	0.4933	0.3540	0.3856	0.5926	0.8644	0.9702	0.9907	(86)

MIT	20.2329	20.4348	20.6413	20.8559	20.9640	20.9959	20.9996	20.9993	20.9879	20.8515	20.5132	20.1917	(87)
Th 2	20.2940	20.2952	20.2963	20.3015	20.3025	20.3071	20.3071	20.3079	20.3053	20.3025	20.3005	20.2985	(88)
util rest of house	0.9850	0.9624	0.9195	0.8097	0.6412	0.4412	0.2985	0.3279	0.5368	0.8332	0.9625	0.9885	(89)
MIT 2	19.5958	19.7938	19.9921	20.1908	20.2791	20.3051	20.3069	20.3077	20.2989	20.1916	19.8767	19.5588	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.7951	19.9943	20.1952	20.3989	20.4934	20.5212	20.5236	20.5240	20.5144	20.3980	20.0758	19.7568	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7951	19.9943	20.1952	20.3989	20.4934	20.5212	20.5236	20.5240	20.5144	20.3980	20.0758	19.7568	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9826	0.9591	0.9172	0.8139	0.6535	0.4574	0.3159	0.3460	0.5539	0.8378	0.9595	0.9863	(94)
Useful gains	593.0387	678.2821	700.2870	668.3948	549.8737	377.4284	251.0367	263.4209	406.6991	557.2559	579.1865	566.9638	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1011.9189	984.0444	891.3173	742.4088	566.8788	379.0424	251.1678	263.6518	411.7342	631.6461	839.0568	1009.1424	(97)
Space heating kWh	311.6468	205.4723	142.1266	53.2901	12.6518	0.0000	0.0000	0.0000	0.0000	55.3463	187.1066	328.9809	(98a)
Space heating requirement - total per year (kWh/year)												1296.6214	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	311.6468	205.4723	142.1266	53.2901	12.6518	0.0000	0.0000	0.0000	0.0000	55.3463	187.1066	328.9809	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1296.6214	
Space heating per m2											(98c) / (4) =	14.9553	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	601.7381	473.7088	485.8756	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9715	0.9894	0.9851	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	584.6061	468.7003	478.6593	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	900.3518	867.8724	831.6237	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	227.3370	296.9841	262.6055	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	56.8342	74.2460	65.6514	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												196.7316	(107)
Energy for space heating												14.9553	(99)
Energy for space cooling												2.2691	(108)
Total												17.2244	(109)
Fabric Energy Efficiency (DFEE)												17.2	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

---

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
Heatloss Floor 1			43.3500	0.1300	5.6355			(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1247			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	6.2700	0.0500	0.3135
E2 Other lintels (including other steel lintels)	2.5200	0.0500	0.1260
E3 Sill	20.7200	0.0500	1.0360
E4 Jamb	13.5400	0.0000	0.0000
E6 Intermediate floor within a dwelling	6.7700	0.1600	1.0832
E5 Ground floor (normal)	22.0000	0.0600	1.3200
E18 Party wall between dwellings	12.6600	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	19.4300	0.0800	1.5544
P1 Party wall - Ground floor	6.7700	0.0200	0.1354
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0700	0.4739
E7 Party floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0424 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.1671 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	71.4535	71.2501	71.0507	70.1143	69.9391	69.1235	69.1235	68.9725	69.4377	69.9391	70.2935	70.6641	(39)
Average = Sum(39)m / 12 =												70.1135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8241	0.8218	0.8195	0.8087	0.8067	0.7973	0.7973	0.7955	0.8009	0.8067	0.8108	0.8150	(40)
HLP (average)												0.8087	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 64.3029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906	(45)
Energy content (annual)										Total = Sum(45)m =		1067.9337	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		907.7436	(64)
12Total per year (kWh/year)												908	(64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		614.3496	(64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122 (71)

Water heating gains (Table 5)

	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778 (72)

Total internal gains

	478.2284	493.7248	471.3597	459.2424	436.0346	422.6682	406.7322	405.7818	417.9801	429.1721	453.4896	467.5487 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.2400	36.7938	0.6300	0.7000	0.7700	103.9008	(77)

Solar gains	103.9008	176.9815	242.1538	300.0403	336.0701	333.6398	321.6644	294.7845	262.2013	195.6022	124.4492	88.9174 (83)
Total gains	582.1292	670.7063	713.5134	759.2827	772.1047	756.3081	728.3966	700.5663	680.1814	624.7743	577.9388	556.4662 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3015	70.5022	70.7000	71.6442	71.8237	72.6712	72.6712	72.8303	72.3424	71.8237	71.4616	71.0868	
alpha	5.6868	5.7001	5.7133	5.7763	5.7882	5.8447	5.8447	5.8554	5.8228	5.7882	5.7641	5.7391	
util living area													
	0.9913	0.9800	0.9588	0.8953	0.7709	0.5741	0.4161	0.4505	0.6746	0.9091	0.9796	0.9931	(86)
MIT	20.0590	20.2516	20.4709	20.7417	20.9153	20.9874	20.9983	20.9974	20.9689	20.7557	20.3706	20.0290	(87)
Th 2	20.2325	20.2345	20.2365	20.2458	20.2475	20.2557	20.2557	20.2572	20.2526	20.2475	20.2440	20.2403	(88)
util rest of house													
	0.9891	0.9751	0.9488	0.8715	0.7260	0.5116	0.3465	0.3789	0.6118	0.8834	0.9738	0.9913	(89)
MIT 2	19.3733	19.5644	19.7794	20.0408	20.1904	20.2495	20.2552	20.2563	20.2356	20.0593	19.6909	19.3500	(90)
Living area fraction									fLA = Living area / (4) =			0.3128	(91)
MIT	19.5878	19.7794	19.9957	20.2600	20.4172	20.4803	20.4876	20.4881	20.4650	20.2771	19.9035	19.5624	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5878	19.7794	19.9957	20.2600	20.4172	20.4803	20.4876	20.4881	20.4650	20.2771	19.9035	19.5624	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9868	0.9717	0.9452	0.8720	0.7366	0.5307	0.3682	0.4013	0.6303	0.8845	0.9707	0.9894	(94)
Useful gains	574.4297	651.6996	674.4014	662.1138	568.7549	401.4066	268.2276	281.1507	428.6927	552.6286	560.9934	550.5430	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1092.3642	1060.1564	958.8815	796.5019	609.6722	406.4680	268.7274	281.9693	441.9683	676.8075	900.0044	1085.5711	(97)
Space heating kWh													
	385.3433	274.4829	211.6532	96.7594	30.4424	0.0000	0.0000	0.0000	0.0000	92.3891	244.0879	398.0609	(98a)
Space heating requirement - total per year (kWh/year)												1733.2191	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	385.3433	274.4829	211.6532	96.7594	30.4424	0.0000	0.0000	0.0000	0.0000	92.3891	244.0879	398.0609	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1733.2191	
Space heating per m2										(98c) / (4) =		19.9910	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	649.7609	511.5139	524.1907	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9331	0.9708	0.9619	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	606.2797	496.5593	504.2015	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	819.8821	790.2910	760.5254	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	153.7938	218.5364	190.7050	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	38.4484	54.6341	47.6763	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												140.7588	(107)
Energy for space heating												19.9910	(99)
Energy for space cooling												1.6235	(108)
Total												21.6145	(109)
Fabric Energy Efficiency (TFEE)												21.6	(109)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.53	**TER**	9.50
Environmental	99 A	**% DER < TER**			83.89
CO_2 Emissions (t/year)	0.11	**DFEE**	17.22	**TFEE**	21.61
Compliance Check	See BREL	**% DFEE < TFEE**			20.31
% DPER < TPER	59.84	**DPER**	20.13	**TPER**	50.12

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			30.0000	1300.5000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)									(28)...(30) + (32) + (32a)...(32e) =			17650.3300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												203.5794	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												2.7933	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss										(33) + (36) + (36a) =		27.3548	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778	(42)
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
12Total per year (kWh/year)												2752	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	585.1725	599.4125	574.1464	555.0340	527.7111	509.9987	491.0918	492.1220	506.7128	522.7531	553.7476	573.5411	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.4800	36.7938	0.7600	0.7000	0.7700	101.4662	(77)
Southeast	1.7600	36.7938	0.7600	0.7000	0.7700	23.8744	(77)

Solar gains	125.3406	213.5015	292.1220	361.9533	405.4179	402.4861	388.0396	355.6131	316.3064	235.9646	150.1292	107.2655	(83)
Total gains	710.5132	812.9140	866.2684	916.9873	933.1290	912.4849	879.1314	847.7351	823.0191	758.7177	703.8768	680.8066	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	78.5675	
alpha	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	6.2378	
util living area													
	0.9689	0.9351	0.8799	0.7661	0.6094	0.4363	0.3122	0.3384	0.5187	0.7864	0.9343	0.9752	(86)
MIT	20.4355	20.6097	20.7724	20.9161	20.9813	20.9979	20.9998	20.9996	20.9942	20.9165	20.6653	20.3865	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house													
	0.9625	0.9232	0.8600	0.7345	0.5687	0.3907	0.2643	0.2887	0.4696	0.7502	0.9202	0.9699	(89)
MIT 2	19.6763	19.8893	20.0826	20.2428	20.3081	20.3221	20.3233	20.3233	20.3195	20.2464	19.9601	19.6153	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.9138	20.1147	20.2984	20.4534	20.5187	20.5335	20.5349	20.5348	20.5306	20.4560	20.1807	19.8566	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9138	20.1147	20.2984	20.4534	20.5187	20.5335	20.5349	20.5348	20.5306	20.4560	20.1807	19.8566	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9580	0.9191	0.8592	0.7408	0.5806	0.4049	0.2792	0.3042	0.4847	0.7576	0.9169	0.9656	(94)
Useful gains	680.6386	747.1536	744.3204	679.2767	541.7484	369.4774	245.4902	257.9197	398.9460	574.8006	645.3975	657.4102	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	974.3512	949.4456	861.0627	720.9731	550.3135	370.2712	245.5522	258.0272	401.2879	615.0484	816.2764	977.0213	(97)
Space heating kWh													
	218.5222	135.9402	86.8563	30.0214	6.3725	0.0000	0.0000	0.0000	0.0000	29.9444	123.0328	237.7907	(98a)
Space heating requirement - total per year (kWh/year)												868.4805	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	218.5222	135.9402	86.8563	30.0214	6.3725	0.0000	0.0000	0.0000	0.0000	29.9444	123.0328	237.7907	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												868.4805	
Space heating per m2											(98c) / (4) =	10.0171	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	218.5222	135.9402	86.8563	30.0214	6.3725	0.0000	0.0000	0.0000	0.0000	29.9444	123.0328	237.7907	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	327.7833	203.9103	130.2844	45.0321	9.5587	0.0000	0.0000	0.0000	0.0000	44.9166	184.5493	356.6860	
Space heating requirement													
	327.7833	203.9103	130.2844	45.0321	9.5587	0.0000	0.0000	0.0000	0.0000	44.9166	184.5493	356.6860	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1302.7207	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												13.0272	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4721.8215	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1448.0591	0.1580	54.8812	(367)
Electrical energy for heat distribution (space & water)	13.0272	0.0000	7.8737	(372)
Overall CO2 factor for heat network			0.0401	(386)
Total CO2 associated with community systems			217.8392	(373)
Space and water heating			217.8392	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			132.2644	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.5300	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1448.0591	1.5848	550.5450	(467)
Electrical energy for heat distribution (space & water)	13.0272	0.0000	83.4247	(472)
Overall CO2 factor for heat network			0.4250	(486)
Total CO2 associated with community systems			2308.0822	(473)
Space and water heating			2308.0822	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	1.4870	-740.7930	
PV Unit electricity exported	-460.0477	0.4448	-204.6291	
Total			-945.4221	(480)
Total Primary energy kWh/year			1745.1389	(483)
Dwelling Primary energy Rate (DPER)			20.1300	(484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor		43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1412	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3912	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3032	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3866	0.3790	0.3714	0.3335	0.3259	0.2880	0.2880	0.2805	0.3032	0.3259	0.3411	0.3563	(22b)
Effective ac	0.5747	0.5718	0.5690	0.5556	0.5531	0.5415	0.5415	0.5393	0.5460	0.5531	0.5582	0.5635	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.9700	1.0000	1.9700			(26)
TER Opening Type			9.2400	1.1450	10.5802			(27)
Heatloss Floor 1			43.3500	0.1300	5.6355			(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.1800	3.9528			(29a)
Wall to Access Corridor	16.5900		16.5900	0.1800	2.9862			(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1247			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2700	0.0500	0.3135
E3 Sill	2.5200	0.0500	0.1260
E4 Jamb	20.7200	0.0500	1.0360
E6 Intermediate floor within a dwelling	13.5400	0.0000	0.0000
E5 Ground floor (normal)	6.7700	0.1600	1.0832
E18 Party wall between dwellings	22.0000	0.0600	1.3200
P2 Party wall - Intermediate floor within a dwelling	12.6600	0.0000	0.0000
P1 Party wall - Ground floor	19.4300	0.0800	1.5544
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.7700	0.0200	0.1354
E7 Party floor between dwellings (in blocks of flats)	6.7700	0.0700	0.4739
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.6600	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0424 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.1671 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.2865	40.0831	39.8837	38.9473	38.7721	37.9564	37.9564	37.8054	38.2706	38.7721	39.1265	39.4970	(38)
Heat transfer coeff	71.4535	71.2501	71.0507	70.1143	69.9391	69.1235	69.1235	68.9725	69.4377	69.9391	70.2935	70.6641	(39)
Average = Sum(39)m / 12 =												70.1135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8241	0.8218	0.8195	0.8087	0.8067	0.7973	0.7973	0.7955	0.8009	0.8067	0.8108	0.8150	(40)
HLP (average)												0.8087	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)

Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8665	233.8280	261.4773	(62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
										Total per year (kWh/year) = Sum(64)m =		2362.9741	(64)
12Total per year (kWh/year)												2363	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	133.8049	148.1412	133.8049	138.2651	133.8049	138.2651	133.8049	133.8049	138.2651	133.8049	138.2651	133.8049	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8540	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348	(72)
Total internal gains													

	578.8372	593.0772	567.8110	548.6986	521.3757	500.6634	481.7564	482.7867	497.3774	516.4178	547.4122	567.2057	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	9.2400	36.7938	0.6300	0.7000	0.7700	103.9008	(77)

Solar gains	103.9008	176.9815	242.1538	300.0403	336.0701	333.6398	321.6644	294.7845	262.2013	195.6022	124.4492	88.9174	(83)
Total gains	682.7380	770.0586	809.9648	848.7388	857.4458	834.3032	803.4208	777.5712	759.5787	712.0200	671.8614	656.1232	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.3015	70.5022	70.7000	71.6442	71.8237	72.6712	72.6712	72.8303	72.3424	71.8237	71.4616	71.0868	
alpha	5.6868	5.7001	5.7133	5.7763	5.7882	5.8447	5.8447	5.8554	5.8228	5.7882	5.7641	5.7391	
util living area													
	0.9817	0.9636	0.9325	0.8522	0.7149	0.5241	0.3778	0.4068	0.6141	0.8616	0.9608	0.9848	(86)
MIT	20.2013	20.3810	20.5797	20.8084	20.9426	20.9921	20.9990	20.9985	20.9806	20.8254	20.4922	20.1722	(87)
Th 2	20.2325	20.2345	20.2365	20.2458	20.2475	20.2557	20.2557	20.2572	20.2526	20.2475	20.2440	20.2403	(88)
util rest of house													
	0.9774	0.9555	0.9179	0.8235	0.6685	0.4656	0.3143	0.3417	0.5536	0.8288	0.9508	0.9813	(89)
MIT 2	19.3093	19.5350	19.7804	20.0558	20.1992	20.2508	20.2553	20.2566	20.2394	20.0811	19.6836	19.2789	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	19.5883	19.7997	20.0304	20.2912	20.4317	20.4827	20.4879	20.4886	20.4712	20.3139	19.9365	19.5583	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5883	19.7997	20.0304	20.2912	20.4317	20.4827	20.4879	20.4886	20.4712	20.3139	19.9365	19.5583	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9729	0.9502	0.9134	0.8253	0.6803	0.4836	0.3341	0.3621	0.5717	0.8320	0.9460	0.9772	(94)
Useful gains	664.2612	731.6735	739.8511	700.4799	583.3075	403.4835	268.4505	281.5292	434.2643	592.3694	635.5760	641.1744	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1092.4035	1061.6036	961.3439	798.6888	610.6904	406.6304	268.7476	282.0033	442.4043	679.3831	902.3261	1085.2810	(97)
Space heating kWh	318.5379	221.7131	164.7907	70.7104	20.3729	0.0000	0.0000	0.0000	0.0000	64.7382	192.0601	330.4153	(98a)
Space heating requirement - total per year (kWh/year)												1383.3387	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	318.5379	221.7131	164.7907	70.7104	20.3729	0.0000	0.0000	0.0000	0.0000	64.7382	192.0601	330.4153	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1383.3387	
Space heating per m2											(98c) / (4) =	15.9555	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	318.5379	221.7131	164.7907	70.7104	20.3729	0.0000	0.0000	0.0000	0.0000	64.7382	192.0601	330.4153	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	345.1115	240.2092	178.5381	76.6094	22.0725	0.0000	0.0000	0.0000	0.0000	70.1389	208.0825	357.9798	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	233.6812	206.5686	219.5062	193.4419	187.7464	169.4507	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.7550	84.2188	83.4257	82.0254	80.5997	79.8000	79.8000	79.8000	79.8000	81.8610	83.8838	84.8599	(217)
Fuel for water heating, kWh/month	275.7137	245.2763	263.1157	235.8317	232.9370	212.3443	209.9929	218.2535	220.5242	239.2699	247.6930	272.4692	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.8020	22.3038	20.0821	14.7130	11.3648	9.2851	10.3673	13.4758	17.5038	22.9659	25.9399	28.5747	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.0522	-34.0491	-51.2340	-60.3739	-67.5059	-63.8722	-63.0931	-58.3837	-50.4758	-40.1585	-25.8892	-19.7533	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.6843	-18.6438	-37.7720	-57.7989	-77.4856	-78.2579	-77.3368	-64.9856	-46.9877	-27.0053	-11.7029	-6.8394	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1498.7418	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2873.4214	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	224.3782	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1071.3411	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3611.2003	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1498.7418	0.2100	314.7358	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2873.4214	0.2100	603.4185	(264)
Space and water heating			918.1543	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	224.3782	0.1443	32.3847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	0.1336	-74.5440	
PV Unit electricity exported	-513.5003	0.1254	-64.3679	
Total			-138.9120	(269)
Total CO2, kg/year			823.5563	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.5000	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1498.7418	1.1300	1693.5782	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2873.4214	1.1300	3246.9662	(278)
Space and water heating			4940.5444	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	224.3782	1.5338	344.1588	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-557.8408	1.4938	-833.3127	
PV Unit electricity exported	-513.5003	0.4601	-236.2611	
Total			-1069.5738	(283)
Total Primary energy kWh/year			4345.2302	(286)
Target Primary Energy Rate (TPER)			50.1200	(287)

Full SAP Calculation Printout

Property Reference	Flat Duplex GF	**Issued on Date**	23/08/2025
Assessment Reference	Rev C - Northwest	**Prop Type Ref**	
Property	Plot X, Old Town, Newbury, RG14		

SAP Rating	89 B	**DER**	1.53	**TER**	9.50
Environmental	99 A	**% DER < TER**			83.89
CO_2 Emissions (t/year)	0.11	**DFEE**	17.22	**TFEE**	21.61
Compliance Check	See BREL	**% DFEE < TFEE**			20.31
% DPER < TPER	59.84	**DPER**	20.13	**TPER**	50.12

Assessor Details	Mr. Alex Dodson	**Assessor ID**	DS02-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500 (1b)	x	2.4500 (2b)	=	106.2075	(1b) - (3b)
First floor	43.3500 (1c)	x	2.4500 (2c)	=	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.4150	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			3	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)										(28)...(30) + (32) + (32a)...(32e) =		18083.8300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												208.5794	(35)
Thermal bridges (User defined value 0.030 * total exposed area)												2.7933	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss										(33) + (36) + (36a) =		27.3548	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778	(42)
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.4800	36.7938	0.7600	0.7000	0.7700	101.4662	(77)
Southeast	1.7600	36.7938	0.7600	0.7000	0.7700	23.8744	(77)

Solar gains	125.3406	213.5015	292.1220	361.9533	405.4179	402.4861	388.0396	355.6131	316.3064	235.9646	150.1292	107.2655	(83)
Total gains	764.9645	850.7953	910.4073	944.9070	953.2205	918.5910	885.4880	856.3255	835.2281	787.1458	740.1330	731.0482	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area													
	0.9586	0.9247	0.8616	0.7515	0.5985	0.4335	0.3100	0.3350	0.5118	0.7687	0.9225	0.9672	(86)
MIT	20.5171	20.6592	20.8116	20.9296	20.9845	20.9982	20.9998	20.9997	20.9952	20.9313	20.7113	20.4663	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house													
	0.9504	0.9114	0.8399	0.7192	0.5580	0.3882	0.2624	0.2858	0.4631	0.7314	0.9065	0.9605	(89)
MIT 2	19.7758	19.9480	20.1268	20.2566	20.3109	20.3223	20.3233	20.3233	20.3202	20.2610	20.0138	19.7134	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0077	20.1704	20.3410	20.4671	20.5216	20.5338	20.5349	20.5349	20.5313	20.4707	20.2320	19.9489	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0077	20.1704	20.3410	20.4671	20.5216	20.5338	20.5349	20.5349	20.5313	20.4707	20.2320	19.9489	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9460	0.9080	0.8405	0.7263	0.5700	0.4024	0.2773	0.3012	0.4782	0.7398	0.9041	0.9561	(94)
Useful gains	723.6638	772.5378	765.1692	686.2502	543.3151	369.6058	245.5033	257.9431	399.3662	582.3243	669.1241	698.9578	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	980.2113	952.9265	863.7236	721.8275	550.4969	370.2864	245.5538	258.0300	401.3369	615.9634	819.4788	982.7822	(97)
Space heating kWh													
	190.8714	121.2212	73.3244	25.6157	5.3432	0.0000	0.0000	0.0000	0.0000	25.0275	108.2554	211.1654	(98a)
Space heating requirement - total per year (kWh/year)												760.8242	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	190.8714	121.2212	73.3244	25.6157	5.3432	0.0000	0.0000	0.0000	0.0000	25.0275	108.2554	211.1654	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												760.8242	
Space heating per m2											(98c) / (4) =	8.7754	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	190.8714	121.2212	73.3244	25.6157	5.3432	0.0000	0.0000	0.0000	0.0000	25.0275	108.2554	211.1654	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	286.3070	181.8318	109.9867	38.4235	8.0149	0.0000	0.0000	0.0000	0.0000	37.5412	162.3831	316.7480	
Space heating requirement													
	286.3070	181.8318	109.9867	38.4235	8.0149	0.0000	0.0000	0.0000	0.0000	37.5412	162.3831	316.7480	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1141.2362	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												11.4124	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)													
mechanical ventilation fans (SFP = 0.1292)												33.4924	(330a)
Total electricity for the above, kWh/year												33.4924	(331)
Electricity for lighting (calculated in Appendix L)												216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-958.2209	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												4560.3370	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1141.2362	4.4400	50.6709	(340a)
Space heating total			50.6709	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			259.2619	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.7087 (357)
SAP value		88.5122
SAP rating (Section 12)		89 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1404.9966	0.1581	48.1059	(367)
Electrical energy for heat distribution (space & water)	11.4124	0.0000	7.6196	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			210.8098	(373)
Space and water heating			210.8098	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			125.2349	(383)
CO2 emissions per m2			1.4400	(384)
EI value			98.7258	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b)	x 2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c)	x 2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1162 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area) 2.7933 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)

Average = Sum(39)m / 12 = 62.4033

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers

67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day) 126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)

Total per year (kWh/year) = Sum(64)m = 2751.6674 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.4800	42.9509	0.7600	0.7000	0.7700	118.4456	(77)
Southeast	1.7600	42.9509	0.7600	0.7000	0.7700	27.8696	(77)

Solar gains	146.3152	221.4792	299.2755	377.4295	409.9363	437.9421	413.7339	384.4230	342.7809	258.3726	172.6085	125.9735	(83)
Total gains	785.9390	858.7730	917.5608	960.3832	957.7390	954.0470	911.1824	885.1354	861.7026	809.5538	762.6124	749.7563	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area													
	0.9496	0.9161	0.8422	0.7235	0.5662	0.3789	0.2671	0.2890	0.4757	0.7257	0.9033	0.9601	(86)
MIT	20.5667	20.6885	20.8422	20.9449	20.9892	20.9993	20.9999	20.9999	20.9969	20.9526	20.7598	20.5155	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house													
	0.9398	0.9014	0.8182	0.6897	0.5249	0.3349	0.2207	0.2413	0.4278	0.6855	0.8841	0.9520	(89)
MIT 2	19.8367	19.9830	20.1614	20.2722	20.3150	20.3230	20.3234	20.3234	20.3215	20.2820	20.0706	19.7742	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0650	20.2037	20.3744	20.4826	20.5259	20.5345	20.5350	20.5350	20.5328	20.4918	20.2862	20.0061	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0650	20.2037	20.3744	20.4826	20.5259	20.5345	20.5350	20.5350	20.5328	20.4918	20.2862	20.0061	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9356	0.8986	0.8201	0.6979	0.5374	0.3486	0.2352	0.2562	0.4427	0.6958	0.8830	0.9476	(94)
Useful gains	735.3087	771.6791	752.4570	670.2310	514.6666	332.6270	214.3400	226.8064	381.4886	563.2751	673.3769	710.4878	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	965.0685	936.2802	834.6057	697.8335	519.5630	332.8930	214.3563	226.8354	382.7042	586.0774	797.9015	967.6323	(97)
Space heating kWh													
	170.9413	110.6119	61.1187	19.8739	3.6429	0.0000	0.0000	0.0000	0.0000	16.9649	89.6577	191.3155	(98a)
Space heating requirement - total per year (kWh/year)												664.1268	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	170.9413	110.6119	61.1187	19.8739	3.6429	0.0000	0.0000	0.0000	0.0000	16.9649	89.6577	191.3155	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												664.1268	
Space heating per m2											(98c) / (4) =	7.6601	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	170.9413	110.6119	61.1187	19.8739	3.6429	0.0000	0.0000	0.0000	0.0000	16.9649	89.6577	191.3155	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	256.4120	165.9178	91.6780	29.8108	5.4643	0.0000	0.0000	0.0000	0.0000	25.4474	134.4866	286.9732	
Space heating requirement													
	256.4120	165.9178	91.6780	29.8108	5.4643	0.0000	0.0000	0.0000	0.0000	25.4474	134.4866	286.9732	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)

Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year		
Space heating fuel - community heating	996.1901	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4127.5010	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	9.9619	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1054.7470	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4318.7648	(338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	996.1901	6.5500	65.2505	(340a)
Space heating total			65.2505	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			328.5555	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1366.3177	0.1585	42.1061	(367)
Electrical energy for heat distribution (space & water)	9.9619	0.0000	7.3946	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			204.5851	(373)
Space and water heating			204.5851	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			106.7521	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)
Space and Water heating from Heat pump	1366.3177	1.5867	421.5131	(467)
Electrical energy for heat distribution (space & water)	9.9619	0.0000	78.5860	(472)
Overall CO2 factor for heat network			0.4243	(486)
Total CO2 associated with community systems			2174.2116	(473)
Space and water heating			2174.2116	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1530.3765	(483)

SAP 10 EPC IMPROVEMENTS

Rev C - Northwest

Current energy efficiency rating: B 89
Current environmental impact rating: A 99

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 89
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£71	£71	£0
Community scheme	£440	£440	£0
Space heating	£179	£179	£0
Water heating	£270	£270	£0
Lighting	£62	£62	£0
Generated (PV)	-£182	-£182	£0
Total cost of fuels	£329	£329	£0
Total cost of uses	£329	£329	£0
Delivered energy	50 kWh/m²	50 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	18 kWh/m²	18 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation 0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.5000 (23b)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.5778 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)

Hot water usage for baths

29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)

Hot water usage for other uses

41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)

Average daily hot water use (litres/day)	126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	

Distribution loss (46)m = 0.15 x (45)m

32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:	
Store volume	110.0000 (47)
b) If manufacturer declared loss factor is not known :	
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)
Volume factor from Table 2a	1.0294 (52)
Temperature factor from Table 2b	0.6000 (53)
Enter (49) or (54) in (55)	1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Primary loss / Combi loss

Total heat required for water heating calculated for each month

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

WWHRS / PV diverter / Solar input / FGHRS

Output from w/h

273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
									Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.4800	36.7938	0.7600	0.7000	0.7700	101.4662	(77)
Southeast	1.7600	36.7938	0.7600	0.7000	0.7700	23.8744	(77)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	125.3406	213.5015	292.1220	361.9533	405.4179	402.4861	388.0396	355.6131	316.3064	235.9646	150.1292	107.2655	(83)
Total gains	764.9645	850.7953	910.4073	944.9070	953.2205	918.5910	885.4880	856.3255	835.2281	787.1458	740.1330	731.0482	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area	0.9586	0.9247	0.8616	0.7515	0.5985	0.4335	0.3100	0.3350	0.5118	0.7687	0.9225	0.9672	(86)
MIT	20.5171	20.6592	20.8116	20.9296	20.9845	20.9982	20.9998	20.9997	20.9952	20.9313	20.7113	20.4663	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house	0.9504	0.9114	0.8399	0.7192	0.5580	0.3882	0.2624	0.2858	0.4631	0.7314	0.9065	0.9605	(89)
MIT 2	19.7758	19.9480	20.1268	20.2566	20.3109	20.3223	20.3233	20.3233	20.3202	20.2610	20.0138	19.7134	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0077	20.1704	20.3410	20.4671	20.5216	20.5338	20.5349	20.5349	20.5313	20.4707	20.2320	19.9489	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0077	20.1704	20.3410	20.4671	20.5216	20.5338	20.5349	20.5349	20.5313	20.4707	20.2320	19.9489	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9460	0.9080	0.8405	0.7263	0.5700	0.4024	0.2773	0.3012	0.4782	0.7398	0.9041	0.9561	(94)
Useful gains	723.6638	772.5378	765.1692	686.2502	543.3151	369.6058	245.5033	257.9431	399.3662	582.3243	669.1241	698.9578	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	980.2113	952.9265	863.7236	721.8275	550.4969	370.2864	245.5538	258.0300	401.3369	615.9634	819.4788	982.7822	(97)
Space heating kWh	190.8714	121.2212	73.3244	25.6157	5.3432	0.0000	0.0000	0.0000	0.0000	25.0275	108.2554	211.1654	(98a)
Space heating requirement - total per year (kWh/year)												760.8242	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	190.8714	121.2212	73.3244	25.6157	5.3432	0.0000	0.0000	0.0000	0.0000	25.0275	108.2554	211.1654	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												760.8242	
Space heating per m2											(98c) / (4) =	8.7754	(99)

9b. Energy requirements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	190.8714	121.2212	73.3244	25.6157	5.3432	0.0000	0.0000	0.0000	0.0000	25.0275	108.2554	211.1654	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	286.3070	181.8318	109.9867	38.4235	8.0149	0.0000	0.0000	0.0000	0.0000	37.5412	162.3831	316.7480	
Space heating requirement													
	286.3070	181.8318	109.9867	38.4235	8.0149	0.0000	0.0000	0.0000	0.0000	37.5412	162.3831	316.7480	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	
Water heating fuel													
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446	(331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-15.1626	-25.3775	-43.6672	-56.8338	-66.7233	-64.1271	-62.8837	-56.2504	-45.1434	-31.7293	-17.7572	-12.5176	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-4.3362	-11.2009	-28.3282	-52.0302	-77.2675	-81.0249	-78.8572	-61.4920	-38.3190	-17.7675	-6.1928	-3.2314	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												1141.2362	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4127.5010	(310)

Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	11.4124	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)		
mechanical ventilation fans (SFP = 0.1292)	33.4924	(330a)
Total electricity for the above, kWh/year	33.4924	(331)
Electricity for lighting (calculated in Appendix L)	216.3282	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-958.2209	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4560.3370	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	1141.2362	4.4400	50.6709	(340a)
Space heating total			50.6709	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	4.4400	183.2610	(342a)
Water heating total			183.2610	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	16.4900	5.5229	(349)
Energy for lighting	216.3282	16.4900	35.6725	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	16.4900	-82.1488	
PV Unit electricity exported	-460.0477	5.5900	-25.7167	
Total			-107.8654	(352)
Total energy cost			259.2619	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.7087	(357)
SAP value	88.5122	
SAP rating (Section 12)	89	(358)
SAP band	B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1404.9966	0.1581	48.1059	(367)
Electrical energy for heat distribution (space & water)	11.4124	0.0000	7.6196	(372)
Overall CO2 factor for heat network			0.0400	(386)
Total CO2 associated with community systems			210.8098	(373)
Space and water heating			210.8098	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-498.1732	0.1318	-65.6675	
PV Unit electricity exported	-460.0477	0.1212	-55.7760	
Total			-121.4435	(380)
Total CO2, kg/year			125.2349	(383)
CO2 emissions per m2			1.4400	(384)
EI value			98.7258	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	43.3500	(1b) x	2.4500	(2b) =	106.2075	(1b) - (3b)
First floor	43.3500	(1c) x	2.4500	(2c) =	106.2075	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 86.7000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		212.4150	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	3.9000	3.7000	3.7000	3.2000	3.2000	3.1000	3.2000	3.5000	3.4000	3.8000	(22)
Wind factor	1.0500	1.0000	0.9750	0.9250	0.9250	0.8000	0.8000	0.7750	0.8000	0.8750	0.8500	0.9500	(22a)
Adj infilt rate	0.1221	0.1162	0.1133	0.1075	0.1075	0.0930	0.0930	0.0901	0.0930	0.1017	0.0988	0.1104	(22b)

Mechanical extract ventilation - decentralised

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4800	1.0536	7.8812			(27)
FD Shelt.			1.9700	0.5500	1.0835			(26)
French Door			1.7600	1.0536	1.8544			(27)
Heatloss Floor 1			43.3500	0.1100	4.7685	110.0000	4768.5000	(28a)
100mm FullFill Cavity	33.1700	11.2100	21.9600	0.2500	5.4900	50.0000	1097.9999	(29a)
Wall to Access Corridor	16.5900		16.5900	0.2100	3.4839	150.0000	2488.5000	(29a)
Total net area of external elements Aum(A, m2)			93.1100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5615			(33)
Main dwelling								
Party Wall			79.3600	0.0000	0.0000	70.0000	5555.2000	(32)
Party Ceiling 1			43.3500			40.0000	1734.0000	(32b)
Timber partitions			141.0200			9.0000	1269.1800	(32c)
Internal Floor 1			43.3500			18.0000	780.3000	(32d)
Internal Ceiling 1			43.3500			9.0000	390.1500	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	18083.8300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		208.5794 (35)
Thermal bridges (User defined value 0.030 * total exposed area)		2.7933 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	27.3548 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	35.0485	(38)
Heat transfer coeff	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	62.4033	(39)
Average = Sum(39)m / 12 =												62.4033	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	0.7198	(40)
HLP (average)												0.7198	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5778	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824	(45)
Energy content (annual)										Total = Sum(45)m =		2100.8276	
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)

Water storage loss:		
Store volume	110.0000	(47)
b) If manufacturer declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152	(51)
Volume factor from Table 2a	1.0294	(52)
Temperature factor from Table 2b	0.6000	(53)
Enter (49) or (54) in (55)	1.0327	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592	(64)
										Total per year (kWh/year) = Sum(64)m =		2751.6674	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	116.6790	103.6989	111.2083	99.9826	98.4807	90.4135	90.3235	92.8879	92.8011	101.5018	105.5497	115.6698	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.6235	27.1995	22.1201	16.7464	12.5181	10.5683	11.4194	14.8434	19.9228	25.2966	29.5248	31.4746	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.5730	351.1797	342.0909	322.7419	298.3172	275.3615	260.0257	256.4189	265.5078	284.8568	309.2814	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)													
	156.8266	154.3139	149.4735	138.8647	132.3666	125.5744	121.4026	124.8494	128.8904	136.4271	146.5968	155.4702	(72)
Total internal gains													
	639.6239	637.2939	618.2853	582.9537	547.8026	516.1049	497.4484	500.7124	518.9217	551.1812	590.0038	623.7827	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.4800	42.9509	0.7600	0.7000	0.7700	118.4456	(77)
Southeast	1.7600	42.9509	0.7600	0.7000	0.7700	27.8696	(77)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	146.3152	221.4792	299.2755	377.4295	409.9363	437.9421	413.7339	384.4230	342.7809	258.3726	172.6085	125.9735	(83)
Total gains	785.9390	858.7730	917.5608	960.3832	957.7390	954.0470	911.1824	885.1354	861.7026	809.5538	762.6124	749.7563	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	80.4971	
alpha	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	6.3665	
util living area													
	0.9496	0.9161	0.8422	0.7235	0.5662	0.3789	0.2671	0.2890	0.4757	0.7257	0.9033	0.9601	(86)
MIT	20.5667	20.6885	20.8422	20.9449	20.9892	20.9993	20.9999	20.9999	20.9969	20.9526	20.7598	20.5155	(87)
Th 2	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	20.3234	(88)
util rest of house													
	0.9398	0.9014	0.8182	0.6897	0.5249	0.3349	0.2207	0.2413	0.4278	0.6855	0.8841	0.9520	(89)
MIT 2	19.8367	19.9830	20.1614	20.2722	20.3150	20.3230	20.3234	20.3234	20.3215	20.2820	20.0706	19.7742	(90)
Living area fraction										fLA = Living area / (4) =		0.3128	(91)
MIT	20.0650	20.2037	20.3744	20.4826	20.5259	20.5345	20.5350	20.5350	20.5328	20.4918	20.2862	20.0061	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0650	20.2037	20.3744	20.4826	20.5259	20.5345	20.5350	20.5350	20.5328	20.4918	20.2862	20.0061	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9356	0.8986	0.8201	0.6979	0.5374	0.3486	0.2352	0.2562	0.4427	0.6958	0.8830	0.9476	(94)
Useful gains	735.3087	771.6791	752.4570	670.2310	514.6666	332.6270	214.3400	226.8064	381.4886	563.2751	673.3769	710.4878	(95)
Ext temp.	4.6000	5.2000	7.0000	9.3000	12.2000	15.2000	17.1000	16.9000	14.4000	11.1000	7.5000	4.5000	(96)
Heat loss rate W													
	965.0685	936.2802	834.6057	697.8335	519.5630	332.8930	214.3563	226.8354	382.7042	586.0774	797.9015	967.6323	(97)
Space heating kWh													
	170.9413	110.6119	61.1187	19.8739	3.6429	0.0000	0.0000	0.0000	0.0000	16.9649	89.6577	191.3155	(98a)
Space heating requirement - total per year (kWh/year)												664.1268	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	170.9413	110.6119	61.1187	19.8739	3.6429	0.0000	0.0000	0.0000	0.0000	16.9649	89.6577	191.3155	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												664.1268	
Space heating per m2										(98c) / (4) =		7.6601	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump-Space and Water	1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		

Space heating requirement

	170.9413	110.6119	61.1187	19.8739	3.6429	0.0000	0.0000	0.0000	0.0000	16.9649	89.6577	191.3155 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	256.4120	165.9178	91.6780	29.8108	5.4643	0.0000	0.0000	0.0000	0.0000	25.4474	134.4866	286.9732
Space heating requirement												
	256.4120	165.9178	91.6780	29.8108	5.4643	0.0000	0.0000	0.0000	0.0000	25.4474	134.4866	286.9732 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement

	273.1943	241.6777	256.7410	225.4866	218.4626	196.7075	193.9297	201.6421	203.8882	227.5485	242.2299	270.1592 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388
Water heating fuel												
	409.7914	362.5166	385.1115	338.2299	327.6940	295.0613	290.8946	302.4632	305.8322	341.3227	363.3448	405.2388 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	2.8446	2.5693	2.8446	2.7528	2.8446	2.7528	2.8446	2.8446	2.7528	2.8446	2.7528	2.8446 (331)
Lighting	26.8046	21.5036	19.3616	14.1852	10.9570	8.9520	9.9954	12.9924	16.8758	22.1419	25.0093	27.5496 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-18.1436	-27.2619	-46.0013	-59.8009	-68.1805	-68.0662	-66.0788	-60.1130	-49.0438	-35.3423	-20.8689	-15.0930 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	-5.8549	-12.7033	-31.2438	-57.7722	-81.0600	-93.0525	-88.4113	-71.1286	-45.3050	-21.6541	-8.1615	-4.4057 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year	
Space heating fuel - community heating	996.1901 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	4127.5010 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	9.9619 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 3.7480, total flow = 29.0000, SFP = 0.1292)	
mechanical ventilation fans (SFP = 0.1292)	33.4924 (330a)
Total electricity for the above, kWh/year	33.4924 (331)
Electricity for lighting (calculated in Appendix L)	216.3282 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1054.7470 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4318.7648 (338)

10b. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	996.1901	6.5500	65.2505	(340a)
Space heating total			65.2505	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	4127.5010	6.5500	270.3513	(342a)
Water heating total			270.3513	(342)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(347a)
Pumps, fans and electric keep-hot	33.4924	28.4300	9.5219	(349)
Energy for lighting	216.3282	28.4300	61.5021	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	28.4300	-151.8146	
PV Unit electricity exported	-520.7528	5.8100	-30.2557	
Total			-182.0703	(352)
Total energy cost			328.5555	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			375.0000	(367)
Space and Water heating from Heat pump	1366.3177	0.1585	42.1061	(367)
Electrical energy for heat distribution (space & water)	9.9619	0.0000	7.3946	(372)
Overall CO2 factor for heat network			0.0399	(386)
Total CO2 associated with community systems			204.5851	(373)
Space and water heating			204.5851	(376)
Pumps, fans and electric keep-hot	33.4924	0.1387	4.6458	(378)
Energy for lighting	216.3282	0.1443	31.2229	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	0.1321	-70.5455	
PV Unit electricity exported	-520.7528	0.1213	-63.1561	
Total			-133.7016	(380)
Total CO2, kg/year			106.7521	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			375.0000	(467a)

Space and Water heating from Heat pump	1366.3177	1.5867	421.5131	(467)
Electrical energy for heat distribution (space & water)	9.9619	0.0000	78.5860	(472)
Overall CO2 factor for heat network			0.4243	(486)
Total CO2 associated with community systems			2174.2116	(473)
Space and water heating			2174.2116	(476)
Pumps, fans and electric keep-hot	33.4924	1.5128	50.6673	(478)
Energy for lighting	216.3282	1.5338	331.8115	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-533.9942	1.4881	-794.6405	
PV Unit electricity exported	-520.7528	0.4449	-231.6735	
Total			-1026.3140	(480)
Total Primary energy kWh/year			1530.3765	(483)